Long Term Planning Process

West Midlands & Chilterns Route Study

Advice and choices for funders

August 2017

Contents

Foreword

'There is clear evidence that high quality transport networks are an important enabler of economic growth'

We are delighted to present the West Midlands & Chilterns Route Study. It is an important milestone in the development of the region's transport infrastructure, and is the result of much collaborative industry effort. It sets out a clear and compelling case to support the growth of rail in a way that will benefit passengers, communities and the economy.

Following the wide consultation of the Draft for Consultation, the strategy has already been reflected in the competition to operate the next West Midlands Franchise. Our continued work with Midlands Connect to support their aspirations, has led to the alignment of strategies and priorities. Their strategy has endorsed the findings of the Route Study and provides detailed economic evidence to support further investment in rail. This partnership approach has already delivered funding to progress the development of the Midlands Rail Hub, a joint priority for Midlands Connect and the rail industry. On the Chilterns, the strategic case for connecting passengers on to Crossrail and high speed services at Old Oak Common has led to collaborative work between the rail industry, DfT and HS2 Ltd to define the scale of economic benefits.

Rail's role in the region is vital, and increasingly so; every day, it takes many thousands of people to work, education and leisure opportunities, carries freight and passengers that cross the country, and brings our towns and cities, businesses and communities closer together. The success of the rail industry over the last 20 years, during which it has delivered greater capacity, performance and safety, at the same time as improved efficiency and value, is notable. Rail use has grown even faster in the West Midlands than in the country as a whole, with a growing shift to commuting by train supported by the increasing frequency and reliability of services. On Chiltern routes, the long-term franchise has been a vehicle for investment in more frequent and better services.

Investment in rail is about more than purely transporting greater numbers of people around the network. There is clear evidence that high quality transport networks are an important enabler of economic growth. The recently-redeveloped Birmingham New Street station is a great example; a world-class gateway to the region, it has increased capacity for passengers and is driving forward the regeneration of the southern part of the city centre. On a wider scale, the arrival of High Speed 2 offers an exciting and transformational opportunity for the area, with new services and stations in Birmingham and at Old Oak Common. This will be a catalyst for wide scale economic development through new, fast journey opportunities and a large increase in capacity for passengers.

However, sustaining this growth and progress to meet forecast demand for the next 30 years, is not without significant challenges, which will be addressed and explored further in this study. The increase in services into and across Birmingham city centre over the past two decades has been delivered without any significant increase in the capacity of the network itself. The travelling public will know that some trains are crowded today, and will be even more so in the future unless we intervene; that journey times between the East and West Midlands do not compare favourably with similar cities and towns elsewhere in the country; and that there are physical constraints that make it difficult to add more trains on today's network.

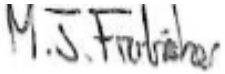
The purpose of this Route Study is to provide an evidence base to inform funders considering rail industry investment for the medium and long term. This means identifying ways in which the industry can meet forecast demand over the coming years, get 'HS2-ready' by 2026, and look ahead to 2043. This longer-term planning horizon means we can consider a broad range of options and identify a set of choices for the next 10 years that we know would be fit for the future. Embedded within this strategy are the opportunities provided by the Digital Railway programme, including advanced signalling and better information for passengers.

The approach we take is to first make the best use we can of the infrastructure we have, before we consider enhancing the network. But we are confident that there is a coherent and compelling case to invest in the growth of the network in the West Midlands and Chilterns, to take the opportunity of a high speed, digital future and to support and enable continued economic growth.

Jo Kaye

Managing Director,
System Operator

Martin Frobisher



Route Managing Director,
London North Western

Executive Summary

Meeting Demand

'The number of passengers using the railway across the study area has increased substantially over the past decade, and further growth is forecast'

The railway across the West Midlands and Chilterns area is vital to the region, the markets and communities it serves. Those varied markets include passengers travelling long distances for work or leisure, day-to-day commuting into Birmingham city centre and London Marylebone, freight to and from all corners of the country as well as providing important connections between the Midland's key urban centres.

The West Midlands and Chilterns Route Study seeks to identify the capacity and capability that the railway needs to play its part in delivering economic growth by connecting people to jobs, and businesses to markets.

The number of passengers using the railway across the study area has increased substantially over the past decade, and further growth is forecast. Strategic options have been identified in order to meet this challenge, and set out as choices for funders. These strategic options are in three clear categories:

1. Meeting passenger demand to 2024

- providing longer trains across the West Midlands network, and into London Marylebone on the Chiltern route
- upgrading passenger facilities at stations to safely manage increasing passenger numbers

2. Maximising the opportunities offered by the arrival of High Speed Two (HS2)

- providing 10 additional train services across the Midlands by unlocking additional capacity in central Birmingham
- supporting additional passenger and freight services by providing additional capacity between Birmingham and the East Midlands
- providing new passenger journey opportunities through links into Old Oak Common from the Chiltern route into HS2 and Crossrail
- maximising the opportunities to interchange on to HS2 services

3. Developing a longer term view towards 2043

- better services for passengers on the Chiltern route through the introduction of new rolling stock, electrification and advanced signalling
- enabling additional trains and improved performance by separating the flows of passenger and freight services at key locations
- improved provision of information and better train performance through roll out of advanced signalling across the study area

Following the publication of the Draft for Consultation the strategy has started to be implemented. The West Midlands franchise Invitation to Tender recognised the requirement for a substantial increase in vehicle numbers to serve the West Midlands. Meanwhile, Midlands Connect secured £5m of new funding to develop a Strategic Outline Business Case (SOBC) for the Midlands Rail Hub.

At the south end of the route, the strategic option of delivering additional capacity into London is being developed further and consideration is being given as to how it could be integrated into the new station at Old Oak Common. This station will sit at the heart of regeneration in the Old Oak and Park Royal area, providing transport links to HS2, Crossrail and Great Western services.

The importance of delivering sufficient passenger capacity at our stations has also been recognised, with further development and funding identified for priority stations at Birmingham Snow Hill and University.

Going forward the rail industry will continue to work with funders and wider stakeholders to deliver a railway that will continue to support the growth of the economy across the West Midlands and Chilterns areas.

A growth story

The railway of the West Midlands is at the heart of the national network and a key component of the Midlands Engine for Growth with the Midlands economy worth in excess of £200bn, and ambitious plans for growth. Every year nearly 50 million passengers make journeys by rail in the West Midlands, and demand is growing faster than the national average, at over four per cent a year.

Today 38 per cent of passengers travelling into Birmingham at peak times choose to travel by rail; this is a dramatic increase from the 17 per cent who chose to travel by rail in 2001. Forecast demand shows continuing strong growth in passengers commuting in to Birmingham of 49 per cent in just 10 years from 2013 to 2023, and 114 per cent by 2043.

Commuting into London Marylebone is a similar success story. Between 2011 and 2015 the number of passengers travelling in and out of Marylebone during peak times increased by 20 per cent. Looking forward, these figures are forecast to grow by 22 per cent to 2023, and 76 per cent by 2043.

The number of passengers travelling longer distances between the towns and cities across the route is likewise set to grow significantly, with Birmingham acting as a vital long distance hub. Passenger numbers on these services are set to continue to grow, with forecasts of up to 45 per cent to 2023, and up to 188 per cent to 2043.

Following the publication of the West Midlands and Chilterns Draft for Consultation the Department for Transport, as part of the 2017 HLOS, has published its expectations for passenger growth over the period 2019-2024 and beyond. These forecasts differ from those used for this route study, but also show continuing growth in passenger numbers across the whole network throughout the period. The rail industry will continue to review growth forecasts and incorporate revised data into strategic planning processes.

The railway in the West Midlands plays an important role in moving goods, and reducing the number of lorries on the roads. Traditionally the railways have focused on moving heavy goods, including coal, but this market is declining, with energy policy being a major driver. Future growth is expected in the intermodal market moving goods from ports to freight terminals and onward distribution across the country. There is a number of existing important freight terminals in the study area, as well as proposals for new ones including at Cannock and Four Ashes.

There are clear stakeholder ambitions across the study area to accelerate forecast growth through targeted investment in transformational transport projects. These stakeholders include Local Transport Authorities, Local Enterprise Partnerships and the emerging sub-national transport bodies.

The Midlands Connect partnership has identified the role transport can play in supporting the housing, jobs and economic growth identified by the Midlands Engine strategy. They have set out their priorities for transformational investment in the Midland's strategic transport networks, identifying that every £1 invested could deliver £2 of economic benefits.

At the southern end of the study area, the London Mayoral Development Commission's plans for the Old Oak and Park Royal area will make it a significant new destination for business and leisure in its own right, as well as a major transport hub.

England's Economic Heartland are strongly supporting the development of East West Rail, as a critical element to join two of the UK's most prestigious university cities, and the high tech industries and jobs clustered around these institutions.

The arrival of HS2 in 2026 will be transformational for passengers and the economy, with new stations at Curzon Street in Birmingham city centre, Birmingham Interchange adjacent to Birmingham Airport and at Old Oak Common. It will reshape travel across the nation, acting as a catalyst for change in the towns and cities of the region. This presents an opportunity to consider options for delivering future capacity and connectivity across the area in a way that maximises the benefits of this major investment.

Developing a strategy

It is a great time to be planning for the future of rail travel in the West Midlands and Chilterns, but meeting this growing demand for passenger and freight is not without its challenges. The Market Studies established in 2013 set out the forecast levels of passenger and freight demand and connectivity-based conditional outputs to 2043. To meet these challenges the rail industry has worked together

to develop strategic options to accommodate the future passenger and freight end user demand as well as outline ways in which the rail network could be developed.

This strategy is intended to provide advice and guidance to funding bodies, to inform future investment decisions. This strategy has not been developed in isolation, and the rail industry has worked closely with other bodies to understand their requirements of the rail network, to meet passenger needs by connecting people to jobs, businesses to other businesses and trading partners, as well as leisure users. This work forms an important input into the franchising programme, the development and delivery of enhancements, and the setting of outputs and funding for Network Rail.

The strategy builds upon the investment that is already committed up to 2019 and the associated train service improvements. The network in the West Midlands benefits from relatively modern infrastructure, with renewed signalling across the route and the landmark enhancement of passenger facilities at Birmingham New Street. An improved service for passengers, with faster and more frequent trains, is also being delivered through the electrification of the route between Walsall and Rugeley. However, the level of on-track capacity available to meet growing demand for services into central Birmingham has remained largely unchanged for decades.

In the last decade the Chiltern route has seen sustained investment through an innovative funding mechanism, which has increased capacity and dramatically improved journey times along the route. East West Rail Phase 1 has delivered a new service between London and Oxford via new railway in the Bicester area. Additional seats for passengers have also been delivered through longer trains on the Chiltern route, supported by longer platforms at key stations. However, the available capacity on the approaches to London Marylebone is now very limited, and for its size it is already a very busy station.

The strategy also takes in to account schemes promoted by other funders focused around improving passenger access to the rail network, with new stations at Kenilworth, Coventry Arena and Bermuda Park, as well as improvements to station access and facilities.

The safety, resilience and performance of the railway system are also important considerations that have informed the strategy, as well as the opportunities provided through the roll out of a technology enabled Digital Railway. There is no commitment at this stage to the funding required to deliver these outputs, with these studies aiming to inform decisions taken by these funders.

These strategic options have not been developed in isolation and this is one of a series of Route Studies. Cross boundary analysis has been undertaken to assure the fit with other studies, particularly for long distance passenger services and freight flows.

Choices for funders

In setting out strategic options for the rail network in West Midlands and Chiltern areas, there are two key imperatives:

to accommodate growing demand from passenger and freight end users

to maximise the benefits of High Speed rail services and wider regeneration as a result of HS2

The West Midlands and Chilterns Route Study focuses in detail on three key themes:

1. meeting demand to 2024
2. opportunities to maximise the benefits of HS2 in 2026
3. the longer term view to 2043.

All of the strategic options considered have been presented as ‘choices for funders’ which have been assessed with a focus on providing value for money to taxpayers and funders, and are presented in tables ES1 and ES2. The choices for funders identified are a key input into the industry’s ongoing discussions with funders on the future outputs, investment choices and funding requirements for the railway. These have fed in to the franchising process, including the next franchise in the West Midlands in 2017 and the Chiltern route refranchising in 2022. The longer term vision is intended to guide investment decisions up to 2043.

A strategy for the West Midlands

In the West Midlands, there are clear opportunities and challenges presented by a growing economy and increasingly constrained rail network. Passengers seek to access the jobs in the core urban areas across the route, while Birmingham acts as the national hub of the current and future HS2 network. Demand to send freight by rail is also growing, with a particular focus on the movement of consumer goods and other containerised products between deep sea ports and freight terminals in the West Midlands and beyond. A blueprint setting out the strategy for the West Midlands is shown in Figure ES1.

The arrival of HS2 in 2026 will reshape travel into and across the region and act as a catalyst for change in its towns and cities. Connecting into the HS2 network, with its new high speed services from London to Birmingham, Manchester, Leeds and beyond, is a key element of the strategic options that have been developed as part of this Study.

Meeting the needs of an increasing number of passengers, both on trains and at stations is the first important imperative. Strategic options have been identified to provide longer trains, both on commuter services into Birmingham, and on longer distance cross-country services. The new West Midlands franchise, scheduled to start in 2017, has specified a significant uplift in the amounts of seats that it will offer passengers, including a much improved Sunday level of service. This will lead to a requirement for facilities to maintain and stable the additional trains, with the potential for a new train maintenance site at Duddeston having been identified as a strategic option.

Stations form an important part of the passenger experience, and additional passengers will also add pressure to a number of stations and their ability to safely handle these increased numbers. Strategic options have been developed to meet this challenge, with funding already secured to further develop and refine these at Birmingham Snow Hill and University. These longer trains and station upgrades will enable forecast passenger growth to be accommodated to 2024.

Beyond these strategic options for longer trains, current network constraints restrict the ability to operate any extra services into central Birmingham, while the opportunity to deliver additional longer trains is also limited. Meeting further growth beyond 2024 will require increased network capacity in central Birmingham to be provided.

Strategic options have been developed to form the Midlands Rail Hub. This includes options to provide increased capacity in central Birmingham, for up to 10 additional trains per hour and the capacity to increase the train service between Birmingham and the East Midlands. This package also includes strategic options that provide increased capacity for freight growth, including improved access to important freight terminals. The Digital Railway programme forms a key component of the Midlands Rail Hub, with the potential to improve performance and enhance the level of information offered to passengers.

The Midlands Rail Hub has been endorsed by Midlands Connect, and forms a key component of their Strategy. Analysis has shown up to £2bn of Wider Economic Benefits (WEBs) over 30 years being delivered through the new passenger services as part of the Midlands Rail Hub. This has led to the allocation of £5m of funding to collaboratively develop the SOBC with the rail industry.

The arrival of HS2 will release capacity, with some long distance services transferring on to the HS2 network. The strategy has fed into wider industry processes, which are developing service options for the existing network. In the West Midlands the focus is on the opportunity to change the timetable on the Coventry corridor to better meet passenger needs. The strategic option put forward as part of the study would see a cross-country train service, which currently runs via Solihull, diverted to run on the Coventry corridor. This would strengthen connectivity between Coventry, Birmingham Airport and the East Midlands and North East. Analysis has identified that this would require infrastructure improvements between Leamington and Coventry, and this is presented as a choice for funders.

In order to support investment in the Midlands, the Midlands Connect partnership has identified the economic benefits that could be unlocked by improved links between the East Midlands and West Midlands. Analysis undertaken by the partnership has shown the potential for in excess of £500m in WEBs by improving services on three corridors; Birmingham to Nottingham, Birmingham to Leicester and Coventry to Leicester. The rail industry will continue to work with Midlands Connect, to further develop the Midlands Connect rail strategy, and unlock the identified economic prize.

Table ES1: Choices for funders - West Midlands

No.	Timescale	Choices for funders	Conditional outputs delivered
1	To 2024	Train lengthening in the West Midlands (with associated infrastructure)	Capacity
2	To 2024	Train lengthening on cross-country services	Capacity
3	To 2024	Passenger capacity improvements at Birmingham Moor Street, Birmingham Snow Hill, and University stations	Capacity
4	Medium term	Midlands Rail Hub	Capacity Connectivity Access to HS2
5	Medium term	Leamington Spa – Coventry capacity enhancements	Capacity Connectivity Access to HS2
6	Medium term	Journey time improvements between East Midlands and West Midlands	Connectivity

In the longer term, the need to accommodate forecast growth up to 114 per cent in passengers and a growing need to move goods by rail on an increasingly constrained network are discussed with options that looks at how best to remove capacity constraints, by separating fast passenger services from slower commuter services and freight.

The Digital Railway programme outlines the deployment of advanced signalling, known as European Train Control Systems (ETCS), across the West Midlands towards 2043. This has the potential to increase the level of service that can be accommodated over the infrastructure, by increasing the ability to safely run trains closer together.

Figure ES1: West Midlands Strategic Blueprint

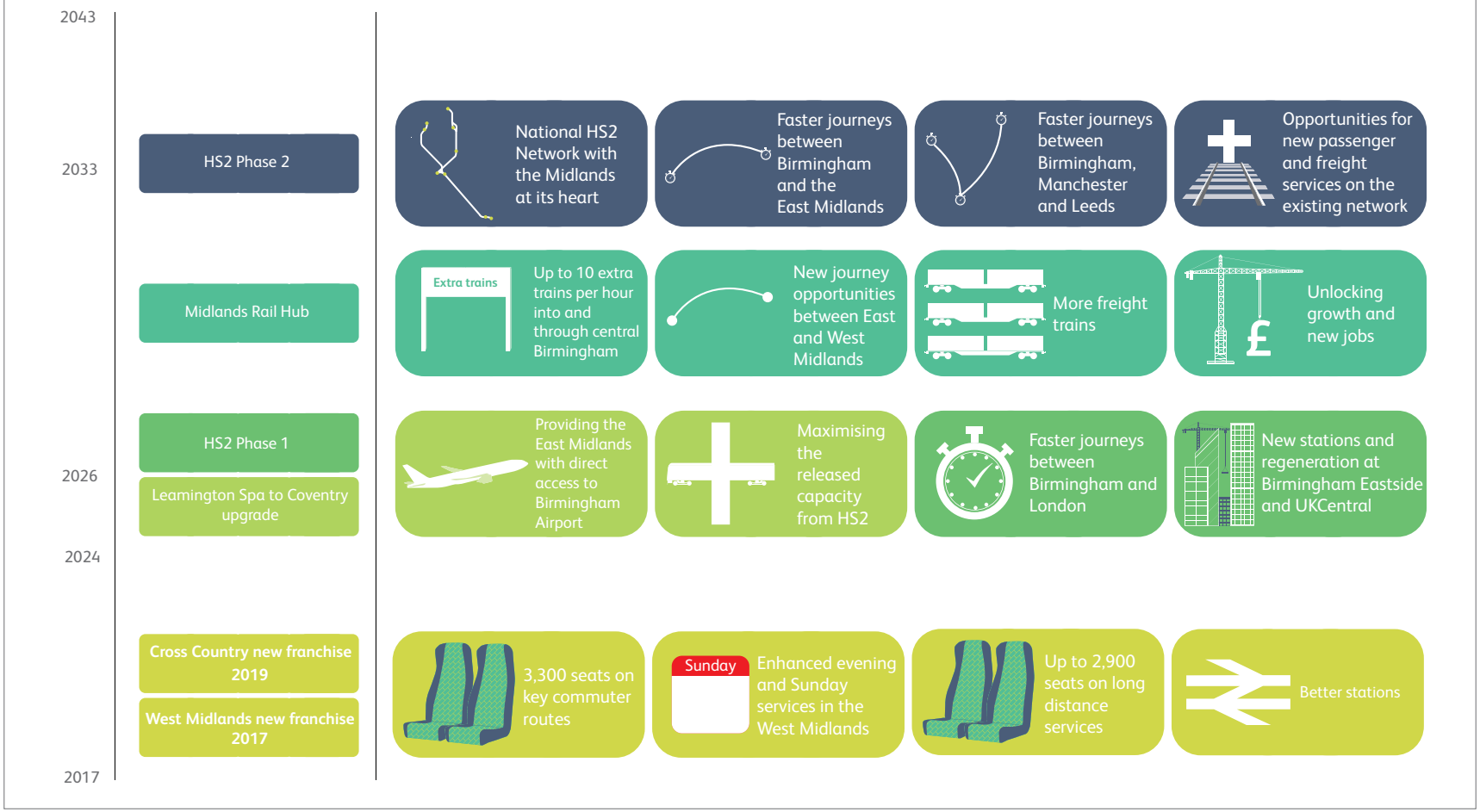


Table ES2: Choices for funders - Chilterns			
No.	Timescale	Choices for funders	Conditional outputs delivered
1	To 2024	Train lengthening on the Chiltern route (with associated infrastructure)	Capacity
2	Medium term	Old Oak Common connectivity package	Capacity Connectivity Access to HS2
3	Medium term	Chiltern Route Upgrade	Rolling stock Electrification Digital Railway Capacity enhancements Connectivity

A strategy for the Chiltern routes

The area that the Chiltern route runs through is becoming increasingly important in delivering additional housing to support jobs and growth, both along the route and in London. Marylebone station is becoming increasingly busy, and is located in a very constrained location that makes it hard to expand. It is also increasingly not the destination of choice for passengers travelling into London with, many journeys involving an interchange, either on to the Bakerloo line or via Baker Street. A blueprint setting out the strategy for the Chiltern route is shown in Figure ES2.

In the short term the strategic options focus on providing longer trains, particularly on services from Banbury, Bicester and High Wycombe. Increased passenger numbers travelling into Marylebone will also require an improvement to the facilities at the station and options have been developed and presented as a choice for funders.

The completion of the East West Rail Western Section as a new local and inter-regional strategic railway between Oxford and Bletchley will create additional journey opportunities, and provide capacity for passenger growth between Oxford and Buckinghamshire. This will provide benefits for passengers and freight users as well as encouraging economic and housing growth across the region.

In order to fully meet future passenger demand on the Chiltern route in to London, strategic interventions would need to be developed. Beyond the shorter-term strategic options outlined in the strategy two options for managing the growth in passenger demand have been considered; to build extra capacity at London Marylebone, or to provide an alternative destination in London for some of that demand.

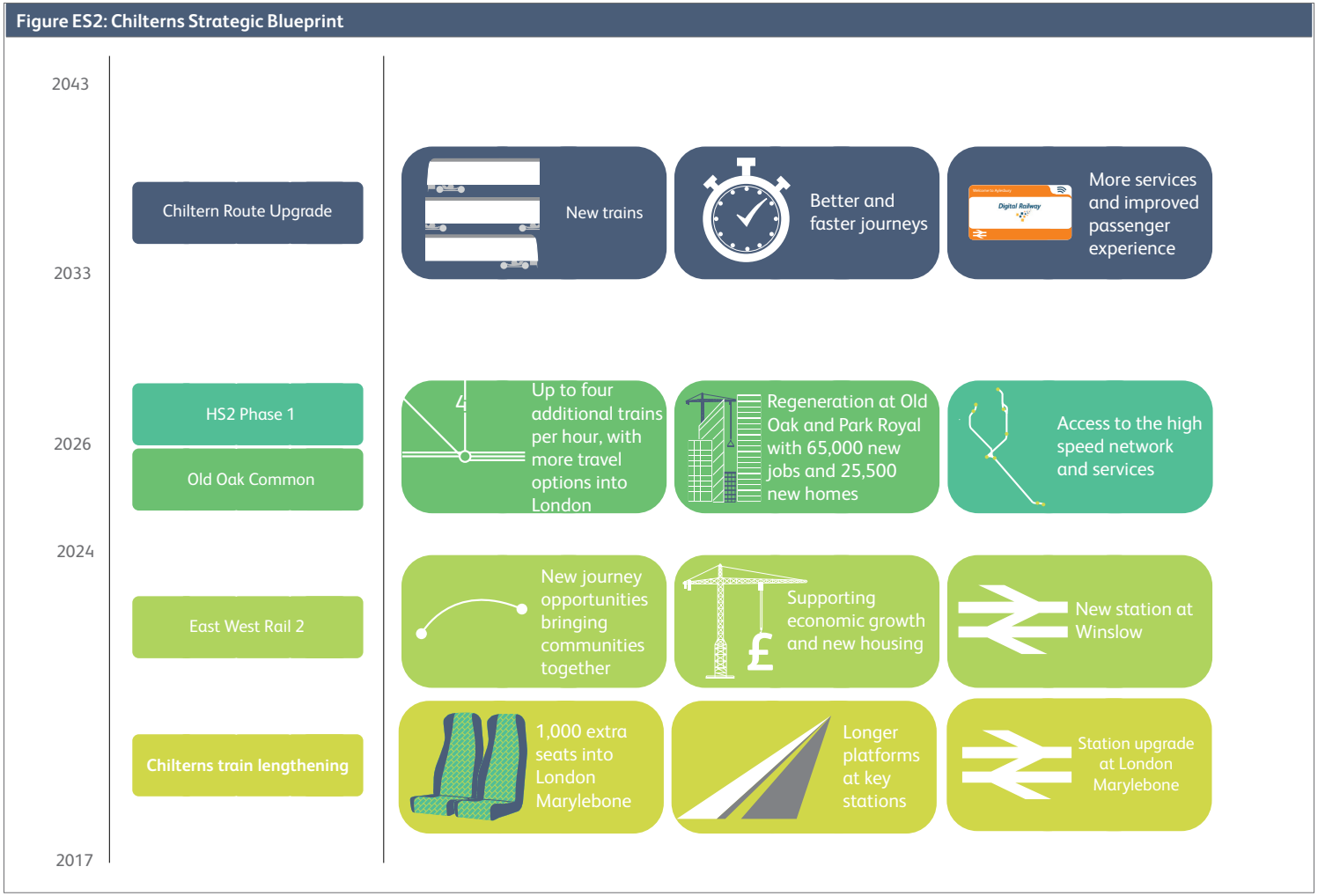
A number of options focused on London Marylebone have been considered in the medium term, but these have been found to offer limited passenger benefits and would be challenging to deliver. These options considered increasing the footprint to deliver additional platforms, as well as longer platforms within the current boundary. Given changing travel behaviours leading to commuters wanting to reach other areas of London, the strategy considers providing an alternative station destination at Old Oak Common for some services using the Chiltern route.

The proposed development of Old Oak Common station and the wider regeneration of the area will make it a key strategic transport hub as well as a major new destination in its own right. The opportunity to improve connectivity into HS2 and Crossrail from Aylesbury and High Wycombe, as well as reducing the cost and impact of accommodating demand at Marylebone, make this a compelling strategic option. A Strategic Outline Business Case is being developed to support this option, and to ensure that it can be accommodated within the Old Oak Common station footprint.

Looking longer-term, there is an opportunity to improve the passenger experience on the route, with the trains on the route due to be replaced in the late 2020s. Together with the potential for electrification and planned renewal of signalling on this route, this provides an opportunity to consider a wider Chiltern route upgrade.

The strategy has identified a package of upgrades to routes that would include electrification, capacity enhancements, through additional four track sections and remodelling key junctions, to deliver additional train services. This would include the deployment of advanced signalling (ETCS), which has the potential to increase the level of service that can be accommodated over the infrastructure by allowing trains to safely run closer together.

Figure ES2: Chilterns Strategic Blueprint



01: The long term planning process

This chapter sets out:

- How the rail industry's long term planning process is developed
- how investment in rail could meet the needs of the West Midlands and Chilterns Route Study area and the key choices for funders
- how those choices are developed collaboratively by the rail industry with its wider stakeholders.

Background to the development of the Long Term Planning Process

The purpose of the Long Term Planning Process (LTPP) is to inform funders as to how the railway could support the UK economy over the next 30 years. It comprises a set of activities and documents that:

- set out strategic options that address the demands that are likely to be placed on Britain's rail network over the next 30 years
- capture stakeholder aspirations to develop new train services in the light of potential rail investments
- present investment choices for funders to inform their decisions in relation to the franchising programme, the development and delivery of enhancements and the outputs and funding of Network Rail

The LTPP proposes ways in which train services and infrastructure enhancement could develop over the longer term to 2043, and provides an evidence base for investment to 2024 and in the medium term including the arrival of HS2 Phase 1 in 2026.

Structure

The LTPP consists of a number of different elements:

The **Market Studies** forecast future rail demand and develop conditional outputs for future rail services, informed by the views of stakeholders of how rail services could support delivery of regional and local strategic goals.

Route Studies develop choices for future services and investment decisions in the rail network. Options are based on the conditional outputs and demand forecasts from the Market Studies, and are assessed against industry appraisal criteria to provide choices for funders.

Cross-boundary analysis considers options for services that run across multiple Route Studies areas to ensure consistent assumptions.

In addition to these studies, Network Rail facilitates the production of **Network Route Utilisation Strategies** (Network RUS). These strategies look at network-wide issues and address the future capacity and technology-related issues for the railway.

The West Midlands and Chilterns Route Study

This study has been developed through a joint working group that is made up of stakeholders from across the rail industry. The documentation and analysis supporting the study is produced by Network Rail on behalf of the working group.

The strategy takes as its starting point the railway as it will be following the delivery of committed investment. Details of the changes which will result from this investment are articulated in Chapter 2.

In developing the investment choices for funders detailed in Chapter 5, the strategy has taken into account a number of key issues that shape the way the railway will develop in the UK. These are: safety, performance, the implications of High Speed 2 (HS2), resilience and moving towards a digital railway across the network.

Safety

Network Rail set out a vision for safety in its 'Transforming Safety and Wellbeing' report which takes a view through to 2024. Many of the choices for funders set out later in this document are at an early stage of maturity; safety considerations and requirements will be embedded from the outset of their development. The Office of Rail and Road, has recognised that our railways continue to have a good safety record and remain among the safest in Europe as reported in ORR Health and Safety Report 2014-2015.

Safety on the railways is measured in three key areas: public, passenger and workforce safety. The approach taken in this Study has the potential to further improve passenger safety through the removal of crossing movements at junctions and easing the flow of customers at stations. Furthermore, some investment proposals have the potential to eliminate level crossings, further improving public and passenger safety; where this is the case, these opportunities have been identified and estimated, and will be progressed if and when schemes are developed further.

Flooding at Castle Bromwich junction in the West Midlands

Performance

In developing the options set out in this strategy, the rail industry has principally considered how the conditional outputs identified via the Market Studies could be met, both for 2024, and in the longer term to 2043. More immediately, Network Rail has been set targets to improve performance by 2019; these are set out in detail within the Delivery Plan for Control Period 5 (2014 – 2019). The trajectory of these changes is to improve performance, monitored through the Public Performance Measure (PPM); the national target is a PPM of 92.5 per cent by 2019.

The performance objectives for the rail industry in the medium term have not yet been established. However, the industry is moving towards Right Time performance measures based around the amount of services arriving and departing as scheduled. As the choices for investment are developed further, emerging opportunities for performance improvement can be considered in more depth.

Resilience

The resilience of transport networks was severely tested by the winter storms of 2013/14. These events have brought into sharp focus the vulnerability of parts of the network to changes in climate, and the increasing incidence of extreme weather events. Whilst the immediate response to address these challenges has been well received, there is also a need to consider resilience broadly, as a strategic issue for the railway.

To this end, the London North Western Route has developed a *Weather Resilience and Climate Change Adaptation Plan* which was published at the end of September 2014. This document sets out a management plan for weather and climate change resilience; it is supported by an evaluation of the effects of historical weather events on infrastructure, and an awareness of potential future impacts based on regional climate change projections.

High Speed 2 (HS2)

The HS2 Ltd. proposals for a Y-shaped network linking London with Birmingham, Manchester, the East Midlands and South and West Yorkshire have major implications for travel patterns. Phase 1 achieved Royal Assent in February 2017.

This significant investment provides the opportunity for additional services and freight demand to be accommodated on the existing network whilst providing a step change in journey times between many of the towns and cities within the West Midlands and beyond. Improved connectivity to the new HS2 Station Hubs at Birmingham Curzon Street, Birmingham Interchange and Old Oak Common will also be key to maximising both the transport and wider benefits of the new high speed rail line. This has been an important factor in the consideration of options that have an interface with HS2.

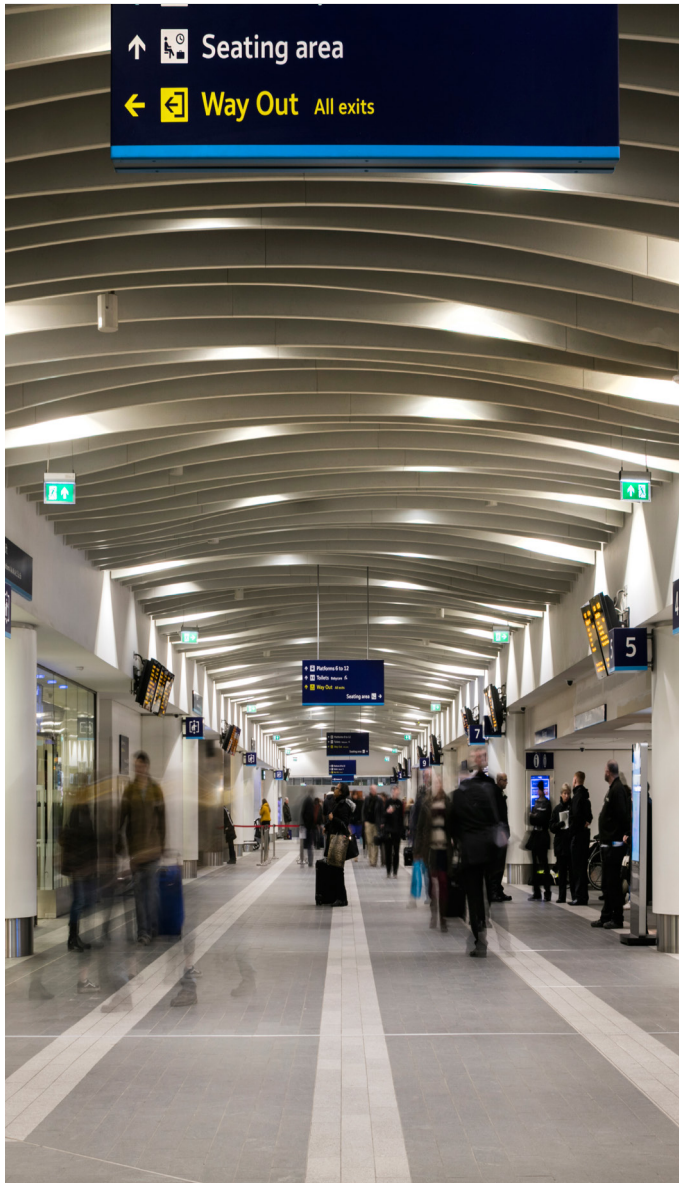
East West Rail

In the Autumn Statement 2016, the Government announced the intention to establish a private company to develop and deliver the East West Rail (EWR) scheme, beginning with the Western Section.

The Digital Railway

The Digital Railway is a rail industry-wide programme designed to benefit Britain's economy by accelerating the use of digital technology on the railway. Areas under consideration include train operation, capacity allocation, passenger experience, infrastructure and stations and interchanges.

The West Midlands and Chilterns Route Study has identified opportunities for realising the benefits of the application of the digital railway. Further detail on the Digital Railway approach is set out in Chapter 2.



Midlands Connect Partnership

The Midlands Connect Partnership was established in 2014, bringing together Local Transport Authorities and Local Enterprise Partnerships (LEPs) from across the East Midlands and West Midlands as well as the Department for Transport (DfT), Highways England and Network Rail.

Midlands Connect has identified the role that transport has to play in supporting the delivery of housing, jobs and economic growth. The partnership has taken a cross border, evidence led approach to form a clear and consistent narrative for investment in the strategic transport network. The Midlands Connect strategy: Powering the Midlands Engine was launched in March 2017, setting out their transport priorities for the region.

West Midlands Rail

West Midlands Rail (WMR) has worked closely with the Department for Transport to jointly specify the West Midlands rail franchise. This is due to replace the current London Midland services from October 2017. The West Midlands local services will be also be jointly managed and operated under distinct West Midlands Railway branding. It is anticipated that this franchise will include a distinct business unit for the West Midlands travel to work area and will form a potential first step towards a future, devolved West Midlands franchise.

England's Economic Heartland

England's Economic Heartland (EEH) are a strategic alliance of nine Local Transport Authorities, three Local Enterprise Partnerships, with DfT, Highways England and Network Rail. EEH's vision is to see investment in transport infrastructure and services grow the economy of the region and the nation. To do so they are looking to build upon their network of world leading universities and research institutes, globally competitive busines clusters and highly-skilled workforce.

The initial rail focus for the alliance is to support the wider development of EWR, which would provide a direct link between the university cities of Oxford and Cambridge.

Document Structure

The rest of this document is structured as follows:

Chapter 2: Baseline and approach. This chapter summarises the characteristics of the railway on the West Midlands and Chilterns Route Study area following the delivery of the current planned enhancements.

Chapter 3: The capacity challenge - meeting demand. This sets out the forecast levels of demand and the crowding impacts.

Chapter 4: Improving Connectivity. This sets out the strategic objectives around train frequency between locations in the study area and sets out an indicative service specification to accommodate these.

Chapter 5: Strategy and choices for funders. Here, outputs are detailed in terms of investment options that can be considered as choices and advice for funders to 2024, in alignment with HS2 in 2026 and the longer term development strategy.

Chapter 6: Consultation. The final chapter sets out a summary of the consultation responses recieved, and how these have been reflected in the strategy.

This document has been published exclusively on Network Rail's website. If you would like a paper copy, please email the following address:

WestMidlandsandChilternsRouteStudy@networkrail.co.uk

02: The starting point

This chapter sets out:

- The definition of today's railway which includes the current infrastructure and train service frequencies
- a summary of investment schemes planned for delivery between 2014 and 2019
- the starting point from which the strategy is developed.

Geographical scope

The West Midlands and Chilterns Route Study geography is set out in Figure 2.1. For the purposes of analysis, cross-boundary services are also considered within the scope of the study.

The geography of the study is divided into corridors as follows:

- central Birmingham (defined as Birmingham New Street, Birmingham Moor Street and Birmingham Snow Hill station areas)
- Birmingham to Walsall and Rugeley
- Birmingham to Lichfield Trent Valley
- Birmingham to Nottingham/Leicester
- Birmingham to Worcester/Hereford via Bromsgrove
- Birmingham to Rugby/via Coventry and Birmingham to Stafford/ Shrewsbury via Wolverhampton
- 'Snow Hill lines' – Birmingham Moor Street and Birmingham Snow Hill to:
  - Worcester via Stourbridge
  - Stratford-upon-Avon/Leamington Spa
- Chiltern routes
  - Leamington Spa/ Oxford to London Marylebone
  - Aylesbury to London Marylebone
- East West Rail Western section
  - Oxford to Bletchley
  - Aylesbury to Milton Keynes

There are two key hubs within the Route Study area: central Birmingham and London Marylebone. These act as a focal point for a large number of passenger journeys each day, offering services to key destinations within the area and providing links into the wider rail network through the interchange opportunities available.

Route characteristics

As the heart of the national network, the West Midlands and Chilterns area supports services across several routes, many of them operating into and through central Birmingham. The railway in the study area supports important and varied markets with large numbers of passengers commuting into urban centres, travelling between cities for business and leisure over both short and long distances. The network also supports freight flows including the movement of consumer goods, construction materials and fuel.

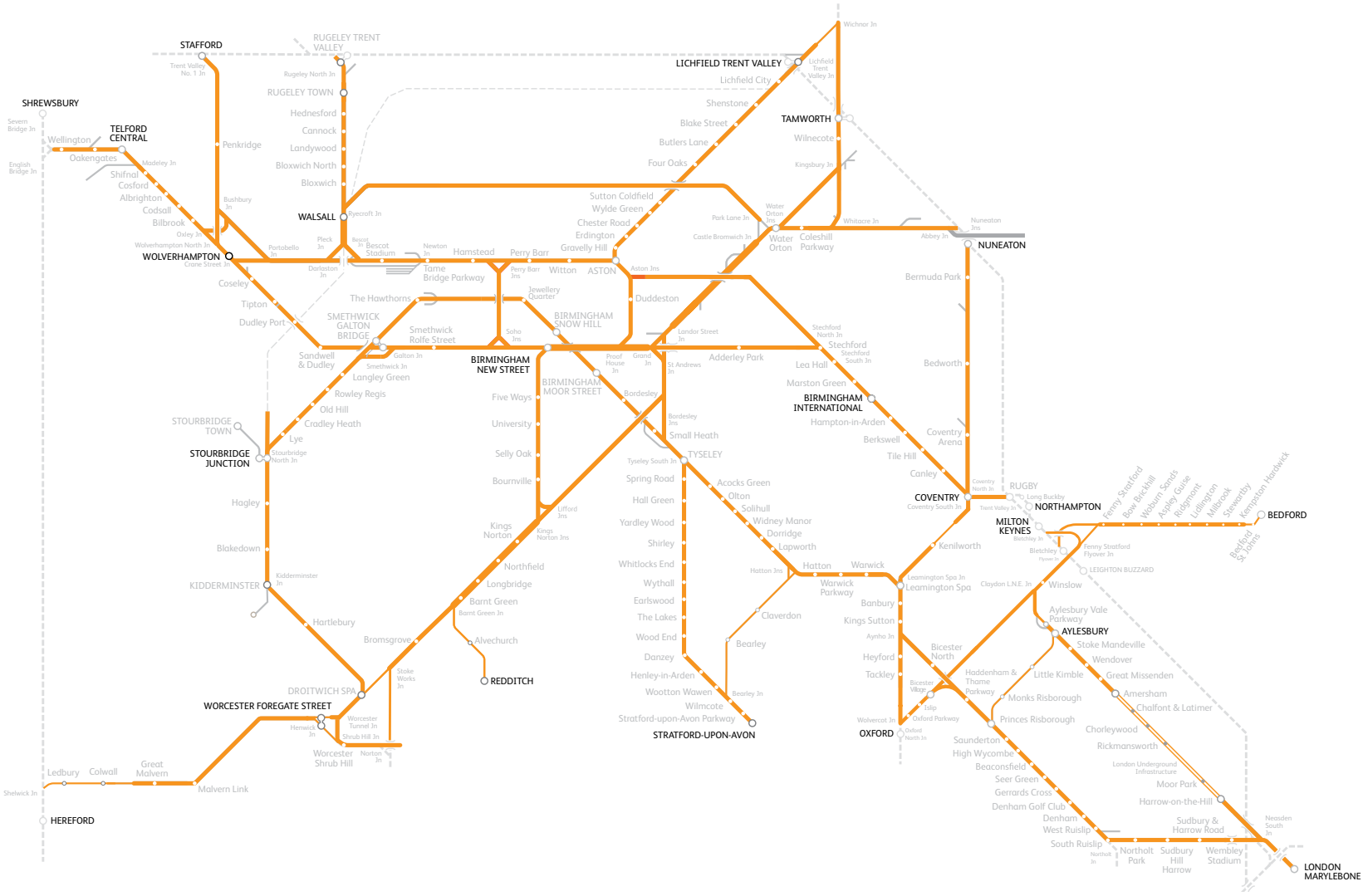
The railway in the study area is largely two-track. This can create challenges due to a mixture of traffic speeds and stopping patterns, and limited opportunities for faster services to overtake slower services.

Within the West Midlands there has been an ongoing programme of resignalling over the last 15 years, with Birmingham New Street Station area forming the final element of these works. This has consolidated signalling control into the West Midlands Signalling Centre.

In the last decade the Chiltern route has seen sustained investment through an innovative funding mechanism, which has increased capacity and improved journey times along the route.

More detailed information on the infrastructure characteristics and capabilities of the study area can be found in the West Midlands and Chilterns Strategic Route Specification document.

Figure 2.1: Geographical scope of West Midlands and Chilterns Route Study



Schemes completed since publishing the Draft for Consultation

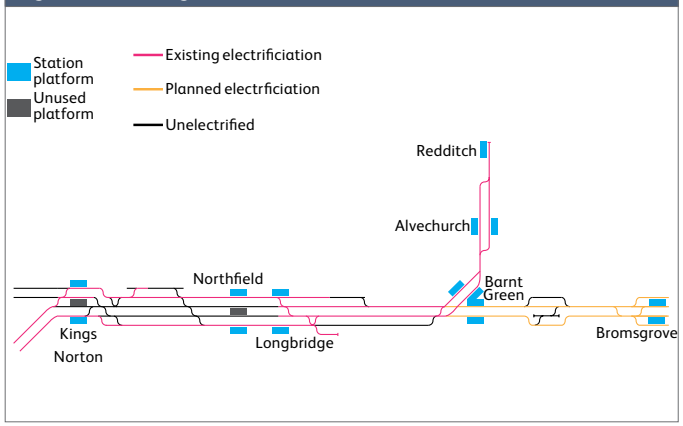
There are a number of projects and programmes currently planned or in delivery, all of which – in addition to existing infrastructure – have contributed to the formation of a starting position for the study. The Network Rail Enhancement Delivery Plan (EDP) sets out milestones for the planned completion of enhancements to the network. High level overviews of projects within the study area are outlined alphabetically below, with more detail to be found in the EDP.

Several of the planned projects and programmes have been completed since the draft strategy was published.

Banbury Resignalling has replaced signalling equipment in the Banbury area which has delivered increased capacity, and improved performance .

Birmingham Gateway Project has delivered greater connectivity within the city centre, more space on platforms, a significantly bigger concourse, improved passenger facilities and information at Birmingham New Street. The busiest station outside of London and the busiest interchange in the UK, the project has delivered a station to play a vital role in the national transport network.

Figure 2.2: Bromsgrove electrification



Bromsgrove Resignalling has upgraded the signalling between Birmingham New Street and Bromsgrove to provide the required capability on this corridor to facilitate the extension of Cross-City services to Bromsgrove.

East West Rail Phase 1 has delivered the extension of services from London Marylebone via Bicester to Oxford, providing new journey opportunities. The project included an upgrade of the route from Bicester to Oxford, a brand new station north of Oxford - 'Oxford Parkway' and a new chord line in the Bicester area to connect to the Chiltern Main Line. A rebuilt station at Bicester Village (formerly known as Bicester Town) was also delivered as part of the project.

NUCKLE (phase 1.1) has seen the delivery of two new stations at Coventry Arena and Bermuda Park on the line between Coventry and Nuneaton.

Stafford Area Improvement Project has removed a major bottleneck on the West Coast Main Line through the Stafford area and increased linespeeds between Stafford and Crewe from 75mph to 100mph on the slow lines.

Planned schemes

Banbury Depot will deliver a new stabling and light maintenance facility at Banbury, on the Birmingham to London Marylebone route. The project involves the construction of new sidings to provide stabling facilities for 60 vehicles together with facilities for cleaning and fuelling. The design offers the opportunity for growth in the current or future franchises for the development of a full maintenance facility.

Bromsgrove Electrification will see the extension of electrification from Barnt Green to Bromsgrove (Figure 2.2), which will enable the extension of current Longbridge Cross City services to Bromsgrove. The scheme provides capacity for three trains per hour to serve Bromsgrove and closely interfaces with the third party funded scheme to relocate Bromsgrove Station.

Birmingham New Street Area Resignalling will replace and ugrade signalling across a number of routes in the West Midlands, including in the Birmingham to Wolverhampton lines, and the lines between Stechford, Aston, and Hamstead. This will incorporate a number of enhancements, including improvements to key junctions, and improved capacity.

East West Rail Phase 2 (EWR2) will deliver a new rail link connecting Oxford and Aylesbury/London Marylebone with Bedford/Milton Keynes. The EWR2 project is currently developing a programme for the scheme which reinstates the railway between Bicester and Bletchley, electrifying the route, delivering a new station at Winslow and two new platforms at Bletchley.

HS2 Phase 1 achieved Royal Assent in February 2017 with construction expected to begin on schedule in Spring 2017. The new line will enter service in 2026, enabling wider Phase 1 services to operate across the UK rail network.

NUCKLE (phase 1.2 and 2) is set to bring improvements along the line between Nuneaton and Coventry, improving connectivity and supporting economic regeneration. Increasing the train service frequency to half hourly forms the next phase of the project, and will include the delivery of a new bay platform at Coventry and a new freight loop.

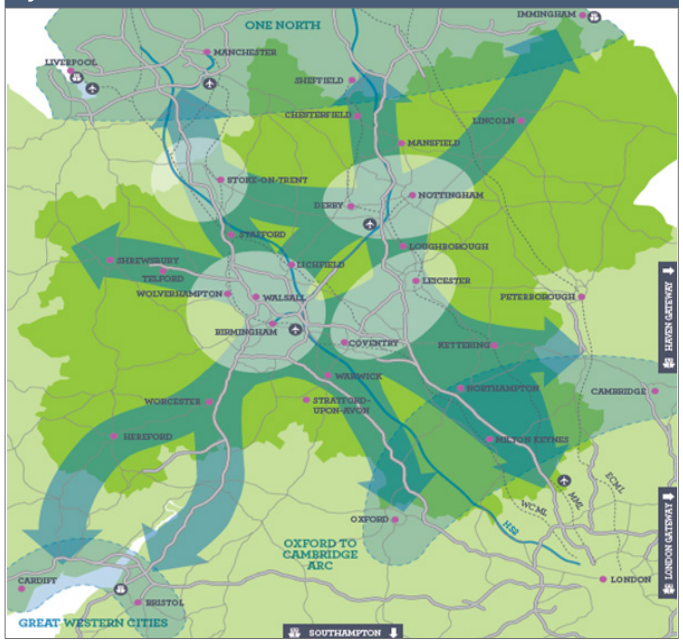
Kenilworth Station is a new station at Kenilworth promoted by Warwickshire County Council to support economic development in Coventry and Warwickshire. In conjunction with associated infrastructure improvements, the new station will provide a train service between Coventry, Kenilworth and Leamington Spa.

Strategic Freight Network Programme will see improvements to freight loops delivered at Fenny Compton, Hatton and Dorridge, to enable the operation of longer freight trains, of up to 775m.

Walsall to Rugeley Electrification will deliver electrification between Walsall and Rugeley Trent Valley, enabling electric trains to operate between Birmingham New Street and Rugeley Trent Valley. A project to improve journey times on the route is being developed in parallel with the electrification scheme and this will enable an all-day half hourly train service. Once electrified, the route will also provide a potential alternative diversionary path to the current Stafford - Wolverhampton route.

West Midlands depots and stabling is a project is underway to identify and deliver increased electrified stabling capacity in the West Midlands by 2019. This project is assessing stabling options to accommodate up to 15 vehicles, in advance of a potential new depot in the medium term.

Figure 2.3: Hubs and 'Intensive Growth' transport corridors identified by Midlands Connect



Midlands Connect partnership

The Midlands Connect partnership has taken an evidence based approach to identifying requirements for improved connectivity and capacity in order to deliver ambitious growth objectives outlined in Strategic Economic Plans across the Midlands.

As part of the Midlands Connect Strategy: Powering the Midlands Engine, conditional outputs were identified and these have informed the development of the Midlands Connect priorities. These conditional outputs broadly align with the outputs of the Market Studies. The strategy is built around the principle of Strategic Economic Hubs and Intensive Growth Corridors (Figure 2.3).

The priorities set out in the strategy have been integrated into the West Midlands and Chilterns Route Study with a focus on reflecting:

- Wider Economic Benefits - where these are available they have been reported in the strategy to strengthen the case for investment
- Midlands Rail Hub - forms the cornerstone of the Midlands Connect rail strategy, and this endorsement, and further work has been reflected in the strategy
- pan-Midlands connectivity - incorporating the work undertaken by Midlands Connect.

Midlands Connect is taking forward the Midlands Rail Hub, with £5m of new funding, to develop the Strategic Outline Business Case. This is due to be complete by early 2019, and will inform future investment decisions. The rail industry will be key contributers and lead the development of this nationally important programme.

Midlands Connect is also commissioning a number of corridor studies to further develop opportunities for improving connectivity and journey times; these are:;

- Birmingham - Derby/Nottingham
- Birmingham - Leicester
- Thames Valley - Birmingham Airport - East Midlands
- Coventry - Leicester
- Nottingham -Toton - Crewe

West Midlands refranchising

The strategy set out in the Draft for Consultation has been fed in to the West Midlands refranchising process, with the Invitation to Tender (ITT) issued on the 30th August 2017. This sets out the required outcomes for passengers, for the next franchise which is due to run for 8.5 years between December 2017 and March 2026. There are two groups bidding to operate the new franchise.

The ITT delivers the WM&C strategy through the following requirements for bidders:

- additional peak capacity in to Birmingham and London through the provision of 137 additional vehicles by 2022
- two trains per hour between Birmingham and Shrewsbury off peak (in addition to the Arriva Trains Wales service) from December 2018
- enhanced Sunday service from 2021 including six trains per hour on Cross City and Snow Hill routes
- more frequent and additional evening services from 2018
- diversion of the Euston to Crewe service from the Stoke Loop, to run on the West Coast between Stafford and Crewe
- an extended service from Wolverhampton to Crewe via Stoke-on-Trent to pick up intermediate stops
- Sunday service on the Marston Vale line.

Working approach and assumptions

This section sets out the working approach and assumptions that have been followed in developing the strategy that underpins the West Midlands and Chilterns Route Study.

Development methodology

The study has developed and assessed choices for the long-term use and development of the network. Determining whether the **conditional outputs** from the relevant Market Studies can be accommodated on the existing network with committed enhancements is the starting point of the study. These conditional outputs reflect the emerging requirements for capacity and connectivity, building on the current infrastructure and the committed development of other interventions including HS2. It is important to note that the conditional outputs are dependent upon affordability, funding and a value for money business case. Equally, the conditional outputs need to be deliverable – technologically, operationally and physically.

The conditional outputs are then translated into an Indicative Train Service Specification (ITSS) for 2043, as the study assesses a 30-year planning horizon. This is used as the basis for identifying constraints on the network where the ITSS cannot be robustly delivered.

In order to address these constraints a standard range of intervention options are used. The starting point for the study is to consider any additional capacity that can be delivered through better timetabling and longer trains on the existing network. Where these options are found to not deliver the required outputs, platform extensions and the construction of additional infrastructure are then considered. Options are then defined and developed into pre-GRIP **strategic concepts** and are assessed against funders' decision making criteria.

In conjunction with assessments of affordability and value for money, these criteria give consideration to factors such as:

- connectivity
- journey times
- performance
- access requirements

To ensure that interventions are part of a long-term, affordable and deliverable strategy, it is essential to consider system requirements beyond 2024 as part of planning for the future.

Identification of choices

The choices for funders have been identified by assessing the strategic concepts that consider up to 2043 based on the following criteria:

- the intervention is required to accommodate forecast passenger and/or freight demand to 2024
- there is a renewal due between 2019 and 2024 that presents an opportunity for enhancement to reduce 'whole life cost'
- the intervention delivers whole-industry cost savings
- the intervention is a funder identified priority
- investment ensures better connectivity to HS2.

Passenger capacity at stations

Stations form an integral part of a passenger's journey and providing sufficient space at stations for passengers is crucial. If passenger capacity is compromised, this can impact the safe operation of a station and can also impact on train performance. An industry-wide stations working group was set up to undertake a review of current passenger capacity issues at stations across the area.

A high-level prioritisation exercise took place to categorise the shortlisted stations based on the current and anticipated capacity constraints identified. This prioritisation process also took into account the option development work and emerging strategy, in particular in central Birmingham. A methodology was agreed based on passenger capacity, safety and performance, including the impact of forecast growth in passenger numbers.

This approach has produced intervention concepts for the high and medium priority stations, including cost ranges and timelines. Benefits have also been analysed for the high priority stations, including the benefits of safety improvements, and full business case appraisals have been undertaken. Examples of outputs of this work are captured in Chapter 5, with further details on all 19 shortlisted stations in Appendix 6.

Current schemes

Enhancements are being developed by the rail industry and third parties, which will increase passenger capacity at the following stations:

Wolverhampton Station enhancements

This scheme will deliver improved facilities for passengers through the provision of a new, larger station building that will offer direct access to both sides of the railway line, and an extended multi-storey car park. Transport for West Midlands (TfWM) are leading the delivery of the upgrade, which will be combined with an extension of the metro line to the station to present passengers with a multi-modal interchange.

Coventry Station enhancements

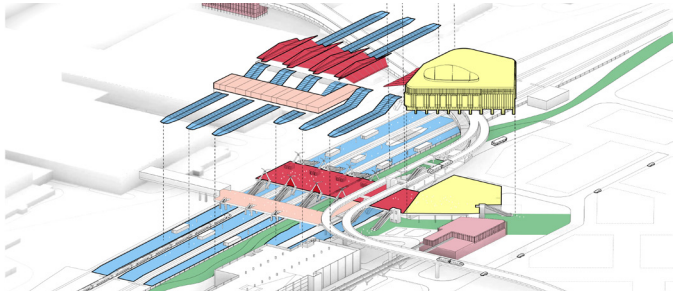
A number of developments are taking place-at Coventry station and the surrounding Friargate area to offer passengers an improved experience and enable economic growth. Proposals have been developed for an additional station concourse to the West of the existing station building, new passenger footbridge and platform canopy extensions, to provide improved access from Warwick Road. The works will also include additional car parking.

Birmingham International Station enhancements

A study to improve passenger interchange facilities between the existing station, Birmingham Airport, NEC complex and the new HS2 Birmingham Interchange station is being undertaken by local stakeholders. Connecting Europe Facility funding has been secured to look at a redesign of the station incorporating a new people mover as well as integrating further modes of transport which could include Metro, SPRINT and traditional bus routes.

Wolverhampton Station enhancements

Coventry Station enhancements



Birmingham International Station enhancements

Digital Railway

The rail industry is developing a business case for the acceleration of the Digital Railway across the network. The study has embraced opportunities that could be delivered by increased digitisation of the railway network.

The Digital Railway programme could deliver the following outputs:

- improved system safety
- additional and improved allocation of capacity
- improved passenger experience
- digital train control and operation
- asset management and monitoring
- improved stations and easier interchanges.

The accelerated introduction of European Train Control System (ETCS) underpins the train control element of the Digital Railway. The introduction of ETCS onto the network, coupled with the continued development of this technology, offers the opportunity for medium or longer term solutions to some of the network capability constraints identified by this study. Therefore the assessment of the additional network capability required in future will inform the development of ETCS. The current asset renewals strategy is to upgrade to ETCS as the signalling equipment becomes life-expired; the Digital Railway workstream is looking at where options could be considered to accelerate this.

In the West Midlands the majority of the signalling equipment is less than 10 years into an assumed 30-year asset life and this is reflected in the current proposed renewal dates for the equipment. The Chiltern Route however offers a shorter term opportunity to consider the roll out of ETCS as part of an integrated route upgrade once signalling becomes due for renewal in the 2020s.

Digital Railway options have been considered throughout the development of the strategy and are discussed in Chapter 5.

Safety

Safety is a key priority for the rail industry and it is important that safety is considered from the very start when developing our strategies and interventions. Safety has been considered in this Study in terms of:

- opportunities to reduce existing system safety risks when developing strategic concepts
- understanding and seeking to mitigate any system safety implications of forecast growth, and our strategies to enable that growth
- the opportunity to enact relevant industry safety strategies through the study.

In addition to safety considerations being part of the development of each strategic concept, this approach has driven a focus on two areas which are a clear strategic safety priority; safety at stations and at level crossings.

The level crossings approach is to identify level crossings affected by the changes outlined in the strategy, be they to service levels or to the infrastructure. Where the strategy requires changes in infrastructure to deliver outputs, the option to improve safety or close crossings has been incorporated into the intervention. The impact of the future service specification on all level crossings across the route has also been considered and shows where additional and/or faster train services may be operating across the crossing. This work will feed into discussions with local transport and planning authorities about the future of each affected level crossing.

For stations the focus has been on the interface between passengers and trains, particularly platform overcrowding. Congestion on stairwells, escalators and concourses has also been considered. In order to quantify the safety benefits, we have used accident frequency data and assessed how a proposed change may reduce the risk.

03: Meeting passenger and freight demand - the capacity challenge

This chapter sets out:

- The growth in passenger and freight demand forecast in the Route Study area through to 2023, and beyond to 2043
- the conditional outputs developed for the West Midlands and Chilterns Route Study area
- the impact of High Speed 2 (HS2)
- Midlands Connect Economic Analysis

[1] *Passenger Rail Usage 2014-15 Quarter 4 Statistical Release, ORR, 2015*

[2] *Centro, https://www.centro.org.uk/transport/rail/*

This chapter will summarise the conditional outputs identified for the West Midlands and Chilterns Route Study area, by applying the Market Studies outputs to each service group. The rail industry working group has developed and agreed an Indicative Train Service Specification (ITSS) for 2043 that demonstrates how a train service could be configured to meet the conditional outputs, if there were no constraints to its operation. The strategy to deliver these outputs is set out in Chapter 5.

Demand and the economy

The link between a growing economy and growth in rail services is well established. Increased economic activity generates demand for rail services. In turn, improving the frequency, speed and reliability of rail services facilitates economic growth by better connecting businesses to each other and people to jobs and leisure opportunities.

Rail demand in the UK has increased by 69.5 per cent to 1.65 billion journeys since 2002/03[1]. In the West Midlands, rail use has increased by 4.3 per cent a year in the latest figures from 2013/14, to 48.5 million journeys[2] . This rate of growth is faster than the national average. Commuting into London Marylebone is a similar success story; between 2011 and 2015 the number of passengers travelling in and out of Marylebone at peak times increased by 20 per cent.

Following the publication of the West Midlands and Chilterns Draft for Consultation the Department for Transport, as part of the 2017 HLOS, has published its expectations for passenger growth over the period 2019-2024 and beyond.

Market Studies: Strategic aims and conditional outputs

In 2013 the rail industry established four 'Market Studies' to understand the demand for rail over a 30-year horizon. This reflects the long life of rail infrastructure assets and investments. The Market Studies identified four key market sectors: the markets for long distance, London and South East, and regional urban passenger services; and the market for freight services. The aim of the studies, published in 2013, was to demonstrate how the rail industry could contribute to delivering a series of outcomes important to the prosperity of the United Kingdom. The Market Studies set out four strategic aims:

- enabling economic growth
- reducing carbon and the impact of the transport sector on the environment
- improving the quality of life for communities and individuals
- improving affordability and value for money (to funders).

The Market Studies also identified a series of high level 'conditional outputs' that would meet growth and connectivity requirements. The conditional outputs are:

- the level of capacity required to accommodate the forecast demand for passenger journeys on weekdays
- the level of capacity required to accommodate passenger demand for leisure journeys at evenings and weekends
- the level of rail connectivity between large towns and cities across the country
- the level of freight demand forecast between pairs of locations
- the level of capacity required at stations for better passenger circulation, especially during peak times
- the level of rail connectivity required to airports, ports, higher education establishments and High Speed Rail (HS2).
- improved rail connectivity for leisure travel
- improved access to the rail network
- improved passenger satisfaction.

The Market Studies included a range of economic scenarios for 2023 and 2043 to better understand potential demand in the future and set out four high to low growth scenarios. The 'prospering in global stability' scenario (the highest growth scenario) was used to identify the network capacity requirement which helps to inform railway development for the future. The highest growth was considered as the most credible scenario by the stakeholders since it represents and reflects the recent growth observed in the study area. The low growth scenario was used to test the robustness of any business cases.

Table 3.1: Summary of 2036 rail economic impacts and job impacts per transport corridor [3]

	2036 benefits from a 20% improvement in rail generalised journey time			
Intensive Growth Corridor	Value of business journey time savings	Agglomeration benefits	Labour market value	Additional Jobs
1. Birmingham – Coventry – Northampton – Milton Keynes – South	£32 million	£30 million	£9 million	3,000
2. Northampton – Corby				
3. Birmingham – Stoke-on-Trent – North West	£37 million	£43 million	£13 million	5,000
4. Birmingham – The Marches[4]				
5. Nottingham/Derby – North of England	£8 million	£10 million	£1 million	2,000
6. Lincoln – Nottingham – Birmingham	£23 million	£30 million	£4 million	5,000
7. Nottingham – Leicester – Coventry	£51 million	£71 million	£12 million	9,000
8. Leicester – Birmingham				
9. Birmingham – Worcester – South West	£20 million	£8 million	£2 million	2,000
10. Worcester – Hereford – South Wales				

Wider Economic Benefits and Gross Value Added

The use of Gross Value Added (GVA) and Wider Economic Benefits (WEBs) allows greater understanding of the benefits of rail investment on the economy. GVA is an economic indicator for the value of goods, jobs and services produced in an area. These benefits are not currently fully measured as part of the transport industry's cost-benefit analysis. Defining the scale of the WEBs allows for a more complete and compelling case to be made when providing choices for funders.

Midlands Connect

Whilst the Midlands economy is strong, it is not currently reaching its full potential. Midlands Connect completed an Economic Impact Study as part of its early analysis, which identified a number of hubs and 'Intensive Growth' transport corridors (Table 3.1). This analysis demonstrated that if we can improve transport connectivity between towns and cities within the Midlands as well as with key centres elsewhere, then we could boost economic growth benefiting both the Midlands and UK.

Midlands Connect launched its Transport Strategy in March 2017. This suggested that for every £1 invested in the strategy, £2 of economic benefits would be delivered. Upon full implementation by 2040, it will have delivered an additional 300,000 jobs in the Midlands as well as a GVA uplift of more than £5bn. While HS2 will address some key strategic capacity issues that impact the Midlands and provide transformational national connectivity, some capacity constraints will remain to be addressed on other parts of the network reflecting the scale of population and job growth across the wider region. Midlands Connect has identified transport investment priorities building on the concept of strategic growth corridors and economic hubs to really deliver benefits to passengers and businesses, through improved connectivity, journey opportunities and journey times.

[3] Midlands Connect, Economic Impact Study 2015, WMCA and East Midlands Councils, Page 24

[4] Marches refers to the area along and around the English and Welsh border.

Passenger demand in the study area

The growth rates identified in the Market Studies for the West Midlands and Chilterns Route Study area are outlined in table 3.2[5]: The effect of growth varies across long distance and interurban passenger markets.

Passenger demand on a number of long distance services will be changed by the arrival of HS2. The HS2 strategic case forecasts that long distance passengers will 'switch' to HS2 services. This will release capacity for additional services on the existing network which could unlock suppressed demand, resulting in strong demand growth.

Although significant levels of commuting into several different economic centres are undertaken, peak demand is largely driven by commuting to and from Birmingham and London.

In central Birmingham, rail's share of the peak travel market has increased from 17 per cent in 2001 to 38 per cent in 2015[2], see Figure 3.1.

In central London, rail's modal share, including London Underground services, of the commuter market is approximately 65 per cent. It is forecast that employment growth, rather than people transferring to rail from other modes of transport, will be the single biggest factor in increased demand for rail.

Figure 3.1: Central Birmingham peak travel modal share

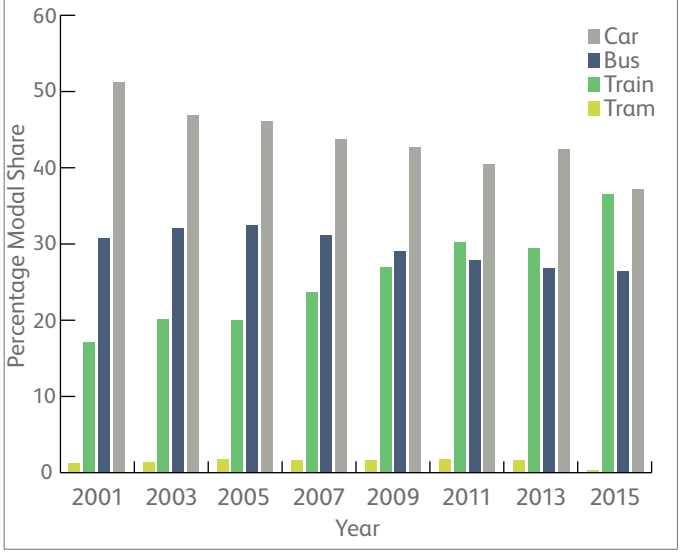


Table 3.2: Growth rates for West Midlands and Chilterns Route Study

	Peak hour demand growth	
	2023	2043
Commuter services into Birmingham	49%	114%
Long distance and interurban services into Birmingham	Up to 45%	Up to 118%
All services into London Marylebone	22%	76%

[5] These growth rates include the effects of committed schemes, but exclude the effect of HS2 and are based on the 'Prospering in global stability' scenario, within the Market Studies

Table 3.3: Conditional outputs for passenger capacity		
	Reference	Conditional Output
2023	CO5	To provide sufficient capacity for passengers travelling into Birmingham stations during peak hours in 2023
	CO6	To provide sufficient capacity for passengers travelling into central London Marylebone during peak hours in 2023
	CO7	To provide sufficient capacity throughout the day for passengers travelling on the long distance services: Plymouth to Edinburgh/Glasgow Central, Southampton/Reading to Newcastle, Bristol Temple Meads to Manchester Piccadilly and Bournemouth to Manchester Piccadilly services, through the Midlands in 2023
	CO8	To provide sufficient capacity throughout the day for passengers travelling on the West Midlands section of interurban services including Birmingham New Street – Leicester – Stansted Airport and Nottingham – Cardiff Central in 2023
2043	CO1	To provide sufficient capacity for passengers travelling into Birmingham stations during peak hours in 2043
	CO2	To provide sufficient capacity for passengers travelling into London Marylebone during peak hours in 2043
	CO3	To provide sufficient capacity throughout the day for passengers travelling on the long distance services: Plymouth to Edinburgh/Glasgow Central, Southampton/Reading to Newcastle, Bristol Temple Meads to Manchester Piccadilly and Bournemouth to Manchester Piccadilly services, through the Midlands in 2043
	CO4	To provide sufficient capacity throughout the day for passengers travelling on the West Midlands section of interurban services including Birmingham New Street– Leicester – Stansted Airport and Nottingham – Cardiff Central in 2043

Conditional outputs relating to capacity

Table 3.3 shows the full set of conditional outputs identified for passenger capacity in the Route Study area, for both 2023 and 2043.

Birmingham commuting - CO1 and CO5

There are three main stations in the centre of the city: Birmingham New Street, Birmingham Moor Street and Birmingham Snow Hill. Rail demand into central Birmingham has increased by around 20% since 2011.

The busiest time period for the Birmingham commuter market is from 08:00 to 08:59 referred to as the 'high-peak hour'. The assumption taken in the strategy is that options identified to accommodate demand during the morning peak, will also be sufficient to accommodate the evening peak, where demand is typically more spread.

The following short distance commuter flows are considered[7]:

1. Rugby corridor via Coventry, services into Birmingham New Street
2. Stafford/Shrewsbury corridor via Wolverhampton, services into Birmingham New Street
3. Walsall/Rugeley lines, services into Birmingham New Street
4. Bromsgrove/Redditch and Lichfield/Sutton Coldfield 'Cross City line', services into Birmingham New Street
5. Hereford and Worcester via Bromsgrove, services into Birmingham New Street
6. Worcester via Stourbridge and Stratford-upon-Avon/Leamington Spa via Tyseley 'Snow Hill lines', into Birmingham Moor Street and Birmingham Snow Hill.

Certain long distance and interurban services also perform a role in commuting into Birmingham. These include the Leamington Spa via Coventry and Tamworth/Nuneaton corridors.

[7] The geography of these service groups can be found in Chapter 2.

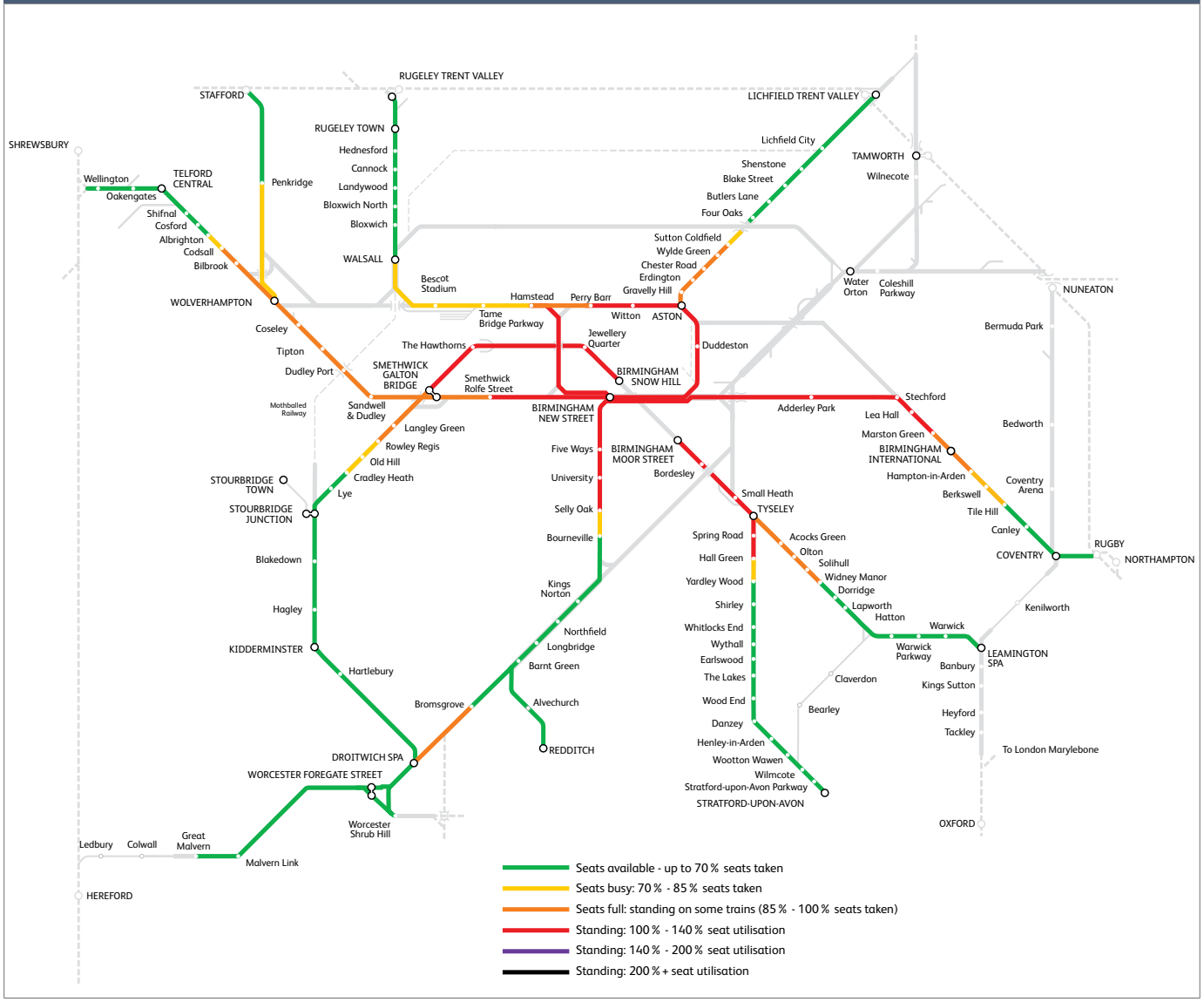
Passenger demand analysis

The capacity provided by the services in these groups is defined as the total number of seats, plus a further allowance for passengers standing on short trips of up to 20 minutes. Seat utilisation across the route into Birmingham, in 2013, 2023 and 2043 is shown across figures 3.2-3.5. It should be noted that for journeys that are 20 minutes or less to central Birmingham a standing allowance is used and, demand is generally considered as 'in excess of train capacity' when seat utilisation is greater than 140%.

Assumptions for the network in 2023 and 2043 reflect the known committed schemes by the end of 2019, as listed in Chapter 2. This is referred to as the baseline in the following sections, reflecting the anticipated capacity provided by end of 2019. The baseline position is based on train operator counts and known changes to operational plans; it does not include any uncommitted schemes or proposed choices for funders presented in this study.

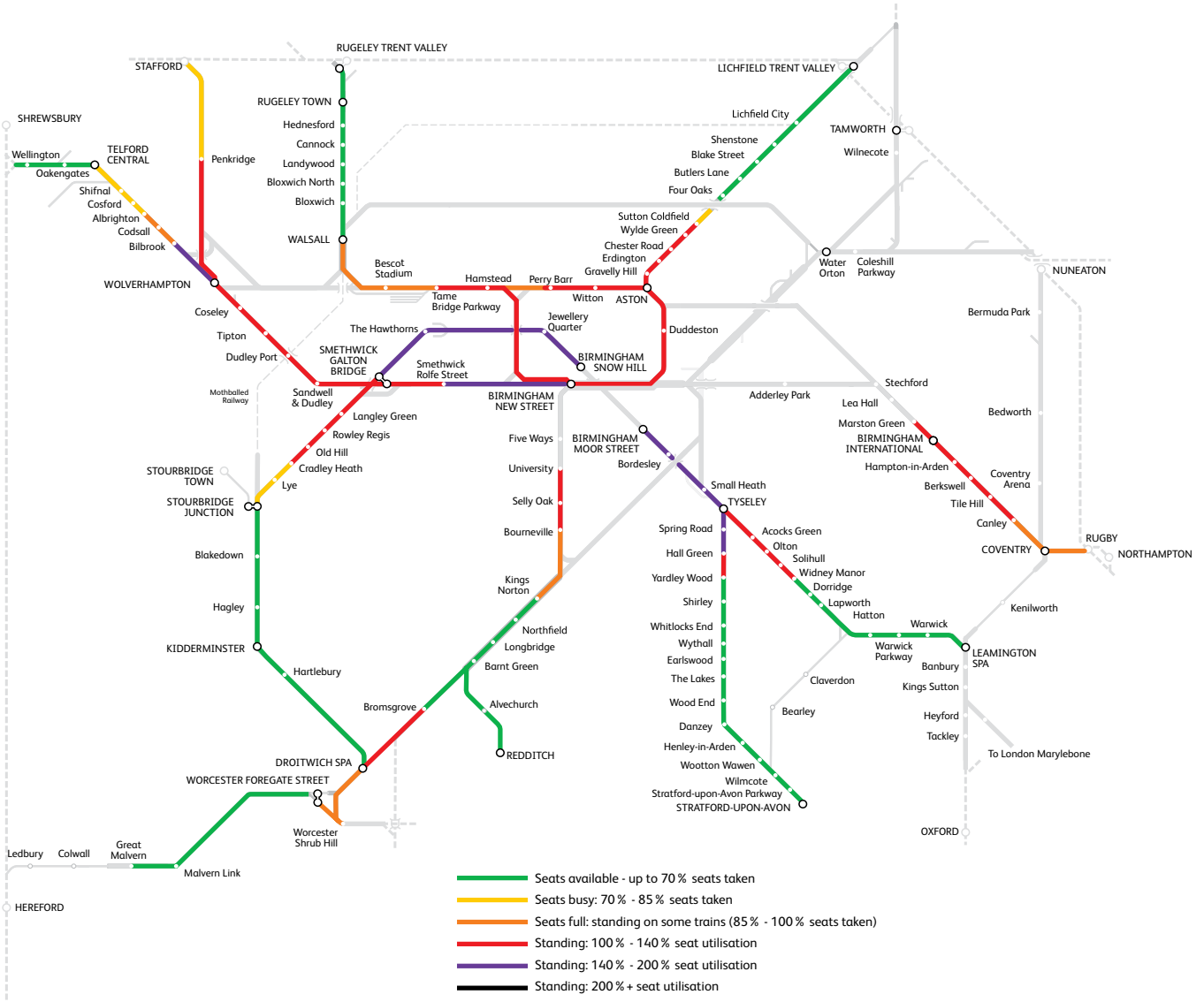
The maps include commuting, stopping services and non-London long distance services. More details on the long distance services are found in the section "**Conditional outputs CO3 and CO7 – long distance all day capacity**"

Figure 3.2: Commuter high-peak arrivals seat utilisation into Birmingham in 2013[8]



[8] The section between Birmingham Moor Street and Birmingham Snow Hill as capacity in to these stations will be sufficient to support flows between the two stations

Figure 3.3: Commuter high-peak arrivals seat utilisation into Birmingham in 2023



A 2043 capacity map was not produced due to the uncertainties of the future structure of the cross-country network, following the full implementation of HS2.

Figure 3.4: Long Distance (excluding flows to/from London) high-peak arrivals seat utilisation into Birmingham in 2023

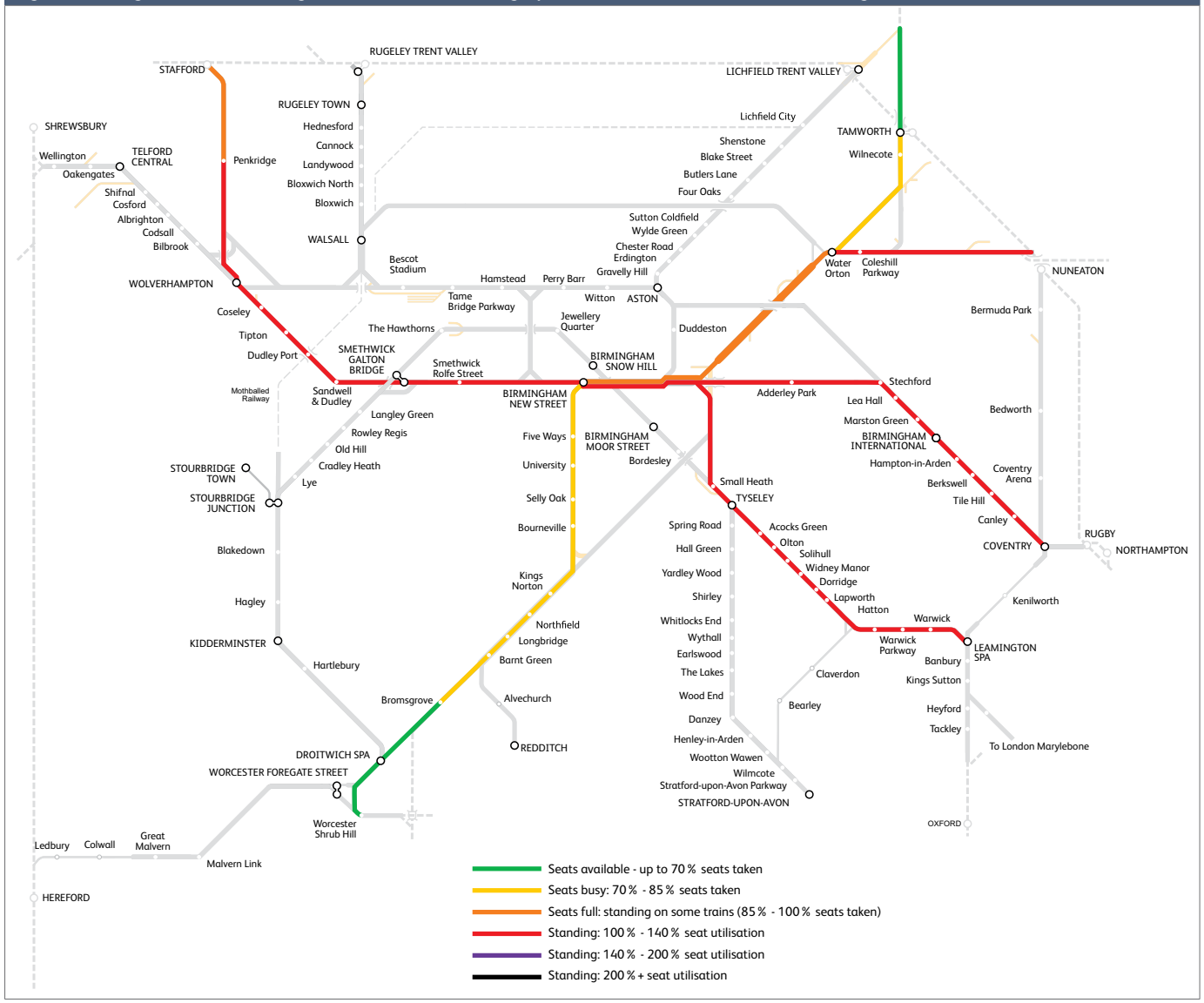
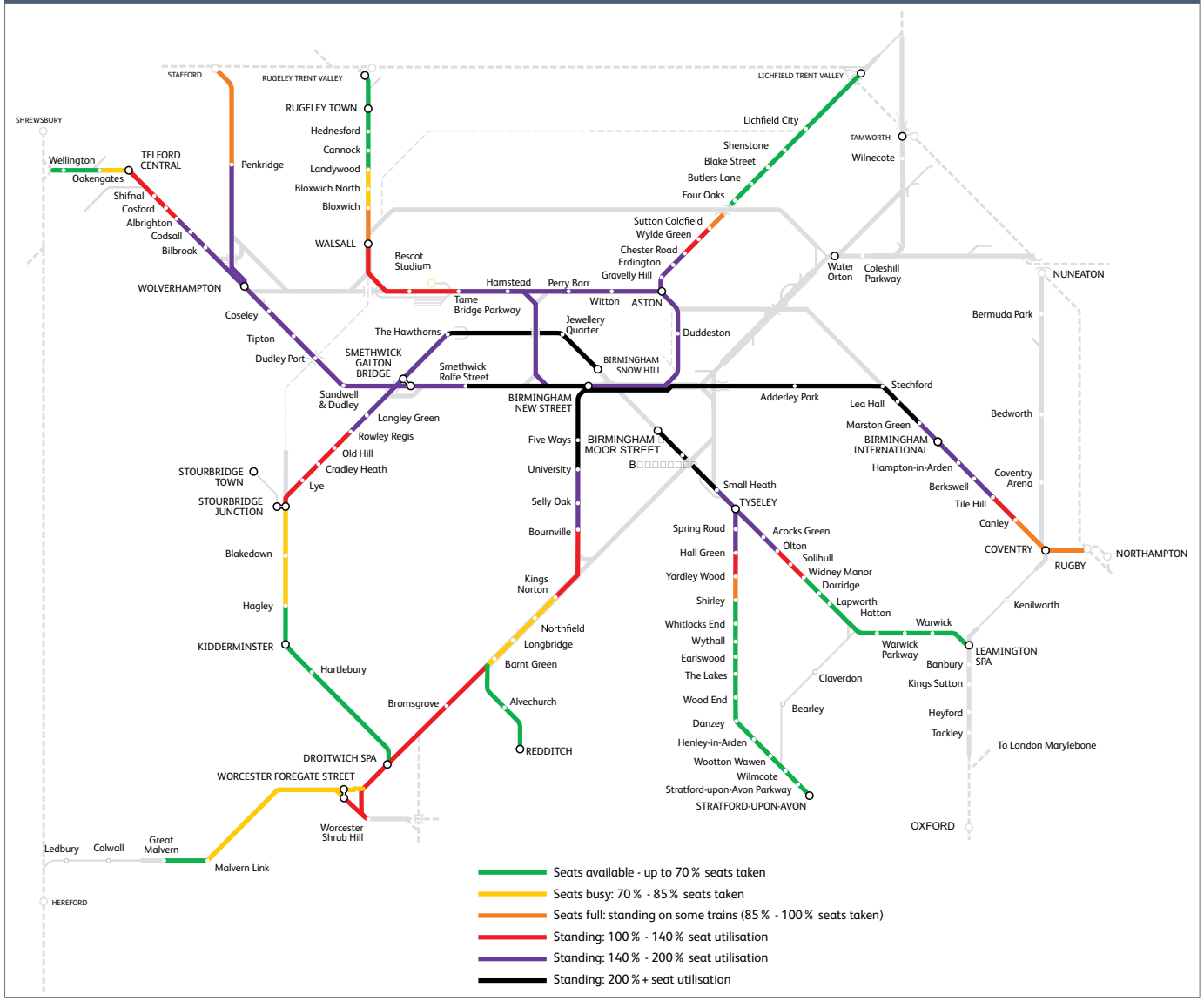


Figure 3.5: Commuter high-peak arrivals seat utilisation into Birmingham in 2043



Analysis undertaken to inform the strategy has identified train lengthening interventions that should be considered in order to meet the conditional outputs for demand across the six corridors. This assessment has identified where additional capacity will be needed into central Birmingham in the morning high-peak hour to meet forecast demand.

This has shown that to meet the demand forecasts, capacity for 3,700 extra passengers (around 33 vehicles) would be needed by 2023, with this increasing up to 12,000 passengers (around 107 vehicles) by 2043. This is broken down in the table below. All train lengthening options are subject to value for money and affordability.

On the Walsall to Rugeley line, electrification will enable the current diesel trains to be replaced with three-car electric units with increased capacity. This will also allow the existing diesel trains to be used on other routes in the West Midlands. The analysis has assumed these are allocated to the Hereford and Worcester via Bromsgrove route.

Longer distance services that serve a commuter role on the Snow Hill routes have been considered below in 'London Marylebone commuting'.

This analysis has been used to inform the West Midlands franchise competition and has fed into the Invitation to Tender which outlines the minimum required capacity to be provided by the new franchise.

Table 3.4: Required capacity to meet forecast demand by corridor

Corridor	2019 number of services (high peak hour, in both directions)	2019 train length assumption	2023 forecast additional passengers beyond 2019 capacity	2023 forecast vehicle requirement	2043 forecast additional passengers beyond 2019 capacity	2043 forecast additional vehicles
Rugby corridor via Coventry (commuter/stopping services)	5	Mix of four and eight-car electric trains	250	2	900	8
Stafford/Shrewsbury corridor via Wolverhampton (commuter/stopping services)	8	Mix of three, four and eight-car electric trains	850	8	2,400	23
Walsall/Rugeley lines (commuter/stopping services)	4	Three-car electric trains	0	0	500	5
Bromsgrove/Redditch to Lichfield/Sutton Coldfield (Cross City line) (commuter/stopping services)	13	Mix of three-car and six-car electric trains	1,100	10	4,000	33
Hereford and Worcester via Bromsgrove (commuter/stopping services)	2	Mix of five and six-car diesel trains, including 3 additional vehicles	0	0	200	2
Worcester via Stourbridge and Stratford-upon-Avon/Leamington Spa via Tyseley (Snow Hill lines) (commuter/stopping services)	15	Mix of three, four, five and six-car diesel trains	1,500	13	4,000	36
		Totals	3,700	33	12,000	107

London Marylebone commuting - CO2 and CO6

Overview

For the purpose of long term capacity planning, it is assumed that options identified to accommodate demand during the morning peak will also be sufficient to accommodate the evening peak.

The London and South East Market Study, which used 2011 passenger numbers as a base, forecast that peak hour demand for services into London Marylebone will grow by 22 per cent by 2023, and by 76 per cent by 2043. Between autumn 2011 and autumn 2015 the number of passengers travelling in and out of Marylebone during peak times has increased by 20 per cent, from 22,832 to 27,311.

There are three service groups that arrive into London Marylebone in the high-peak hour:

1. Kidderminster/Birmingham/Oxford to London Marylebone

2. Gerrards Cross/High Wycombe/Princes Risborough to London Marylebone

3. Aylesbury to London Marylebone via Met Line (excluding LUL services)

Passenger demand analysis

The capacity provided by the services in these groups is defined as the number of seats, plus a further allowance for passengers standing when making short trips of up to 20 minutes. Current and projected seat utilisation across the route into London Marylebone is shown in Figure 3.6.

Analysis undertaken as part of the study has identified where train lengthening interventions should be considered in order to meet demand across the three corridors, into Marylebone in the morning high-peak hour. All train lengthening options are subject to value for money and affordability.

This has shown that to meet the demand forecasts, capacity for 1,700 extra passengers (around 20 vehicles) would be needed by 2023, with this increasing up to 5,100 passengers (around 57 vehicles) by 2043. This is broken down in Table 3.5.

On the Kidderminster/Birmingham/Oxford to London Marylebone

Figure 3.6: High-peak arrivals seat utilisation into London Marylebone in 2013, 2023 and 2043 (does not including London Underground Limited Metropolitan Line services)

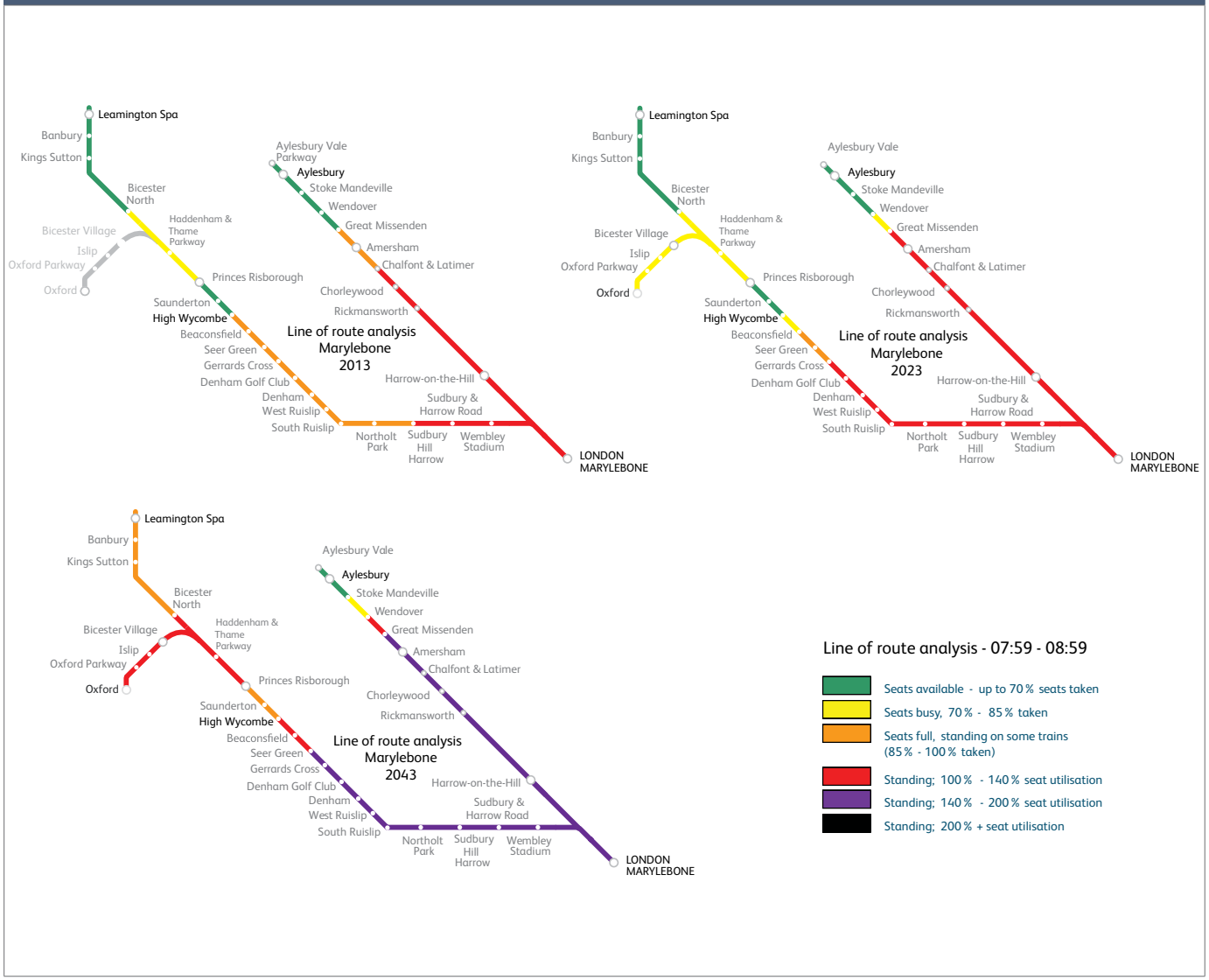


Table 3.5: Required capacity to meet forecast demand by corridor

Corridor	2019 number of services (high peak hour, in both directions)	2019 train length assumption	2023 forecast additional passengers beyond 2019 capacity	2023 forecast vehicle requirement	2043 forecast additional passengers beyond 2019 capacity	2043 forecast additional vehicles
Kidderminster/Birmingham/Oxford to London Marylebone	5	Mix of seven, eight and nine-car diesel trains	900	13	2,150	32
Gerrards Cross/High Wycombe/Princes Risborough to London Marylebone	6	Mix of diesel trains between two and seven-car	450	4	1,650	14
Aylesbury to London Marylebone via Met Line (excluding LUL services)	4	Mix of diesel trains between two and six-car	350	3	1,300	11
		Totals	1,700	20	5,100	57

corridor the train service specification has been enhanced with longer trains, with the addition of a new service between Oxford and London Marylebone.

Long distance all day capacity - CO3 and CO7

The long distance market connects cities and towns across the UK. Due to the distance services travel, each train usually only provides capacity for one peak period per day. Therefore, capacity provided by services across the whole day is considered.

Compared with 2012 figures, demand for long distance services relevant to this Route Study is forecast to grow by up to 45 per cent by 2023, and by up to 188 per cent[9] by 2043.

Passenger demand analysis

The capacity provided by these services is defined as the number of seats provided. Standing allowance is not applied as journey times between stations usually exceed 20 minutes. On these routes, the heaviest loadings are focussed on specific services and certain sections of the route. Crowding on these services is not exclusively in the peak periods, with several off-peak services experiencing crowding in 2013.

Analysis has identified that train lengthening should be considered in order to meet demand, subject to affordability and value for money assessments.

This has identified that to meet the demand forecasts, around 68 additional vehicles would be needed by 2023.

[9] Forecasts vary depending on the origin and destination of journeys, therefore a range of outlooks are presented to indicate that a combination of forecasts from the Long Distance Market study were used to form a forecast for each service group.

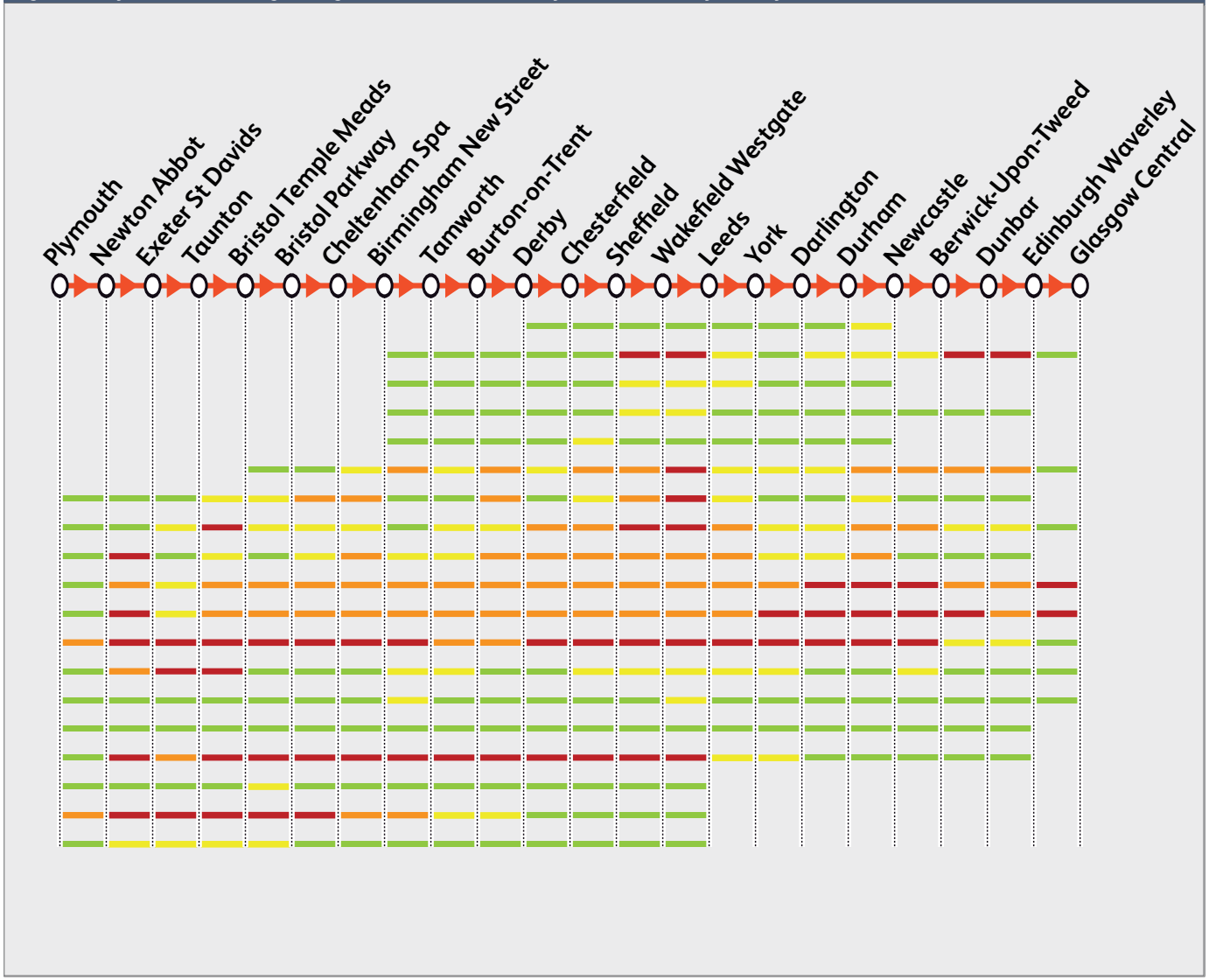
South West and South Coast to North East and Scotland routes

The forecast loads on services from Plymouth to Edinburgh Waverley and Glasgow Central northbound in 2023 are illustrated in Figure 3.7. Two services are forecast to have loads in excess of seating capacity between Derby and Chesterfield. However the heaviest crowding is shown to be between Bristol and Birmingham and in Yorkshire.

By 2023, the forecast growth would present significant crowding problems on both Plymouth to Edinburgh/Glasgow Central and the Southampton/Reading to Newcastle services. To meet the capacity conditional outputs on all services across the day, around 33 additional vehicles are required by 2023.

The implementation of HS2 alters the picture in 2043, based on assumptions provided by HS2 Ltd. In the West Midlands, loadings are reduced between Birmingham New Street and Leeds, but services south of Birmingham continue to experience crowding.

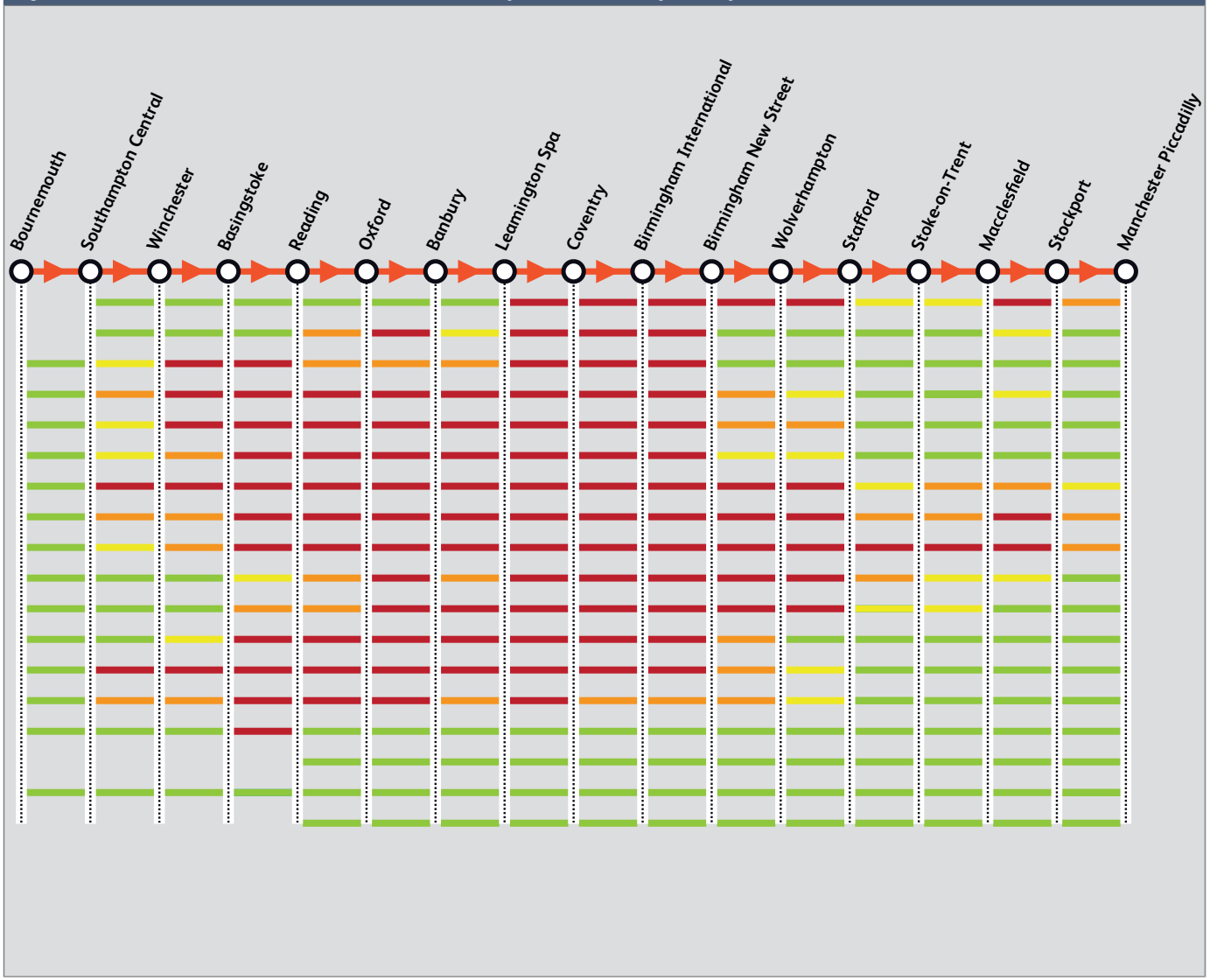
Figure 3.7: Plymouth to Edinburgh/Glasgow forecast load factors by train 2023 (all day, train by train)



South West and South Coast to Manchester Piccadilly routes

The forecast loads on services from Bournemouth to Manchester Piccadilly in 2023 are illustrated in figure 3.8. On the South Coast to North West route ten services are forecast to have loads in excess of seating capacity south of Oxford. However, the heaviest crowding is shown to be between Oxford and Birmingham.

Figure 3.8: South Coast to North West forecast load factors by train 2023 (all day, train by train)



Note: Baseline seating capacities assumed

On the South West to North West route, three services are forecast to have loads in excess of seating capacity south of Birmingham. However, the heaviest crowding is shown to be north of Birmingham.

By 2023, the forecast growth would present significant crowding problems on services from both Bristol Temple Meads and Bournemouth to Manchester Piccadilly. To meet the capacity conditional outputs on all services across the day by 2023, provision for an additional 1,600 passengers (around 35 vehicles) would be required.

The implementation of HS2 alters the picture in 2043, based on assumptions provided by HS2 Ltd. Loadings are reduced between Birmingham New Street and Manchester Piccadilly, but services south of Birmingham New Street continue to experience crowding.

Figure 3.9: South West to North West forecast load factors by train 2023 (all day, train by train)

Note: Baseline seating capacities assumed

Interurban all day capacity - CO4 and CO8

Interurban rail services connect the West Midlands with regional cities and towns in the East Midlands, East of England and Wales. For these services the busiest time period is the afternoon peak between 16:00-18:59. Analysis undertaken has examined the provision of sufficient capacity across the whole of the corridor across all time periods.

Compared with 2012 figures, demand for interurban services relevant to this Route Study is forecast to grow by up to 45 per cent by 2023, and by up to 188 per cent by 2043[10].

Passenger demand analysis

The capacity provided by these services is defined as the number of seats provided. Standing allowance is not applied as journey times between stations usually exceed 20 minutes.

Analysis undertaken identifies that by 2023, additional capacity will be needed on services both in the peak and off-peak periods, with train lengthening required to meet the capacity conditional outputs, subject to affordability and value for money assessments.

This has shown that to meet the demand forecasts, around 24 additional vehicles would be needed by 2023.

Cardiff Central to Nottingham service group

The 2019 baseline assumes an hourly service between Cardiff Central and Nottingham, and between Birmingham New Street and Nottingham, providing a half hourly service between Birmingham and Nottingham. There is an additional Birmingham New Street to Derby service running in the afternoon high-peak[11]. Train lengths and the frequency of services are assumed to remain the same as in 2013.

The busiest point on the route is usually at Birmingham New Street in the peak periods. Services departing Birmingham New Street towards Nottingham in the afternoon peak period tend to experience the most crowding. To meet the capacity conditional outputs on all services throughout the day, provision of around 14 extra vehicles are required by 2023.

The implementation of HS2 alters the picture in 2043, based on assumptions provided by HS2 Ltd. Some passengers travelling between Birmingham and Nottingham/Derby are forecast to switch onto HS2 services via the new station at Toton. However, crowding is likely to persist between Birmingham New Street and Tamworth in the high-peak hour because of demand for commuting.

[10] Forecasts vary depending on the origin and destination of journeys, therefore a combination of forecasts from the Long Distance Market study have been used to form a forecast for each service group.

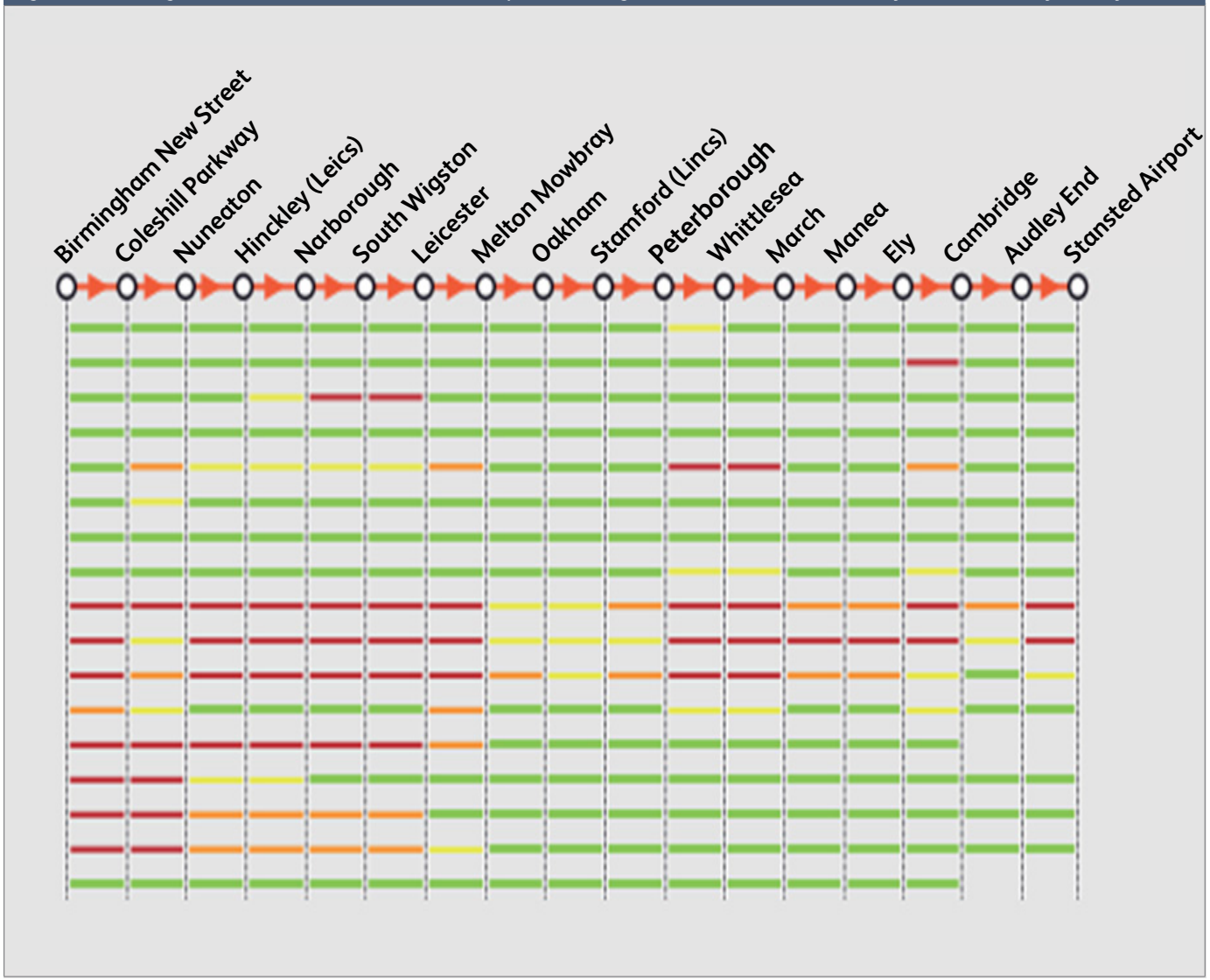
[11] The afternoon high-peak period is between 1700 and 1759.

Birmingham – Leicester - Stansted Airport services

The 2019 baseline assumes an hourly service between Birmingham New Street and Cambridge/Stansted Airport and an hourly service between Birmingham New Street and Leicester (providing a half hourly service between Birmingham and Leicester). Train lengths are assumed to remain the same as in 2013. These services are most heavily loaded into Birmingham New Street in the morning peak period and out of Birmingham New Street in the evening peak period.

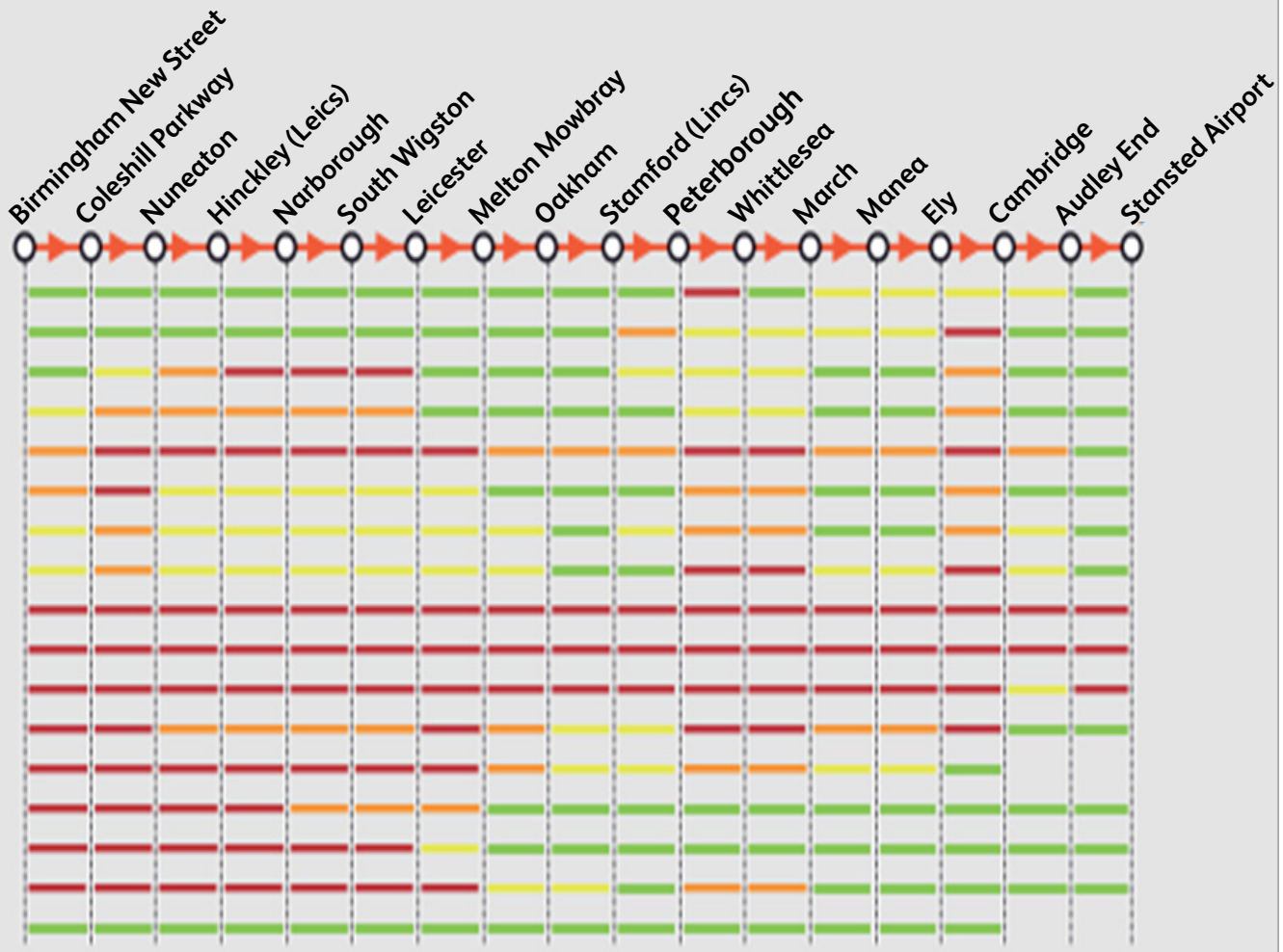
To meet the capacity conditional outputs on all services throughout the day, 10 additional vehicles are forecast to be required by 2023, up to 22 additional vehicles (compared with today) by 2043.

Figure 3.10: Birmingham New Street - Leicester - Stansted Airport/Cambridge services forecast load factors by train 2023 (all day, train by train)



Note: Baseline seating capacities assumed

Figure 3.11: Birmingham New Street - Leicester - Stansted Airport/Cambridge services forecast load factors by train 2043 (all day, train by train)



Key

- Seats available: up to 70% seats taken on average
- Seats busy: 70% – 85% seats taken on average
- Seats full: 85% – 100% seats taken on average
- Standing i.e., load: > 100% of seats

Note: Baseline seating capacities assumed

Table 3.6: Train lengthening summary		
	2024 additional vehicles to meet demand	2043 additional vehicles to meet demand
Central Birmingham commuting	33	107
Marylebone commuting	20	57
Long distance non London Services	68	N/A[12]
Interurban	24	46
	145	210

Train lengthening summary

Table 3.6 shows the number of additional vehicles required to accommodate the forecast demand to 2024 and 2043, broken down by corridor. Business cases for these options have been assessed and are reported in Chapter 5.

Figure 3.12: Forecast changes in intermodal tonnes lifted in the West Midlands and Chilterns Route Study area from 2012 to 2043 (Nuneaton (Croft - Nuneaton Slow) as example)

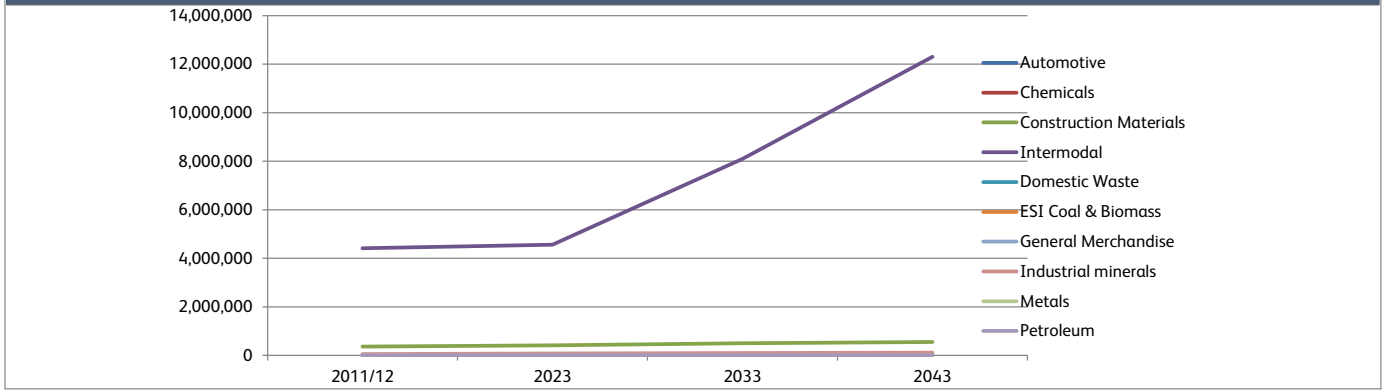
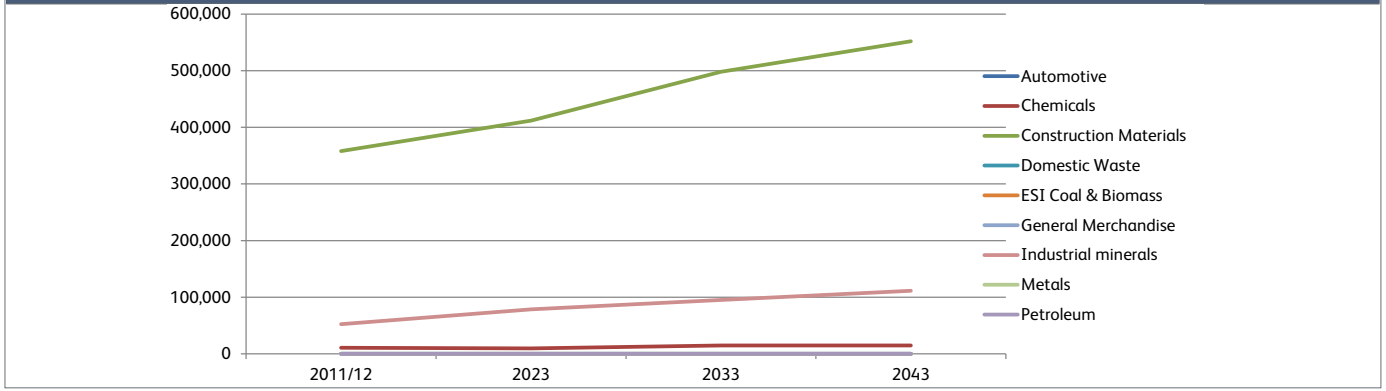


Figure 3.13: Forecast changes in tonnes lifted by commodity (excluding intermodal) in the West Midlands and Chilterns Route Study area from 2012 to 2043 (Nuneaton (Croft - Nuneaton Slow) as example)



[12] *Due to uncertainties around demand following the introduction of HS2 this has not been calculated*

Conditional outputs for freight

Accommodating freight demand

The West Midlands and Chilterns Route Study area forms a critical hub for the national freight network, with freight services accessing important terminals and other traffic passing through. In future, strong freight demand is projected to continue with annual freight growth forecast at 2.8 per cent.

The increase in demand to send freight by rail is driven by forecast growth in the movement of consumable goods (intermodal) and cars, as well as construction materials in the form of aggregates. Table 3.7 outlines the conditional outputs that have been identified for freight flows operating through the West Midlands and Chilterns and onwards across the rest of the UK. These primarily relate to the economic importance of the freight supply chain to businesses in the region and the need to provide sufficient capacity.

This growth in deep sea intermodal traffic will lead to an increase in demand between the key ports of Southampton, Felixstowe and Thames ports to freight terminals in the West Midlands area. The rail network through the West Midlands also provides capacity for longer distance freight flows supporting intermodal traffic to the North West, East and Scotland. This uplift has stimulated the need for additional freight destinations, such as the proposed new intermodal terminal development at Four Ashes, situated between Wolverhampton and Stafford.

Longer trains are planned to meet increasing customer demands for petrochemicals freight with a focus on the Kinsgbury oil terminal. Although a declining market, steel remains an important flow for the West Midlands, and supports the region's automotive industry.

This automotive industry itself will drive the need for longer and additional trains, with services transporting cars by rail from Washwood Heath to Southampton Docks.

Coal traffic has already fallen significantly in the short term with this trend set to continue declining further, reflecting Government policy on power generation, which is to close all coal power stations by 2025. The outputs have been derived from the growth forecasts in the Freight Market Study.

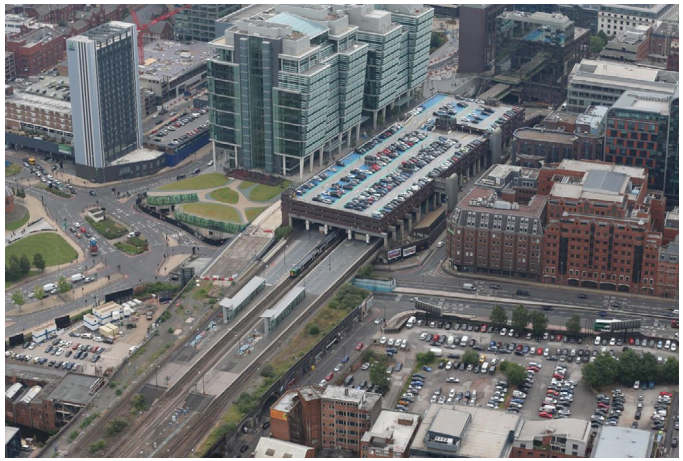
Table 3.7: Conditional outputs for freight

Reference	Conditional Output
CO9	To provide capacity to accommodate forecast growth in intermodal container freight tonnes in the West Midlands and Chilterns Route Study area in 2023
CO10	To provide capacity to accommodate forecast growth in all other commodities freight tonnes in the West Midlands and Chilterns Route Study area in 2023
CO11	To provide capacity to accommodate forecast growth in intermodal container freight tonnes in the West Midlands and Chilterns Route Study area in 2043
CO12	To provide capacity to accommodate forecast growth in all other commodities freight tonnes in the West Midlands and Chilterns Route Study area in 2043

The forecast growth by commodity across the Route Study area is shown in Figure 3.12 and Figure 3.13.

This is likely to increase the pressure on a number of capacity constrained corridors, particularly in the West Midlands. The Birmingham to East Midlands route hosts a number of freight terminals and links with the route to Felixstowe. The route between Southampton and the West Coast Mainline also crosses the West Midlands between Oxford and Nuneaton. The strategy will need to carefully consider the approach to accommodating both passenger and freight conditional outputs on these corridors.

Birmingham Moor Street Station

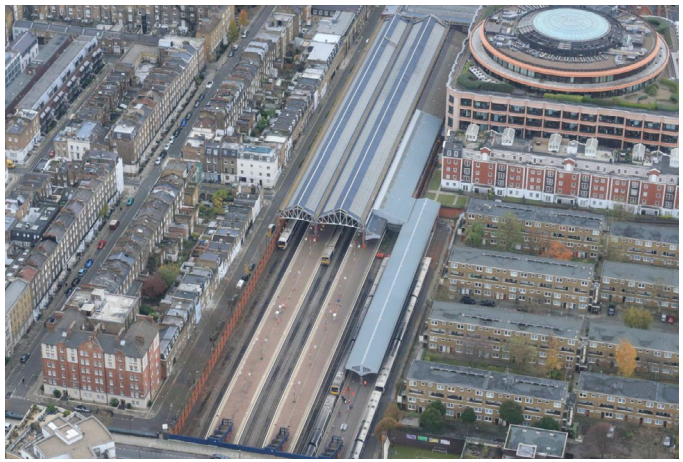


Birmingham Snow Hill Station

Conditional outputs for passenger circulation capacity at stations

Continued growth in the rail passenger market has resulted in a number of stations being congested in the peak hours. This can make stations difficult for passengers to navigate and lead to queueing. In addition congestion can increase the risk of accidents such as slips, trips and falls.

Busy stations on the route have been considered, to identify whether there are currently concerns over passenger circulation, and identify stations where forecast passenger growth will be putting increased pressure on station facilities. For stations identified with potential issues, options have been developed to improve passenger circulation and relieve congestion. Further details on stations identified for further assessment can be found in Chapter 5 and Appendix 6.



London Marylebone Station

University Station

04: Faster journeys and better connections - improving connectivity

This chapter sets out:

- where the market studies identify opportunities to improve journey times, frequency and ease of interchange
- the 2043 inditicative train service specification to deliver the conditional outputs

Conditional outputs relating to connectivity

An important element of the Route Study is improving passengers' access to the railway, to enable as many journey opportunities as possible. This is referred to as connectivity and the study focuses on the following key areas;

- the number of train services between locations
- how long the journeys take
- the interval between passenger train services
- whether journeys are direct or involve a change at another station
- how easy it is to change at stations during a journey (interchange)

The Market Studies set out in detail how conditional outputs for connectivity have been developed, which focus on improving the generalised journey time between two locations.

'Generalised journey time' is a measure of rail connectivity which combines both the speed and frequency of rail services, including the impact of any interchange. This can therefore be improved by any individual or combination of the following options;

- reducing timetabled journey time
- operating a more frequent service
- reducing interchange time
- or providing a through service rather than requiring interchange.

Conditional outputs from the Long Distance and Regional Urban and London and South East Market Studies

The Market Studies set out conditional outputs that improve connectivity between major UK centres over a 30-year planning horizon to 2043. These have been set out in terms of improving average journey speeds, and improvements to train service frequency, subject to affordability and value for money considerations.

Airport connectivity - CO13

Birmingham Airport is located adjacent to Birmingham International Station and carried more than 11.6 million passengers in 2016, supporting 30,000 jobs and generating £1.3 billion in GVA for the West Midlands region, acting as a key economic driver for the region. The airport has recently extended its runway, which enables it to accommodate direct, long haul flights to the Far East and the West Coast of the USA. The airport is forecasting an increase to 15 million passengers per annum by 2020. Currently 20% of air passengers access the airport by rail.

Currently nine trains per hour operate in the off-peak period between Birmingham New Street and Birmingham International, with a mix of fast long distance services, local and interurban services serving Birmingham International. The airport benefits from good connectivity, with a good level of direct services and further opportunities for passengers to interchange at Birmingham New Street. In 2026 the arrival of the HS2 station at Birmingham Interchange will add further journey opportunities for those wishing to access the airport.

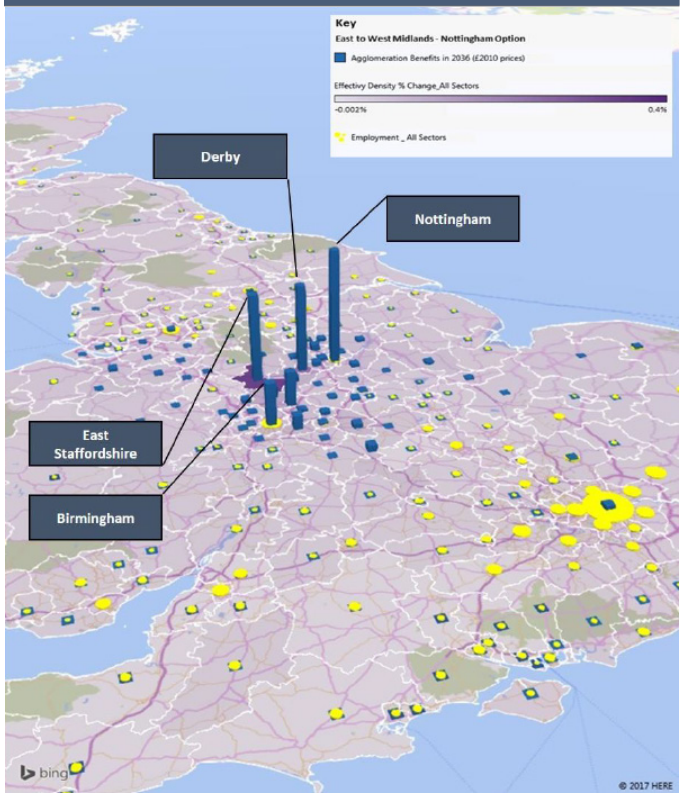
Despite this, Birmingham Airport and other stakeholders, have identified that there is a lack of direct connectivity with the East Midlands. The airport also has strong aspirations set out in its Surface Access Strategy to work towards a 24 hour train service, to meet both passenger and staff needs.

The important role of Birmingham Airport is set out in the strategy for the Coventry corridor in Chapter 5.

HS2 connectivity - CO14

This conditional output recognises the opportunity to improve journey time and connectivity by improving connections to HS2 in Birmingham and at Old Oak Common, once Phase 1 (the Birmingham to London High Speed connection) is completed in 2026. Consultation on HS2 Phase 2 (further extension to North West England and Yorkshire) was completed in 2014. A key focus of this for this strategy is how passengers will interchange from the existing central Birmingham stations to the new HS2 station at Birmingham Curzon Street and Birmingham Interchange.

Figure 4.1: Midlands Connect Birmingham to Nottingham economic benefit diagram



To offer greater connectivity, the strategy set out options for those passengers wishing to change onto HS2 services at Curzon Street. The Midlands Rail Hub option links Birmingham Moor Street to the routes to Longbridge/the south west and Derby/Leicester which will improve access to the ajacent Curzon Street station from these corridors.

The strategy includes the option of routeing additional services on the Chiltern route from London Marylebone to an alternative terminus in the Old Oak Common area, providing further opportunities for connectivity to HS2 services at Old Oak Common as well as being an option for managing the growth in demand for services into Marylebone.

Both these options are set out in detail in Chapter 5.

Longer distance journey time improvements - CO15 - 18

The Regional Urban Market Study established a conditional output to improve generalised journey times to better connect the West Midlands to the East Midlands. Generalised journey times can be reduced by improving timetabled journey time or by operating a more frequent service. The Regional Urban Market Study identifies the following conditional outputs for the West Midlands and Chilterns Route Study.

Table 4.1: Longer distance journey time outputs

Reference	Conditional Output
CO15	To reduce the generalised journey time between Birmingham New Street and Leicester/Stansted Airport
CO16	To reduce the generalised journey time between Birmingham New Street and Derby
CO17	To reduce the generalised journey time between Birmingham New Street and Nottingham
CO18	To reduce the generalised journey time between Coventry and Leicester

These outputs strongly align with the emerging priorities set out by the Midlands Connect partnership. They have undertaken some detailed analysis of the wider economic benefits that could be realised by improving the journey opportunities between key towns and cities.

Figure 4.1 show the economic benefits of improving the journey times spread across the region.

Improving capacity and connectivity for the leisure markets - CO19

The busiest times for travel to and from urban retail and tourism centres are often at weekends and during weekday evenings. This is in contrast to the typical weekday peak for commuting and business travel, when the highest levels of train service frequency and capacity are provided.

Leisure demand is typically highest during the summer months, and declines in the winter. However, around the Christmas period, central Birmingham sees a sharp increase in passenger demand. This is due to an increase in retail activity in the build up to Christmas and the Birmingham Christmas market attracting additional passengers both at weekends and weekday evenings.

The West Midlands franchise ITT has specified increased level of train service on Sundays from 2021, by providing the same level of service as currently offered on a Saturday. The ITT also sets out the requirement for improved evening services.

The leisure market is important to the local economy as well as to passengers; therefore the conditional output is to provide opportunities to travel, sufficient capacity to avoid suppression of demand, and to reduce potential on-train crowding. This involves consideration of the potential trade-offs resulting from alternative engineering regimes, including relevant safety considerations and an assessment of the affordability and value for money.

Access to higher education establishments and other social infrastructure – CO20

Improving accessibility to higher education establishments and social infrastructure such as healthcare and sporting institutions is important to the strategic goal of improving quality of life for communities and individuals.

Cross City, Hereford and longer distance services serve the University of Birmingham, one of the largest universities in the UK with a student population of around 30,000 and a dedicated rail station. Other notable institutions in the West Midlands and Chilterns area include Coventry University, University of Warwick, Aston University, University of Wolverhampton, University of Worcester, Birmingham City University and University College Birmingham, London Business School and University of Westminster as well as access to other London universities.

Providing sufficient capacity and connectivity for this market is a choice for funders, train operating companies and franchise authorities. Conditional outputs to improve connectivity to many of these locations either by enhanced service frequencies or journey time improvements have been identified.

Improved local access to the rail network to cater for demand - CO21

A key theme of a number of the local and regional transport strategies within the West Midlands and Chilterns Route Study area is of improving the integrated transport offering. These strategies explore the opportunities to develop improved interchange between rail and other transport modes and also opportunities afforded by new technology to improve ticketing and travel choices.

Developing a train service specification

In order to test the impact of the conditional outputs on the rail network, an unconstrained Indicative Train Service Specification (ITSS) for 2043 was developed. This rail industry-agreed specification sets out one way that the conditional outputs could be met in the future, both in terms of passenger and freight services. This specification sets out a typical off peak hour, and expresses the conditional outputs as journey opportunities. Figures 4.2–4.7 illustrate the connectivity conditional outputs for each corridor.

The ITSS sets out the typical type of service operating between locations, whether fast, semi-fast or local, and specific station calling patterns have not been identified as part of this analysis.

There is a general conditional output to at least maintain the same level of service as anticipated in the 2019 baseline West Midlands and Chilterns Indicative Train Service Specification. Therefore, the ITSS would normally maintain a direct service where one currently exists.

The 2043 ITSS does not include HS2 services.

Table 4.2: Cross-boundary codes for Figure 4.2

Code	From	To	Via
XB47	Aberystwyth	London Euston	Milton Keynes
XB72	North Wales	Birmingham International	Wrexham
XB75	Scotland	Central Birmingham	Stafford
XB74	Liverpool	Central Birmingham	Stafford
XB32	Liverpool	Swindon	Central Birmingham
XB31	Manchester	Bath Spa	Central Birmingham
XB06	Manchester	Bournemouth	Central Birmingham
XB36	Manchester	Cardiff	Bristol
XB14	Hull	Southampton	Central Birmingham
XB133	Leeds	Coventry	Nuneaton
XB80	Wolverhampton	Nottingham	Options via Walsall
XB45*	London Euston	Wolverhampton	Milton Keynes
XB46 / 76*	London Euston	Manchester	Milton Keynes, Cannock
XB66	Milton Keynes	Wolverhampton	Central Birmingham
XB65	Milton Keynes	Walsall	Central Birmingham
XB69	Northampton	Central Birmingham	
LS01	Leamington Spa	Wolverhampton	Central Birmingham
LS02	Leamington Spa	Wolverhampton	Central Birmingham
SY01	Shrewsbury	Central Birmingham	
CN01	Coventry	Nuneaton	
CN02	Coventry	Nuneaton	

Figure 4.2: Birmingham to Rugby via Coventry and Birmingham to Stafford/Shrewsbury via Wolverhampton 2043 Unconstrained ITSS

Table 4.3: Cross-boundary codes for Figure 4.3

Code	From	To	Via
XB76 / 46	Manchester	Central Birmingham	Walsall
WW01	Walsall	Wolverhampton	Central Birmingham
WW02	Walsall	Wolverhampton	Central Birmingham
RY01	Rugeley Trent Valley	Central Birmingham	Walsall
RY02	Rugeley Trent Valley	Central Birmingham	Walsall
WL01	Central Birmingham	Walsall	Tame Bridge Parkway
WL02	Central Birmingham	Walsall	Tame Bridge Parkway
XB65	Walsall	Milton Keynes	Central Birmingham
XB81	Wolverhampton	Nottingham	Options via Walsall
BR01	Bromsgrove	Lichfield Trent Valley	Aston Junction
BR02	Bromsgrove	Lichfield Trent Valley	Aston Junction
BR03	Bromsgrove	Lichfield Trent Valley	Aston Junction
RY01	Rugeley Trent Valley	Central Birmingham	Aston Junction
RY02	Rugeley Trent Valley	Central Birmingham	Aston Junction

Figure 4.3: Walsall Corridor 2043 Unconstrained ITSS

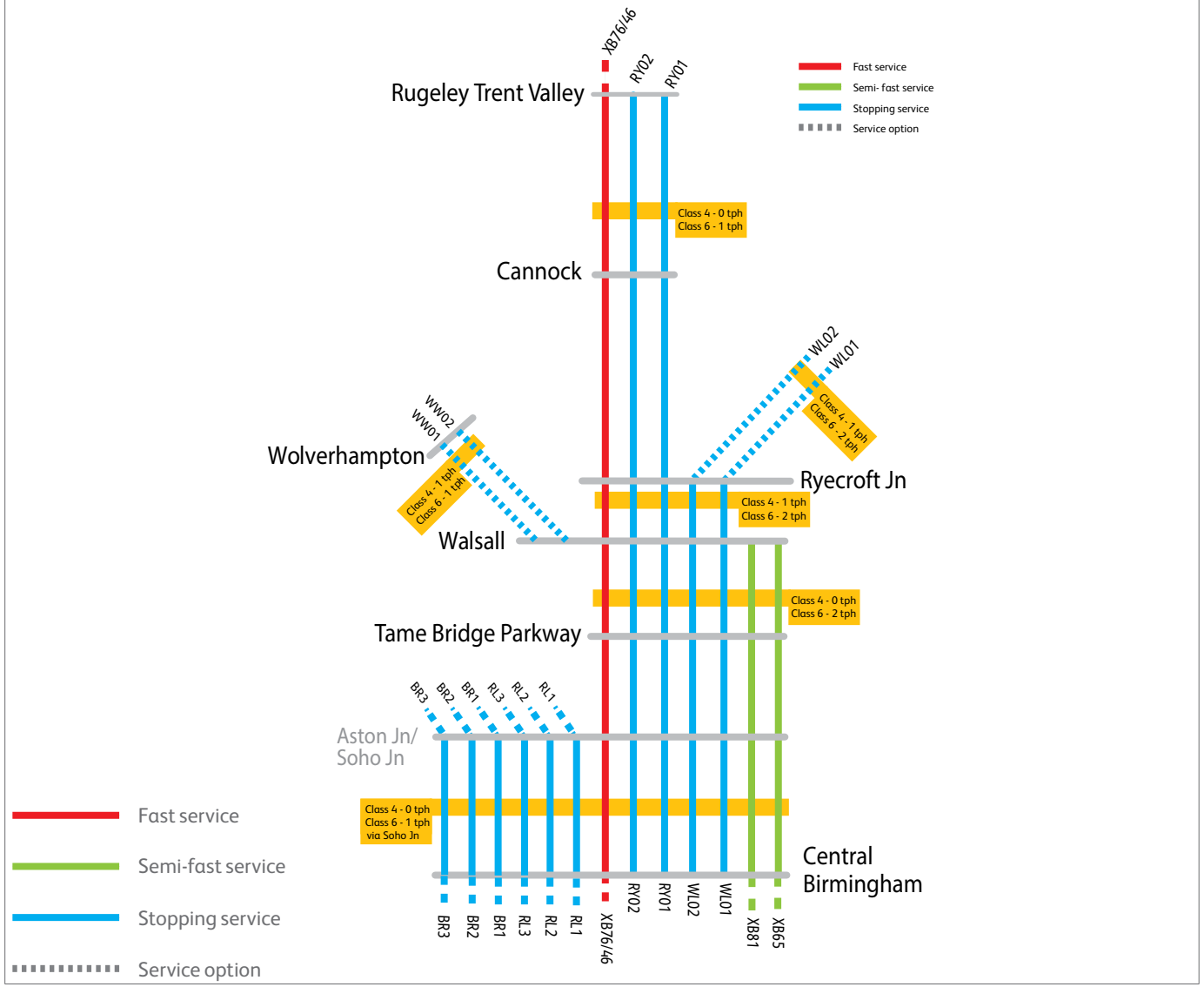


Table 4.4: Cross-boundary codes for Figure 4.4

Code	From	To	Via
XB01	Plymouth	Glasgow Central	Birmingham, Derby, Sheffield, Wakefield, Leeds/HS2
XB19	London Paddington	Hereford	Worcester
XB20	London Paddington	Worcester Foregate St	Swindon/Oxford
XB31	Bath Spa	Manchester	Bristol, Birmingham
XB32	Swindon	Liverpool	Birmingham, Worcester
XB33	Cardiff	Worcester Foregate St	Gloucester
XB34	Cardiff Central	Bradford	Bristol Parkway, Birmingham, Wakefield, Leeds
XB35	Cardiff Central	Lincoln	Gloucester, Birmingham
XB36	Cardiff Central	Manchester Piccadilly	Bristol Parkway, Stafford/ HS2
XB71	Oxford	Worcester Foregate St	Cotswolds
HD01	Hereford	Birmingham	Bromsgrove
HD02	Hereford	Birmingham	Bromsgrove
WR01	Worcester	Birmingham	Snow Hill lines
WR02	Worcester	Birmingham	Snow Hill lines
BR01	Bromsgrove	Lichfield Trent Valley	Birmingham
BR02	Bromsgrove	Lichfield Trent Valley	Birmingham
BR03	Bromsgrove	Lichfield Trent Valley	Birmingham
RY01	Rugeley Trent Valley	Birmingham	Aston Junction
RY02	Rugeley Trent Valley	Birmingham	Aston Junction
WL01	Walsall	Birmingham	Aston Junction
WL02	Walsall	Birmingham	Aston Junction
CH01	Kings Norton	Birmingham	Camp Hill lines
CH02	Kings Norton	Birmingham	Camp Hill lines
CH03	Kings Norton	Birmingham	Camp Hill lines
RL01	Redditch	Lichfield Trent Valley	Birmingham
RL02	Redditch	Lichfield Trent Valley	Birmingham
RL03	Redditch	Lichfield Trent Valley	Birmingham

Figure 4.4: Birmingham to Worcester/Hereford via Bromsgrove 2043 Unconstrained ITSS

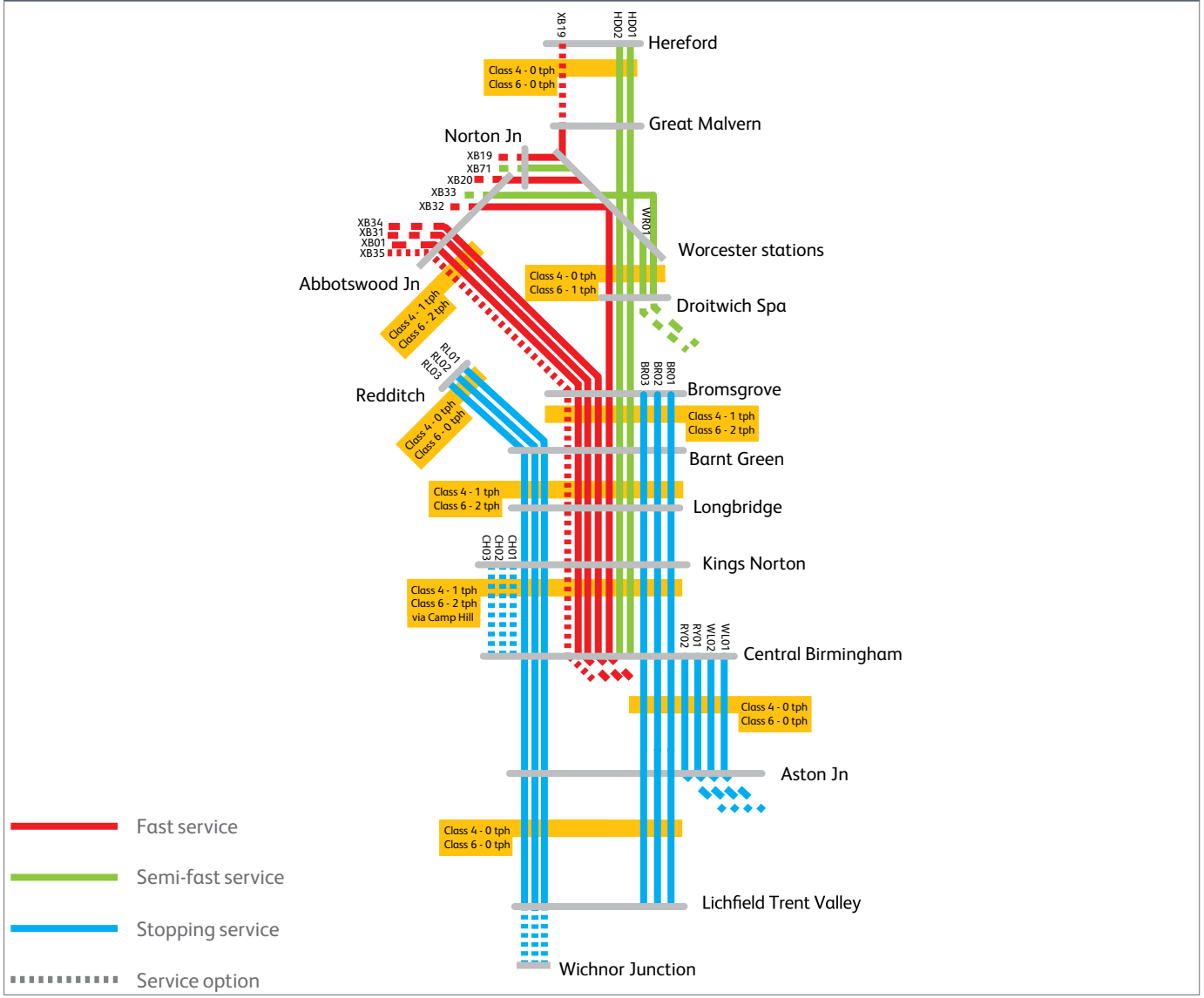


Table 4.5: Cross-boundary codes for Figure 4.5

Code	From	To	Via
XB32	Liverpool	Swindon	Central Birmingham
HD01	Hereford	Birmingham	Bromsgrove
HD02	Hereford	Birmingham	Bromsgrove
WR01	Worcester	Leamington Spa	Snow Hill lines
WR02	Worcester	Leamington Spa	Snow Hill lines
KD01	Kidderminster	Stratford-upon-Avon	Hatton Junction
KD02	Kidderminster	Leamington Spa	Central Birmingham
SB01	Stourbridge Junction	Whitlocks End	Central Birmingham
SB02	Stourbridge Junction	Stratford-upon-Avon	Hatton Junction
RR01	Rowley Regis	Whitlocks End	Central Birmingham
RR02	Rowley Regis	Whitlocks End	Central Birmingham
MB05	Central Birmingham	London Marylebone	Leamington Spa
MB06	Central Birmingham	London Marylebone	Leamington Spa
MB07	Stratford-upon-Avon	London Marylebone	Leamington Spa

Figure 4.5: Snow Hill Lines 2043 Unconstrained ITSS

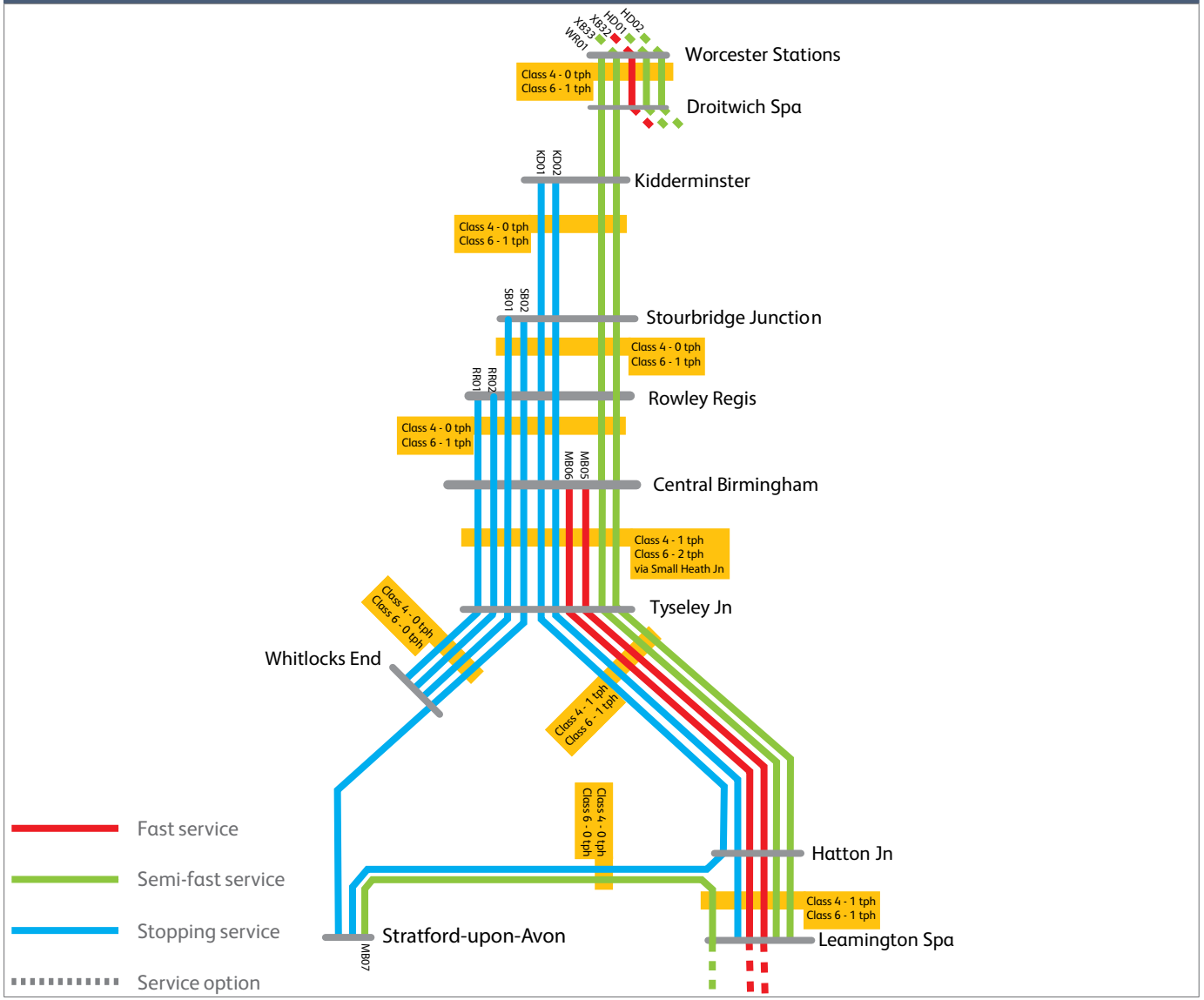


Table 4.6: Cross-boundary codes for Figure 4.6

Code	From	To	Via
XB14	Hull	Southampton	Oxford and Central Birmingham
XB06	Manchester	Bournemouth	Oxford and Central Birmingham
XB70	Banbury	Oxford	
XB41	Oxford	Marylebone	
XB42	Oxford	Marylebone	
XB24	Milton Keynes Central	Paddington	Oxford
XB28	Bristol Temple Meads	Leeds	Bedford
XB39	Cambridge	Oxford	Bletchley
XB84	South West	Nottingham	East West Rail
XB68	Bedford	Milton Keynes	Bletchley
XB40	Cambridge	Oxford	Bletchley
XBEW	Milton Keynes Central	Old Oak Common	Aylesbury
MB01	London Marylebone	Aylesbury	Metropolitan Line
MB02	London Marylebone	Aylesbury	Metropolitan Line
MB03	Gerrards Cross	London Marylebone	Metropolitan Line
MB04	London Marylebone	Aylesbury	Princes Risborough
MB05	London Marylebone	Central Birmingham	
MB06	London Marylebone	Central Birmingham	
MB07	London Marylebone	Stratford-upon-Avon	
OC01	Old Oak Common	High Wycombe	
OC02	Old Oak Common	Gerrards Cross	
OC03	Old Oak Common	Banbury	

Figure 4.6: Chiltern and East West Rail 2043 Unconstrained ITSS

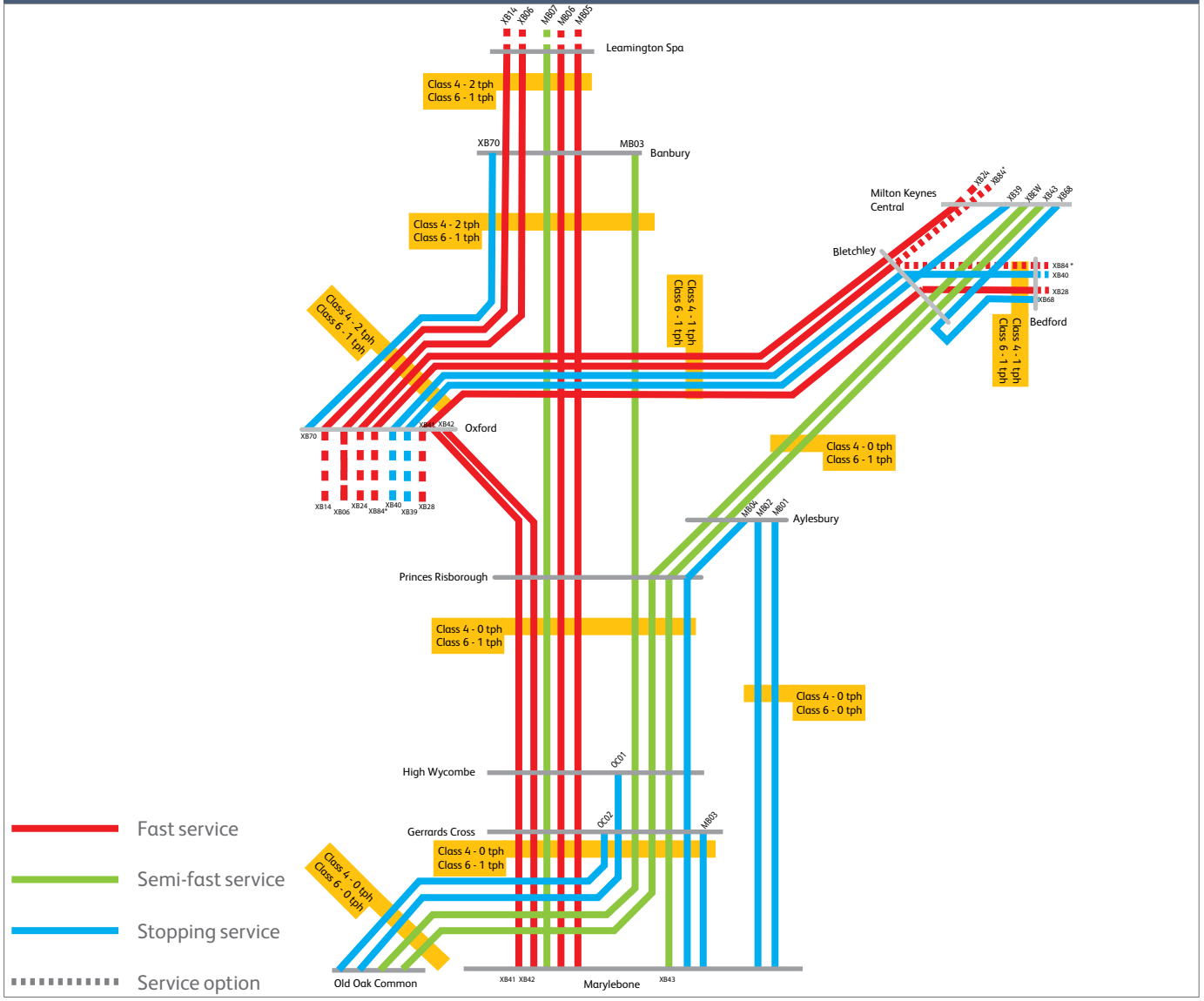


Table 4.7: Cross-boundary codes for Figure 4.7

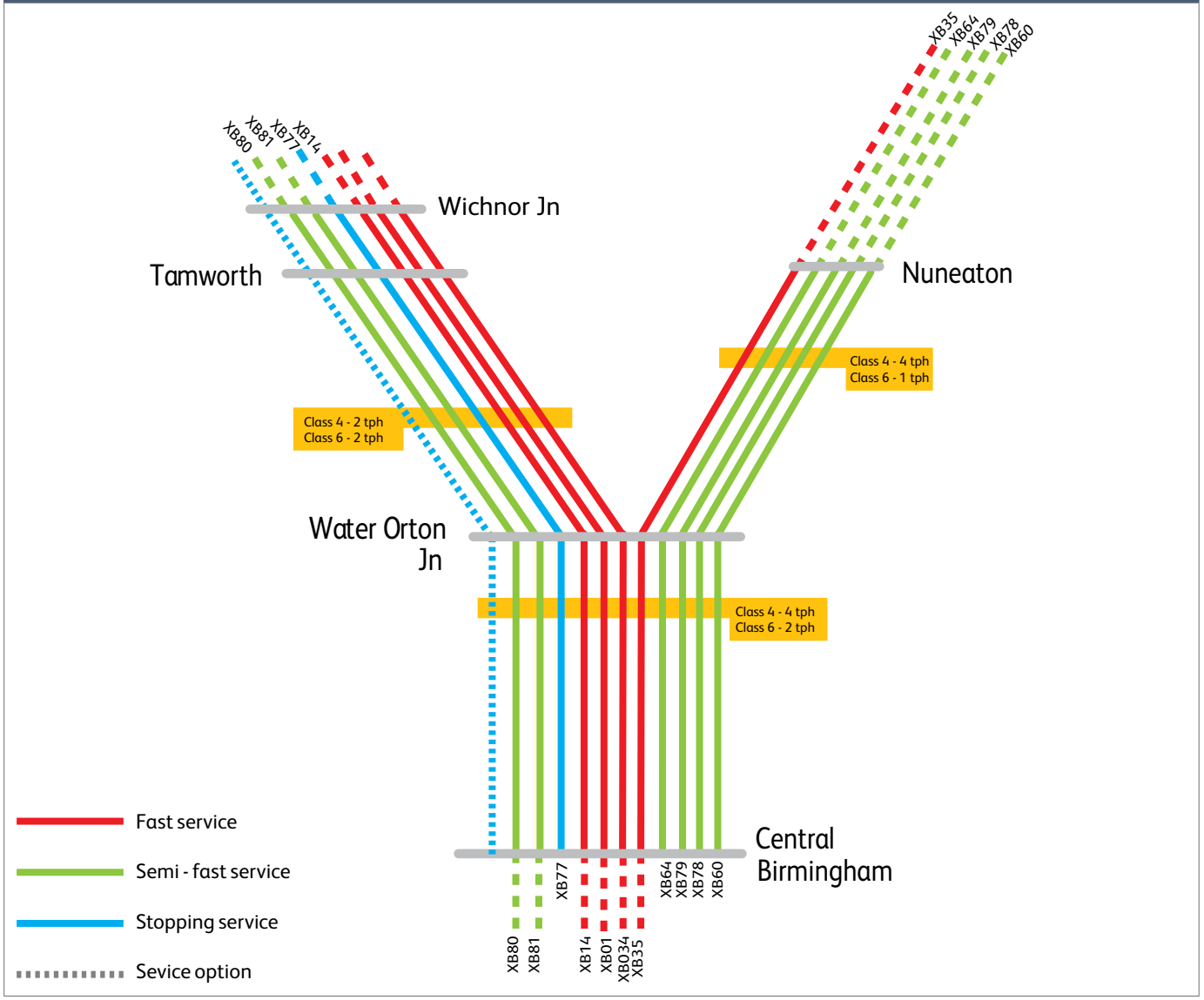
Code	From	To	Via
XB81	Nottingham	Wolverhampton	Central Birmingham and Walsall
XB80	Nottingham	Wolverhampton	Central Birmingham and Walsall
XB01	Glasgow	Plymouth	Central Birmingham
XB14	Hull	Southampton	Central Birmingham and Tamworth
XB77	Burton-on-Trent	Central Birmingham	Tamworth
BB01	Burton-on-Trent	Central Birmingham	Tamworth
XB34	Bradford	Cardiff	Tamworth
XB60	Norwich/ Stansted/ Leicester	Central Birmingham	Nuneaton
XB64	Norwich/ Stansted/ Leicester	Central Birmingham	Nuneaton
XB78	Norwich/ Stansted/ Leicester	Central Birmingham	Nuneaton
XB79	Norwich/ Stansted/ Leicester	Central Birmingham	Nuneaton
XB35	Lincoln	Cardiff	Nuneaton

Analysis

The ITSS is used to test the ability of the rail network to safely and robustly deliver all of the conditional outputs. Where constraints are identified, strategic options are developed to address those constraints and enable the conditional outputs to be delivered. These are then put forward as choices for funders.

The strategy and choices for funders to deliver the conditional outputs are outlined in Chapter 5.

Figure 4.7: Birmingham to Leicester/Nottingham 2043 Unconstrained ITSS



05: Strategy and choices for funders

This chapter sets out:

- the strategy for the West Midlands and Chilterns
- choices for funders
  - to meet forecast demand to 2023
  - to maximise the opportunities presented by High Speed 2
  - to improve links between East and West Midlands
  - to meet longer-term demand and connectivity conditional outputs.

Prioritisation

Choices for funders have been prioritised based on a number of criteria that have been agreed across Route Studies. These are:

- accommodating passenger and freight demand to 2024
- maximising the benefits from High Speed 2
- taking advantage of any potential synergies with planned renewals
- aligning capacity works with major programmes (such as electrification)
- affordability
- value for money

The strategy for the West Midlands and Chilterns area comprises three main policy areas; accommodating future demand for train services into key cities and towns in the Route Study area, maximising the opportunities presented by High Speed 2 (HS2), and improving links between the East and West Midlands.

The arrival of HS2 in 2026 is a significant development for the West Midlands and Chilterns area. The new HS2 stations, Curzon Street and Birmingham Interchange, are likely to change travel patterns and lead to significant regeneration opportunities. The same is true of the Old Oak Common area, where the opportunity will exist to interchange between Crossrail services, HS2 and the Great Western Main Line.

The strategy embraces the outputs and ongoing work of the Midlands Connect partnership and reflects the output of the developing evidence base. The strategy is also feeding into the next phases of Midlands Connect development, which are focused on further defining the economic importance of investment in transport in the Midlands.

The strategy is broken down into two sections, one focused on the West Midlands and one focused on the Chiltern Route and East West Rail. The strategic narrative for each is set out, followed by a series of choices for funders.

HS2

The arrival of HS2 will be transformational for passengers, with new high speed services from Euston via Old Oak Common to Birmingham, Manchester, Leeds and beyond. Phase One, in 2026, will see three trains per hour operate between Euston and Birmingham Curzon Street, while Old Oak Common will be served by ten trains, serving Birmingham, Manchester, Glasgow, Liverpool and Preston.

Phase Two in 2033 will see a further step change in connectivity with sixteen trains per hour from Euston via Old Oak Common to Birmingham, the North West, North East and Scotland. From Curzon Street there will be an additional six trains per hour to the North West, North East and Scotland, with further opportunities for connections at Birmingham Interchange which will be served by five trains per hour. Overall this will deliver an additional twelve trains per hour in the West Midlands, providing increased capacity, and dramatic improvements to journey times.

These new services will replace some of the current long distance services on the existing rail network, releasing capacity for new services, which could serve different markets and further improve connectivity. This strategy has focused on the potential for released capacity on the route between Rugby and Stafford.

The Midlands Connect partnership has identified clear economic benefits of the HS2 network for the wider Midlands and strongly endorses the objective of maximising the opportunities for as many passengers as possible to access these services.

The arrival of HS2 at Birmingham Curzon Street in 2026 drives the requirement to consider rail access to central Birmingham in a different way. The new station will be located adjacent to Birmingham Moor Street station, and will drive significant regeneration, jobs and housing. The Curzon Investment plan published in June 2016 sets out plans to attract £1.7bn of private investment supporting 36,000 jobs and 4,000 homes and the Curzon Urban Regeneration Company has been set up to take this forward.

Birmingham Interchange Station will offer opportunities for passengers from the South West, South Midlands and Coventry to access high speed services to the North West, North East and Scotland via Birmingham International.

Solihull Metropolitan Borough Council has established the 'Urban Growth Company' to act as a delivery agent to maximise the development and regeneration opportunities presented by the arrival of HS2 at UK Central. The site incorporates Birmingham Airport, NEC, Jaguar Land Rover, Birmingham Business Park and the area surrounding the new Birmingham Interchange Station. This strategy highlights the importance of connectivity between the existing rail network and Birmingham Interchange via the people mover. Regional stakeholders are working closely with HS2 Ltd., the rail industry and Birmingham Airport to maximise interchange opportunities and integration with wider strategic plans.

The development of Old Oak Common as a new rail hub in central London, both through the development of Crossrail and the arrival of HS2, is a key element of the strategy. The Greater London Authority has established the Old Oak Common and Park Royal Development Corporation to maximise the substantial regeneration opportunities this offers, including upto 24,000 homes and 55,000 new jobs over the next 20-30 years.

The strategy makes the case for a new connection into Old Oak Common hub from the Chiltern route, providing direct connectivity from Aylesbury, High Wycombe and other towns into HS2, Crossrail, and access to Heathrow.

Electrification

The Route Study area contains committed schemes to electrify the routes between Walsall and Rugeley and between Barnt Green and Bromsgrove. Electrification of the routes between Oxford and Nuneaton (via Leamington Spa and Coventry), between Oxford and Bletchley, and Bletchley to Bedford could be developed further in the medium term, subject to funding.

In terms of setting priorities for future electrification, the rail industry has been considering the priorities for future electrification schemes. For the West Midlands and Chilterns Route Study, we have built into this strategy the potential for electrification on the following routes:

- Bristol to Birmingham, Birmingham to Derby and Leamington Spa to Birmingham
- Chiltern Main Line (Leamington Spa/Aylesbury – London Marylebone)

Digital Railway

The strategy incorporates the Digital Railway Programme, which is developing a deployment approach to accelerate the roll-out of the next generation of signalling, command and control systems across the UK rail network.

At its core is the phased national delivery of the European Train Control System (ETCS) and the removal of lineside signalling, and includes integration of Traffic Management and Connected Driver Advisory systems that help both manage and communicate the impact of disruption.

The emerging deployment strategy identifies 'configuration states' on the route to full implementation of ETCS and the removal of lineside signalling, which packages the other systems and supporting business change to deliver the key benefits. The configuration states include Traffic Management and Connected Driver Advisory Systems (both enabled by an established Railway Operating Centre as the hub of signalling and controls for the route), to deliver improved operational decision-making and disruption management, operational costs / energy savings and performance benefits.

Within the Route Study potential interventions that could have a 'digital' component have been identified:

- where ETCS could directly help provide required capacity by reducing signalling headways
- where digital solutions phased correctly could reduce the overall cost and disruption of enhancements, for example electrification and significant junction remodelling
- identify the desired digital railway solutions and 'configuration states' aligned to the strategy for West Midlands and Chilterns.

The emerging Digital Railway deployment strategy for the West Midlands and Chilterns is:

1. To deliver the Integrated Traffic Management and Connected Driver Advisory System in the West Midlands as part of the proposed Midlands Rail Hub, with the resultant benefits of improved performance, disruption management and passenger information

2. To manage and deliver clear and timely information to passengers to facilitate interchange and navigation around Birmingham, which with the arrival of HS2 becomes a four 'hub' city centre

3. To deliver ETCS and the removal of lineside signalling as part of the comprehensive upgrade programme on the Chiltern route in the medium term in line with the emerging Digital Railway deployment strategy

4. To deliver ETCS and the removal of lineside signalling in the West Midlands in the longer term in line with the emerging Digital Railway deployment strategy

West Midlands Strategy

The challenge set out for the West Midlands is to accommodate more passengers wanting to travel and an increasing amount of users looking to send freight by rail. Additionally, there is demand for improved links between key centres and freight terminals across the Midlands.

The rail industry has worked with wider partners including the Midlands Connect partnership, West Midlands Rail (WMR) and Transport for West Midlands (TfWM) to align objectives and maximise the evidence base to support investment in the rail network.

In order to meet the conditional outputs to 2043, including the connectivity requirements set out in the Indicative Train Service Specification (ITSS) there is a requirement to address a number of capacity and connectivity constraints. The strategy is designed to build on the opportunity provided by HS2.

Outputs from the Route Study process have fed in to the West Midlands franchise competition, influencing the specification of the future service. This includes the strategic requirement for longer trains to provide more capacity for passengers travelling in to key cities and towns across the West Midlands. The new franchise will deliver longer trains and additional services to provide an enhanced service for passengers in the West Midlands.

The CrossCountry Direct Award will also provide additional seats into towns and cities across the UK. Beyond this the strategy sets out the case for longer trains across the cross country network.

In addition to longer trains the strategy focuses on capacity in the central Birmingham area and enabling additional journey opportunities between the East Midlands and West Midlands. The proposed Midlands Rail Hub proposal set out in the strategy has been endorsed by Midlands Connect, with £5m of funding secured to develop the Strategic Outline Business Case.

Figure 5.1: Central Birmingham

- Meeting demand in to and through Central Birmingham
- More seats for passengers through longer trains delivered by new franchises
- Providing new and improved links across the Midlands with additional services
- Maximising the opportunities presented by HS2
- Improved evening and weekend services

[14] *Midlands Connect, Economic Impact Study 2015, WMCA and East Midlands Councils, Page 24*

Central Birmingham

The central Birmingham area is outlined in (Figure 5.1). These stations perform a number of different roles: connecting commuters to their jobs and passengers travelling between key cities in the Midlands and across the UK; both on the existing and HS2 networks. The needs of passengers accessing central Birmingham continues to evolve. Commuters accessing jobs continue to travel at peak times, with passengers accessing leisure and retail travelling throughout the day, and increasingly later in the evening and on weekends. The strategy expects that sufficient rolling stock will be available from serving the commuter peak to enable additional evening and weekend trains to run.

To accomodate forecast increased passenger numbers to 2024, longer trains on corridors into central Birmingham has been identified as an option. It is assumed that there is capacity to accommodate longer trains at Birmingham New Street without additional infrastructure, however some platform lengthening will be required on certain corridors. The West Midlands refranchising Invitation to Tender (ITT) has set out the requirement to provide additional vehicles on routes in to Birmingham. The rail industry will work with the successful bidder to introduce these trains in the most effective way to meet the forecast demand set out in this strategy. The ITT also puts forward the requirement to improve evening and sunday services by 2021.

New infrastructure would be required to accommodate further train lentgthening beyond that identified as an option for 2024, as its assumed that the majority of trains between 07:00 and 09:00 will be operating at full length. Therefore the strategy set out has focused on the introduction of additional train services. These meet journey time and frequency conditional outputs, as well as meeting future demand.

Capacity assessments have identified that additional platforms and approach tracks would be needed at Birmingham New Street to deliver the 10 additional services identified in the 2043 ITSS. The agreed rail industry view that additional trains could not be robustly accommodated at Birmingham New Street with the current train service structure. To deliver additional capacity at Birmingham New Street additional land outside of the railway's ownership in the heart of Birmingham would need to be aquired, in an expensive and highly constrained city centre location.

An option was developed to optimise the utilisation of station capacity in central Birmingham, by maximising the use of Birmingham Moor Street and Birmingham Snow Hill stations. This would offer improved interchange with HS2 services at Curzon Street. This approach also enables the use of Birmingham New Street to be reviewed, potentially reducing conflicts on the station approaches and improving performance.

This option would require the delivery of new chords at Bordesley, connecting Moor Street to the railways serving the East Midlands and North East, and Worcestershire and the South West. Additional platforms would be provided at Birmingham Moor Street and Birmingham Snow Hill. This infrastructure would allow increased flexibility, allowing changes to the routeing of existing services, and the introduction of additional services outlined in the 2043 ITSS. When combined with the released capacity offered by HS2, this change in service structure could enable additional services to call at Birmingham New Street.

A stakeholder group identified that interurban services on the Birmingham to Worcester/Hereford via Bromsgrove and Birmingham to Nottingham/Leicester corridors were the best services to reroute into Moor Strreet to deliver the strategy. The routeing approach has informed the development of infrastructure interventions in the central Birmingham area, which are a critical element of the 'Midlands Rail Hub', as outlined in the Choices for Funders section.

This overall approach is also supported by wider regional stakeholders including the Midlands Connect strategy which has identified the entire Midlands Rail Hub proposal as the core component of their rail requirements. In the HS2 Growth Strategy the Greater Birmingham and Solihull LEP propose to use the new chords and expanded Birmingham Moor Street to improve access to Curzon Street Station.

A tunnelled option, avoiding the need to aquire expensive land in a constrained city centre location was identified as a longer term option, providing additional platform and cross Birmingham train capacity. This option would be developed should demand continue to grow beyond the capacity provided by the delivery of the Midlands Rail Hub. Any tunnelled option would be costly and need to demonstrate a value for money case.

Figure 5.2: Birmingham to the East Midlands

- Improved journey opportunities through additional services
- Longer trains to accomodate forecast additional passengers
- Improved access to freight terminals and capacity through the Water Orton area to meet forecast increased freight demand
- Maximise interchange opportunities at Toton

[14] *Midlands Connect, Economic Impact Study 2015, WMCA and East Midlands Councils, Page 24*

Birmingham to the East Midlands

The Birmingham to Nottingham and Leicester corridors form an important transport connection between the East Midlands and West Midlands, as well as to the East and North East. This corridor is also adjacent to the planned HS2 line between Water Orton and Birmingham. This route crosses the boundary between the East Midlands Route Study and the West Midlands and Chilterns Route Study areas.

Current journey times are slow between Birmingham and Nottingham or Leicester when compared with links between other UK towns and cities of a similar size and distance apart.

The Midlands Connect partnership identified this as a key growth corridor and a clear focus in delivering their strategy with Birmingham and Nottingham both leading professional services hubs, and Birmingham to Leicester an important economic link [14].

The corridor is home to a number of important freight terminals, at Lawley Street, Kingsbury oil depot, Castle Bromwich, Birch Coppice and Hams Hall. These terminals deal with a mix of commodities including consumer goods, in intermodal flows, and heavy freight traffic including metal and oil. Meeting growing demand for intermodal traffic forms an important part of the strategy.

To accommodate demand up to 2023, train lengthening options have been investigated on both the Birmingham to Nottingham and Birmingham to Leicester corridors. Both routes are currently served by interurban services that call at destinations beyond this corridor. They have been considered as part of the cross country train lengthening options.

On the Birmingham to Nottingham corridor, at the current time and based on the passenger count data used, a medium value for money case for lengthening services could not be identified for the whole route. The rail industry is continuing to explore options to address this crowding issue, including proposals to reallocate vehicles to form longer trains on the busiest flows nationally.

An alternative option of a new service between Burton-on-Trent and Birmingham to relieve the most crowded section of route has been identified and this forms part of the Midlands Rail Hub.

On the Birmingham to Leicester corridor, analysis undertaken by the East Midlands Route Study has identified two value for money options to meet growth in demand to 2023: train lengthening or an additional hourly train service between Birmingham and Leicester.

Both the additional Leicester and Burton-on-Trent to Birmingham services would require infrastructure interventions in the Water Orton area, central Birmingham area and potentially in the Burton-on-Trent area.

To accommodate demand to 2043, two approaches have been considered; one looking at providing longer trains, and the other at providing additional services. These additional services would deliver more seats and improved journey opportunities, but would require increased capacity to be provided as part of the Midlands Rail Hub.

The strategy has taken into account that some passengers from the East Midlands to Birmingham will switch to HS2 services. However, the Midlands Connect partnership has identified that improved connectivity between the city centres of Nottingham and Birmingham is critically important for growing the Midlands economy. The rail industry is also working with stakeholders to ensure the best possible interchange between HS2 and existing rail services. The aim is to maximise the benefits of HS2 and the improved journey times this offers.

In order to accomodate both passenger and freight growth the strategy identifies the importance of addressing the critical constraint of the junctions in the Water Orton area.

The option developed separates out different passenger and freight services to reduce conflicting movements. For 2026, an option that delivers four tracking throughout the area will give increased flexibility and better enable the separation of flows and improve access arrangements for the Kingsbury oil terminal whcih are currently complicated.

Depending on the level of freight growth and mix of passenger services, which operate at different speeds, a grade separated option has been developed and would be required in the Water Orton area. The development of the 2026 option should not preclude the implementation of the 2043 option.

Journey time conditional outputs have been assessed on the Birmingham to Nottingham and Birmingham to Leicester corridor areas. The rail industry is continuing to work with the Midlands Connect partnership to identify further choices for funders to build on the work outlined in this strategy, and deliver the economic benefiits that have been identified.

Figure 5.3: Birmingham to Worcester/Hereford via Bromsgrove

- Longer trains to meet forecast growth in passenger numbers
- Development of interchange facilities at Kings Norton
- Accomodating future freight growth from the South West
- Upgraded station at University
- Improved Sunday and evening services

Birmingham to Worcester/Hereford via Bromsgrove

The railway between Birmingham, Worcester and Hereford serves a number of markets; it carries freight traffic, commuter services into Birmingham, and long distance passenger services between the South West and the North. The line also features one of the steepest gradients on the main line rail network, between Bromsgrove and Blackwell Summit, known as the 'Lickey Incline'. This presents unique capacity challenges, particularly for freight services. Important growth locations are situated along the route, including the redevelopment of Longbridge, Birmingham University and the Queen Elizabeth II Hospital.

Between Worcester and Hereford there are a number of single track sections, which limit the ability to run further services and constrain the timetable. Recent provision of new signalling in the Hereford area has enabled services from the West Midlands to turn-back at Hereford station without the need to undertake a time-consuming and complicated operating manouvre.

In 2015 infrastructure upgrades in the Redditch area have enabled an increase in train frequency to three trains per hour. By 2019 the extension of the electrified network from Barnt Green to Bromsgrove will enable the extension of three trains per hour that currently terminate at Longbridge. Figure 2.2 shows the current electrification layout on the corridor. The West Mildands franchise ITT specifies an improvement in the Sunday service on this corridor to provide up to six trains per hour on the Cross City services.

The Midlands Connect partnership has identified Birmingham and Worcester to the South West as an intensive growth corridor. The Midlands Connect strategy identified the economic case for improved train services between Birmingham and Hereford, including an additional train per hour in the off peak. This is likely to require additional infrastructure between Worcester and Hereford.

In order to meet demand to 2023, train lengthening has been identified as the most effective way to deliver additional capacity on the route, as longer trains are deliverable without changes to the infrastructure between Birmingham and Worcester. University station has been identified as needing upgrading to meet current and future passenger numbers. The rail industry is working with partners to develop options for a new station building and wider platforms. The Midlands Engine Strategy in March 2017 included a £10m growth deal funding contribution to this scheme.

The corridor is a critical component of the 'Midlands Rail Hub' and the two routes from Kings Norton to central Birmingham were considered as part of the routeing analysis work. Kings Norton could become an important passenger interchange depending on which routeing strategy is selected. If interurban services that currently call at University Station are diverted to Birmingham Moor Street Station, a stop at Kings Norton would enable interchange onto the six trains per hour service operating on the Cross City line through the station. This would require the reinstatement of the currently out of use island platform, and some changes to the track layout.

The strategy has also considered stakeholder aspirations for future local services to operate between Kings Norton and Moor Street, via new stations on the Camp Hill line. A 'turnback' facility would be required at Kings Norton station to enable these local services to operate.

In the Worcester area, a future resignalling scheme could provide the opportunity to improve operational flexibility. The current track layout is inflexible and drives some sub-optimal service patterns at the two Worcester Stations. Resignalling is a once in 30-years opportunity, and enhancements to the otherwise standard renewal would address this inflexibility, improve performance and strengthen the ability to return the service to normal after disruption.

Capacity analysis work identified a number of constraints to the delivery of the 2043 ITSS, including the number of longer distance services operating through the Bromsgrove area. Depending on the levels of freight growth there may be a requirement to seperate passenger and freight flows on this corridor. An option was developed for grade seperation on this corridor. This should be considered alongside the potential for changing freight routeing, potentially via a reopened route between Stourbridge and Walsall. Any future development should take forward the best value for money option.

Figure 5.4: Birmingham to Rugby via Coventry and Birmingham to Stafford/Shrewsbury via Wolverhampton

- Longer trains to meet forecast growth in passenger numbers
- Improved access to Birmingham Airport
- Maximise benefits of HS2 and released capacity
- Improved journey opportunities between Coventry and Leicester
- Improved train service frequency between Wolverhampton and Shrewsbury
- Meeting forecast freight growth
- Improved connections to North Staffordshire from Birmingham and Wolverhampton

Birmingham to Rugby via Coventry and Birmingham to Stafford/ Shrewsbury via Wolverhampton

This corridor runs between Rugby and Stafford, via Coventry, Birmingham International, Birmingham New Street and Wolverhampton. A mixture of freight, long distance, regional and local passenger services operate on the corridor.

There are also important North-South freight flows, which cross this section of the route at Coventry, often taking intermodal freight trains from Southampton to the WCML. The line also provides commuting opportunities between Leamington Spa, Coventry and Nuneaton. There is a proposed new intermodal freight terminal in the Four Ashes area, between Wolverhampton and Stafford.

The arrival of HS2 will have a major impact on this corridor as long distance passengers will have the opportunity to transfer onto HS2 services, releasing capacity on the West Coast Main Line. This is likely to result in a review of the timetable across the corridor.

The West Midlands franchise ITT has specified that the current service that operates through the Trent Valley on the West Coast, should no longer operate via Stoke-on-Trent and run directly to Crewe. This will be replaced by extending a current Wolverhampton terminating service to Crewe via Stoke-on-Trent. This will improve connections between Birmingham and Wolverhampton and North Staffordshire.

Rugby to Birmingham: The current timetable provides the best use of the available capacity with the current service structure. To meet forecast demand up to 2023, analysis has identified a value for money option for train lengthening on this corridor.

The development of HS2 will provide an opportunity for a review of the timetable post 2026. Existing timetable work has been identified and examined for this corridor in a range of recent studies. This has highlighted two potential 'best use' options, with a trade-off in terms of performance and journey times.

To meet the full 2043 ITSS, analysis indicates that there will need to be additional infrastructure or further trade-offs in terms of number of services, journey times and service structure. The optimum location on the corridor for increasing the infrastructure's capacityto support additional trains is between Birmingham International and Stechford. An option to deliver this capacity is presented as a longer term choice for funders.

Birmingham Airport is currently developing a new masterplan and surface access strategy which will set out the airport growth plans for the future, and the infrastructure required to support this. The current Airport Surface Access Strategy sets a target for 23% of passengers to access the airport by rail; although a small increase from the current 20%, this comes against the backdrop of a growing number of passengers using the airport. The strategy supports the development of this important international gateway, and improving the opportunities to serve the airport form a key consideration of the future of the Birmingham to Rugby corridor.

The strategy acknowledges and supports aspirations for improved access to the airport. The rail industry will continue to work with the airport to help develop opportunities for earlier and later services to Birmingham International to match the peak passenger demand at the airport, subject to a value for money whole-industry business case being made. The strategy also acknowledges the importance of improved connectivity to the East Midlands. The ability to improve access to the airport form an important component of the choices for funders identified on the Coventry corridor.

Leamington Spa to Coventry: The strategy for the route is to facilitate long term aspirations to route an existing long distance cross-country service from the South Coast to the North via Coventry, rather than its current routeing via Solihull. This would improve connectivity for Coventry, between Birmingham Airport and the North East, and with the new HS2 station at Birmingham Interchange after 2026. Rerouteing this service would also require the proposed train service changes to the Rugby -Birmingham (via Coventry) route following the arrival of HS2, which will enable the service to operate between Coventry and Birmingham.

The single line sections between Leamington Spa and Coventry have been identified as a key constraint to rerouteing the second cross-country service and delivering the full ITSS. The Leamington Spa to Coventry Capacity scheme, which has been developed to GRIP 2, has identified that redoubling the route between Kenilworth and Leamington Spa facilitates an additional train path per hour, enabling up to four trains per hour to use the route. This scheme is

presented as a choice for funders.

To achieve the full 2043 ITSS of six trains per hour, analysis has identified that further track doubling will be required between Kenilworth and Coventry. This would require planning consents, as this section of route was built as a single line. There would also need to be works to address constraints in the Coventry and Leamington Spa station areas.

Coventry to Leicester: The route between Coventry and Nuneaton has been enhanced as part of the NUCKLE[15] phase 1 scheme. This has provided additional stations at Coventry Arena and Bermuda Park. The next element of the scheme will see the delivery of a new bay platform at Coventry and a new freight looping facility on the route.

Midlands Connect analysis has highlighted the economic importance of the link between Coventry and Leicester, which currently suffers from uncompetitive journey times.

The 2043 ITSS shows a direct service between Coventry and Leicester and the North East, which is also a strong aspiration of the Midlands Connect partnership in medium term. This cannot be accommodated on the current infrastructure and it would require a grade separated crossing of the WCML at Nuneaton for this direct service to operate.

Birmingham to Stafford: To meet forecast demand to 2023, a value for money case for train lengthening on this corridor has been identified. This will require some platform lengthening on the route.

Following completion of HS2 Phase 2A to Crewe or Phase 2B to Manchester, there may be an option to change the structure of services on this corridor. There are potential opportunities for services from Birmingham to Manchester and/or Liverpool being served by HS2. These service options would impact on intermediate stations which would still need to be served by the classic network. This could be achieved by restructuring classic services, which may reduce the longer term requirement for additional infrastructure.

In order to meet the service specification for 2043 it was found that there would need to be a reduction in headways to allow trains to run closer together, or the provision of additional infrastructure. Additional infrastructure is likely to be expensive to provide as the route contains significant elevated sections on viaducts, and is constrained between Birmingham and Wolverhampton by the Birmingham and Midland canal. The roll-out of ETCS as part of the Digital Railway programme may provide an opportunity to reduce headways and reduce the amount of infrastructure required.

Wolverhampton to Shrewsbury: The train service between Wolverhampton and Telford/Shrewsbury has an uneven service frequency at intermediate stations due to the different calling patterns of the two trains per hour on the route during the off-peak period. The ITT for the West Midlands franchise specifies a second off-peak service from 2018, which will improve the service frequency and improve passenger journeys.

To meet forecast demand to 2023 a value for money case for train lengthening on this corridor has been identified, which will require some platform lengthening on the route.

The 2043 ITSS shows an additional long distance service, increasing the train service to 4tph. Analysis has shown that this can be accommodated, assuming that constraints on the Wolverhampton corridor are resolved.

[15] NUCKLE – third party promoted scheme to increase capacity between Nuneaton, Coventry, Kenilworth, and Leamington Spa which will provide greater local and wider connectivity, and economic regeneration to those areas.

Figure 5.5: Birmingham to Rugeley Trent Valley via Walsall and Birmingham to Lichfield Trent Valley (Cross City North)

- Longer trains to meet forecast growth in passenger numbers
- Improved off-peak frequency between Walsall and Rugeley
- Improved Sunday and evening services
- Meeting forecast freight growth

Birmingham to Rugeley Trent Valley via Walsall and Birmingham to Lichfield Trent Valley (Cross City North)

The Lichfield to Birmingham corridor serves commuters into Birmingham as well as providing cross-Birmingham journey opportunities through to University, Longbridge, Redditch and Bromsgrove.

The route between Lichfield Trent Valley and Wichnor Junction provides diversionary opportunities and access to the depot at Central Rivers. This section is due to be resignalled between 2019 and 2024.

The corridor between Birmingham, Walsall and Rugeley serves a range of markets, but is largely focused on commuters to Birmingham. This route is important for freight, with heavy freight services to Bescot Freight Terminal (which also provides a hub for Network Rail engineering trains). A new railway sleeper factory will also be constructed in the Bescot area, which will provide up to two thirds of the sleepers required nationally. Rugeley Power Station was an important destination on the route, but closed in June 2016. There are proposals, which recently secured planning permission, to provide a rail connection to an existing road served freight facility in the Cannock area.

The electrification of the route between Walsall and Rugeley underpins the strategy for the Walsall lines. This scheme, along with targeted linespeed improvements will allow an all-day two trains per hour service to operate between Walsall and Rugeley improving capacity and overall journey times from stations on the route to Birmingham. This improved off-peak service has been specified in the ITT for the West Midlands franchise from Dec 2018. Additional evening and weekend services, including up to six trains per hour have also been specified in the ITT.

A value for money case for train lengthening to meet forecast demand on the route between Birmingham and Lichfield has been identified. This can be delivered on the existing infrastructure, which has platforms long enough to accommodate six-car trains.

Analysis has identified that in order to accommodate the additional passenger and freight services identified in the 2043 ITSS it will be necessary to improve planning headways between Walsall and central Birmingham. This could be delivered through the Digital Railway programme to implement ETCS which could reduce the need for additional infrastructure.

Another constraint identified is at Lichfield Trent Valley, where there is currently only one high level platform for Cross City trains to use. Any increase in the number of trains running to Lichfield Trent Valley or beyond will require a second, accessible high level platform to be introduced.

Figure 5.6: Snow Hill lines

- Longer trains to meet forecast growth in passenger numbers
- Upgraded stations at Birmingham Moor Street and Snow Hill
- Improved evening and Sunday services
- Improved journey times from Kidderminster and Stourbridge

Snow Hill lines

The Snow Hill lines provide important commuter links into Birmingham city centre from Worcestershire, the Black Country, Solihull and Warwickshire. The corridor also supports a number of freight flows with metal flows focused on the steel terminal at Round Oak, and scrap metal sidings at Handsworth.

Kidderminster, Stourbridge and Worcester via Kidderminster have been identified as currently having relatively slow journey times into central Birmingham.

The Snow Hill lines are an integral part of the central Birmingham analysis, which has identified the opportunity to make better use of Birmingham Moor Street and Birmingham Snow Hill stations. At Birmingham Snow Hill the Midland Metro city centre extension has released Platform 4 for potential future heavy rail use.

To meet forecast demand to 2023 the strategy on this corridor is to consider train lengthening, as the majority of stations on the route can accommodate six-car trains. Analysis has identified that interventions at Snow Hill Station to support passenger capacity should be considered and is included as a choice for funders. The rail industry are working with Birmingham City Council and other stakeholders to align this with wider regeneration proposals in the Snow Hill district of Birmingham. The West Midlands ITT specifies improved evening and Sunday services, with up to six trains an hour on Sundays from 2021.

The Midlands Rail Hub includes the reinstatement of Platform 4 at Snow Hill Station as well as changes to the signalling system in the station area to accommodate future service levels in central Birmingham and improve the operational flexibility of the station. This scheme is an important element of the package as the additional platform capacity at Snow Hill would enable all London services via the Chiltern Route to serve the business district around Snow Hill Station, rather than having some services terminate at Moor Street. This is considered an important enabling scheme, to provide alternative platform capacity in central Birmingham to allow for construction access for the elements of the package proposed at Moor Street.

The strategy identified for the Leamington Spa to Coventry route could also release capacity for additional services and improved journey times on the section of route between Birmingham Moor St and Leamington Spa.

To improve journey times, particularly between Worcester, Kidderminster and Stourbridge, the concept of restructuring the service, to an 'inner' and 'outer suburban' network, has been considered. This option has been promoted by the West Midlands Combined Authority (WMCA) as part of the HS2 Growth Strategy Connectivity programme as it could increase overall service frequency and capacity to HS2 Curzon Street via Moor Street Station. This approach would require additional infrastructure at Rowley Regis to enable trains to turn back without blocking the main lines and at Birmingham Snow Hill (identified as part of the Midlands Rail Hub). The industry will continue to work collaboratively with wider stakeholders to investigate this opportunity.

Analysis has shown that the Leamington Spa area will become increasingly constrained and interventions would be required in order to meet the 2043 ITSS. A number of concepts have been assessed, focussing on improving the operational flexibility and allowing timetabled access to Platform 1.

West Midlands choices for funders

The choices presented by the strategy can be broken down into three key themes:

- Meeting forecast demand to 2024
- opportunities to maximise the benefits of HS2 in 2026
- the longer term view to 2043

The first theme concentrates on accommodating the forecast demand outlined in Chapter 3, both on trains and at stations. The second theme ties into the opportunity presented by the arrival of HS2 at both Curzon Street and Birmingham Interchange. The final theme focuses on the longer term view, and the level of interventions that would be required in order to accommodate the full 2043 ITSS.

Meeting passenger demand on trains

Based on the demand analysis outlined in Chapter 3, strategic options have been developed to understand the business case to accommodate forecast passenger growth to 2023. Where infrastructure interventions are required to support longer trains - for example longer platforms - this has been factored into the business case. Where a high value for money case has not been identified, sub-options have been analysed looking at reduced numbers of vehicles or reduced amounts of infrastructure. Where train lengthening cases have lower value for money ratings, alternative approaches to providing additional capacity have been considered, such as running additional services. Cross boundary long distance flows have been assessed consistently across Route Studies.

In developing the train lengthening options, it is assumed that each intervention is in the early development stages and the DfT's appraisal guidance on risk and contingency for early GRIP projects have been applied. A theoretical approach assuming that trains can be lengthened on a vehicle by vehicle basis has been taken to identify corridors and services where train lengthening has a value for money business case. However, operationally the number of vehicles is determined by the rolling stock type as trains operate in fixed formations of different lengths. Actual operational plans will be developed with train operators and through the refranchising processes.

Sensitivity tests on operating costs have been undertaken to assess the impact of the value for money of lengthening services if the operating costs remain similar to today. The sensitivity test reflects the scenario where the cost of leasing extra vehicles, mileage related costs, and unit costs such as fuel remain similar to the costs incurred to the current train operators. Assessments show that the value for money categorisation is very sensitive to the operating cost assumption. It is anticipated that train operators would work closely with the DfT and funders during the refranchising process to understand and identify the operational requirement and costs of lengthening services to accommodate demand.

Birmingham commuting

A number of corridors into central Birmingham have been identified as requiring additional capacity to meet forecast demand. Options are set out in Figure 5.7. It should be noted that the Anticipated Final Cost (AFC) of any scheme has been set out as an estimate range, reflecting the early stage of strategic development.

The Walsall to Rugeley electrification scheme will deliver additional capacity on the Walsall corridor and the Worcester/ Hereford to Birmingham routes, and this is assumed in the baseline position for the train lengthening assessments.

Additional rolling stock will require further depot and stabling capacity in the West Midlands, which is a recognised constraint. The strategy endorses the opportunity to develop a new consolidated depot and stabling site in the Birmingham area at Duddeston. This would enable the delivery of additional vehicles in the West Midlands and improved operational efficiency.

The analysis shows that the train lengthening cases are sensitive to the level of operational cost - the value for money ratings assume that similar costs to the current operational costs can be achieved in the future. This analysis has fed into the refranchising process, with the new West Midlands franchise due to start in October 2017. The ITT sets out the requirement for an additional 137 vehicles by 2022, across the West Midlands and West Coast services. When the operator of the franchise is in place the rail industry will work together so that these additional trains are deployed to best meet future forecast demand.

The options were assessed with no infrastructure costs in the first instance (these are designated as option A) which assumed that lengthened services could be operated on existing infrastructure or with an operational solution (e.g. selective door opening). Further options are analysed as a sensitivity test based on different vehicle numbers and may include infrastructure changes.

Strategic options were developed for platform lengthening on the Birmingham to Stafford, and Wolverhampton to Shrewsbury corridor.

Figure 5.7: Central Birmingham commuting train lengthening options

Service Group	Capacity required to meet growth to 2023 - passengers (vehicles)	Option number	Option infrastructure AFC	Number of vehicles tested for business case	Value for money rating	Sensitivity test: Value for money (assuming 2015 operating costs)
Birmingham New Street: Rugby via Coventry and Stafford/Shrewsbury via Wolverhampton	1100 (10)	S1A	None	10	Low	High
		S1B	£15m - £35m	8	Poor	Low
		S1C	£5m - £15m	6	Low	Medium
Birmingham New Street: Cross City	1100 (10)	S2A	None	10	Low	High
		S2B	None	6	Medium	High
Birmingham New Street: Hereford and Great Malvern	No additional capacity required to 2024*					
Birmingham New Street: Walsall and Rugeley	No additional capacity required to 2024*					
Birmingham Snow Hill: Snow Hill Lines	1500 (13)	S3A	None	13	Medium	High
		S3B	None	8	High	Very high

**Assumes that additional capacity will be secured by 2019 via the electrification of the Walsall-Cannock Line and subsequent release of diesel vehicles*

Option table 1: Platform lengthening on the Stafford/Shrewsbury corridor via Wolverhampton (S1B)	
Assessment of option S1B	Platform lengthening on the Stafford/ Shrewsbury corridor via Wolverhampton
Summary of intervention	Platform extensions to six-car at: Albrighton, Bilbrook and Codsall Platform lengthening to five-car at: Penkridge, Wolverhampton and Dudley Port
Output assessment	Provides platform lengths which would support train lengthening (8 additional vehicles)
Indicative cost	£15m-35m
Prioritisation assessment	Should be considered for delivery by 2024 to meet forecast demand
Value for money assessment	Low value for money

Option table 2: Platform lengthening on the Stafford/Shrewsbury corridor via Wolverhampton (S1C)	
Assessment of option S1C	Platform lengthening on the Stafford/ Shrewsbury corridor via Wolverhampton
Summary of intervention	Platform lengthening to five-car at: Penkridge, Bilbrook and Codsall
Output assessment	Provides platform lengths which would support train lengthening (6 additional vehicles)
Indicative cost	£5m-15m
Prioritisation assessment	Should be considered for delivery by 2024 to meet forecast demand
Value for money assessment	Low value for money. Sensitivity test: medium value for money assuming 2015 operating costs.

In addition to train lengthening on the Snow Hill lines, the strategic option of segregating passenger flows by providing an inner and outer suburban service structure from Worcester and the Black Country has been considered. Rowley Regis has been identified as the optimum location to provide the ability to start a new inner suburban service. As the station currently only has two main line platforms, this will require additional infrastructure to enable trains to turn back at the station, as outlined in option table 3.

Option table 3: Rowley Regis turnback	
Assessment of option	Rowley Regis Turnback
Summary of intervention	Turnback platform at Rowley Regis Station
Output assessment	This could enable a changed service structure on the route into Birmingham Snow Hill, and could potentially deliver journey time improvements to services starting from Worcester and Kidderminster. This option would also require infrastructure changes at Snow Hill Station (Platform 4) in order to provide sufficient platform capacity (see option table 6). This option is also included as part of the GBS LEP HS2 Growth Strategy.
Indicative cost	£15m-£35m
Prioritisation assessment	Option should be considered to accommodate forecast demand into central Birmingham, subject to further development.
Value for money assessment	Poor value for money at GRIP 0. Assuming operational cost efficiencies can be achieved this option could present medium value for money

Cross boundary long distance train lengthening

The train lengthening assessment for these services has been carried out across the Route Study portfolio, and takes into account the transfer of passengers on to HS2 services as projected by HS2 Ltd. The analysis is based on the assumption that trains can be lengthened incrementally, vehicle by vehicle and that no infrastructure is required to accommodate the longer trains.

The analysis shows that there is a value for money case to lengthen trains across the majority of corridors, with the exception of the Cardiff- Birmingham- Nottingham service (due to high operating costs - see Figure 5.8). As an alternative to train lengthening on the Cardiff- Birmingham- Nottingham service, a new Burton-on-Trent to Central Birmingham service forms an element of the Midlands Rail Connectivity and Capacity package, (see Appendix Option - S13).

An extension to the CrossCountry contract, to 2019, was announced in 2016 and will see a limited number of additional vehicles introduced, focused on the Plymouth - Edinburgh/ Glasgow route. This will not materially change the case identified in the analysis for the requirement for train lengthening across the network. The rail industry are working on ways to ensure that the existing rolling stock is best focused on the busiest sections of the network. This could help to relieve some overcrowding, but is not a long term solution to meet forecast future passenger growth.

Based on the strategic options, by 2024, there is less opportunity to lengthen trains, as many will be operating at maximum length in the peak periods. For the long distance services, the capacity provided by HS2 and associated released capacity on the West Coast and cross-country networks will enable growth to be met. Beyond 2024 there will be a need to operate additional train services into central Birmingham to meet forecast demand for commuters and passengers not directly served by HS2.

Figure 5.8: Long distance and interurban train lengthening summary

Service Group	Capacity required to meet growth to 2023 - passengers (vehicles)	Option number	Number of vehicles	Value for money rating
Cross-country: Plymouth -Edinburgh/ Glasgow	828 (18)	S7A	18	Low/Medium
		S7B	8	Very high
Cross-country: Southampton/ Reading – Newcastle	690 (15)	S8A	15	Poor
		S8B	4	Medium
Cross-country: Bournemouth – Manchester	782 (17)	S9A	17	Low
		S9B	12	Very high
Cross-country: Bristol – Manchester	828 (18)	S10A	18	Low
		S10B	11	High
Cross-country: Birmingham New Street – Leicester – Stansted Airport	640 (10)	S11A	10	Low
		S11B	3	Very high
Cross-country: Cardiff – Birmingham New Street – Nottingham	896 (14)	S12	14	Poor

Option table 4: West Midlands station capacity enhancements			
Assessment of option	West Midlands station capacity enhancements		
	Birmingham Moor Street	Birmingham Snow Hill	University
Summary of intervention	• Widening of Platform 1 • extension of weatherproof shelter • gateline extension • additional emergency exits.	• Additional stairs, escalators or lifts • decluttering of platforms • wider gate lines.	• New station building • new footbridge • gate line extension • widening of Platform 2 • extension of weatherproof shelter.
Output assessment	Increased capacity to enable forecast growth in passenger numbers to be accommodated without increased safety risk. Passenger walk times will be kept to a minimum level and overcrowding will be effectively managed.		
Indicative cost	Up to £5m	£5m - £15m	£5m-£15m
Prioritisation assessment	Should be considered for delivery by 2024 to meet forecast demand.		
Value for money assessment	Financially positive	Very high vlaue for money	Being developed as part of masterplan

**Further industry options are being assessed*

An important element of the route study is to consider the impact of passnger growth at stations as well as on trains. Choices for funders have been identified for three priority stations in the West Midlands .

At Birmingham Moor Street analysis has shown passenger congestion in both the morning and evening peaks. This is projected to be exacerbated as footfall is forecast to increase from 6.5 million to 8.9 million by 2023 and to over 12 million passengers by 2043. By implementing the proposed interventions it is anticipated that there will be reduced queuing at the platform edge and decongestion at the main gate lines, with improved passenger safety and reduced passenger walk times. If further additional services are introduced post 2026 as part of the Midlands Rail Hub, this will put further pressure on the platforms, stairs and at gate lines at the station and further options may need to be developed. The opening of HS2 in 2026 will provide opportunities for good interchange between high-speed and existing services; options to make this as seamless as possible will need to be developed as part of the Curzon Station design process.

At Birmingham Snow Hill the main issues identified are congestion on the platforms, stairs and escalators, particularly in the morning peak. The platforms have large pillars and buildings containing toilets and waiting rooms, this leads to some areas of the platform being narrow, and increasing the safety risk of passnger and train interface. This causes safety concerns with passengers potentially being backed up onto escalators, this is currently managed by opening the gate line to allow safe exit. The option to re-instate Platform 4 will increase the opportunity for two or more trains to arrive at the same time, potentially resulting in increased congestion at an already constrained gate line. A GRIP 2 study has been completed, which has developed options to improve passenger capacity, and safety at the station. These options have fed into the wider regeneration scheme currently being led by Birmingham City Council. Network Rail are working with stakeholders to produce a GRIP 3 option for the station redevelopment as part of the broader master-planning of the Snow Hill area.

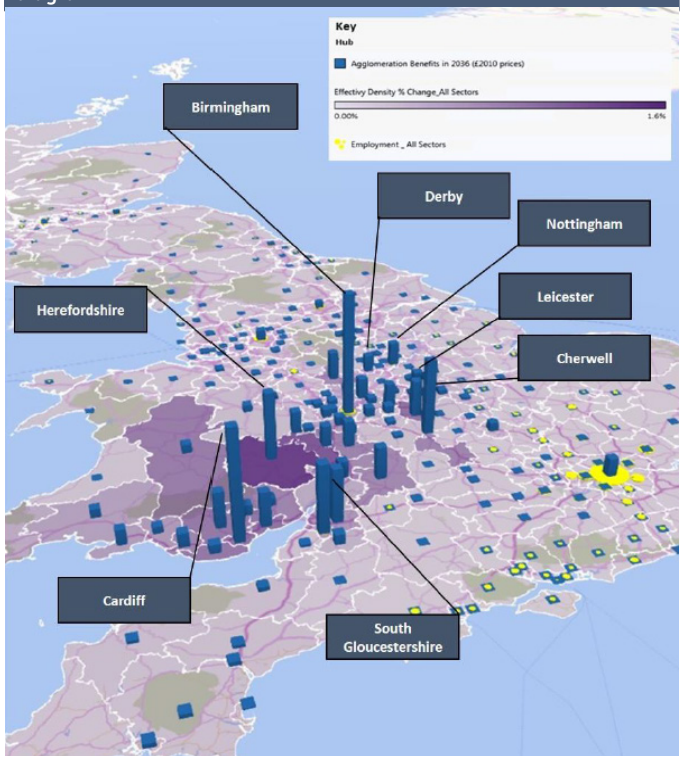
At University, one of the smaller but busier stations in the Route Study area, passenger crowding in both the morning and evening peaks has been identified. The station is constrained in a number of ways. Platform 2 is not wide enough to provide sufficient circulation space at peak times, increasing passenger/train safety risk. The footbridge and stairs are narrow for the number of station users, which causes congestion at busy times. The station concourse is also small, and when in operation the narrow gateline impedes flow, with longer walk times and passengers queuing on stairs, increasing the risk of slips, trips and falls. Options to improve layouts and facilities have been considered to improve passenger flows and passenger safety. Birmingham City Council is leading a master-planning exercise for the area surrounding the station. A GRIP 2 study has been commissioned to develop options for a new station building on an adjacent car park, this will inlude wider platforms and a new footbridge. The Midlands Engine Strategy included a funding allocation of up to £10m for the redevelopment of the station.

Opportunities to maximise the benefits of HS2 in 2026

Midlands Rail Hub

This package brings together interventions which would enable up to 10 additional trains per hour to run into central Birmingham, offering improved journey opportunities and strengthening access to HS2. This has been identified as a package of works that needs to be delivered as a whole in order to deliver the full benefits of the package. Midlands Connect have endorsed the Midlands Rail Hub as a key element of their strategy and have undertaken further business case work. This shows wider economic benefits in excess of £2 billion over 30 years for the UK economy, the distribution of which is show in Figure 5.9.

Figure 5.9: Midlands Connect Midlands Raii Hub economic benefit diagram



Outputs

Increased capacity: The provision of additional platforms at Birmingham Moor Street, the reinstatement of Platform 4 at Birmingham Snow Hill and additional route capacity in the central Birmingham area to enable the delivery of up to 10 additional services. Interventions in the Water Orton area will provide the capability for additional freight services in the area.

Connecting to HS2: The proximity of Birmingham Moor Street Station to the proposed Curzon Street HS2 station will allow good connectivity, and access the regeneration area surrounding the station. The environment, facilities and passenger information provided to support interchange between the Central Birmingham stations will be critical to the passenger experience.

East Midlands – West Midlands Connectivity: The package offers the capacity to run additional trains between the East and West Midlands which would improve generalised journey times and increase opportunities to travel.

Improved performance: Birmingham New Street is critical to the UK rail network in terms of performance, with the ability for delays to have an impact on several regional and long distance routes.

Reducing the number of conflicting moves in the Water Orton area, providing increased capacity and improving access arrangements to the oil terminal at Kingsbury, is forecast to deliver performance benefits on the route. Additional tracks in the Water Orton area will reduce the impact of planned and unplanned disruption.

Resilience: The development of a long distance hub at Birmingham Moor Street Station will improve the resilience of the network. If there is planned or unplanned disruption at Birmingham New Street Station, Birmingham Moor Street Station can continue to operate.

Safety: The changed routeings in the Water Orton area would reduce the number of 'crossing movements', where trains on one line cross over another line, at Water Orton junctions to further improve system safety.

Digital Railway: There is the opportunity to deliver the Integrated Traffic Management and Connected Driver Advisory System, and the resultant benefits of improved performance, disruption management and passenger information, as part of the Midlands Rail Hub.

The economic case

This package of work has been assessed as a whole in order to capture the interrelated benefits, including the opportunity to deliver additional services into Birmingham. The following benefits streams have been considered as part of the core rail industry business case:

- one train per hour additional Birmingham to Leicester service
- one train per hour additional Birmingham to Burton-on-Trent service
- improved performance at Birmingham New Street
- additional freight services
- improved journey times through Water Orton area

Midlands Connect

The rail industry has worked closely with the partnership who have undertaken additional business case work including;

- a package of 10 additional trains services with the biggest economic impact on the Midlands were assessed to inform the wider economic benefits. These include improving the following service frequencies;
  - between Birmingham and Leicester
  - between Birmingham and Nottingham
  - between Birmingham and Bristol/Cardiff
  - between Birmingham and Hereford
  - between Birmingham and Kings Norton
  - between Birmingham and Burton-on-Trent/Derby
- demonstrating the wider economic benefits of the scheme

The wider economic benefits have been included in Option Table 6.

Interventions

The package includes interventions within central Birmingham (Bordesley to Birmingham Moor Street, and Birmingham Snow Hill Station area), along with interventions at Water Orton and Kings Norton, as outlined in the assessment of option table 6 below and Figures 5.10-5.12.

Option table 6: Midlands Rail Hub				
Assessment of option	West Midlands station capacity enhancements			
	Bordesley to Birmingham Moor Street	Snow Hill Station area	Birmingham to Nottingham/Leicester corridor	Birmingham to Worcester/Hereford via Bromsgrove corridor
Summary of intervention	• New chord lines in the Bordesley area • additional tracks and remodelling between Bordesley and Birmingham Moor Street • two new bay platforms at Birmingham Moor Street • closure of Bordesley Station (or option to relocate).	• Reinstatement of Platform 4 • signalling enhancements • extension of stabling sidings.	• Four track layout between Water Orton East Junction and Castle Bromwich Junction • reconfiguration of the track layout and enhanced switches and crossings on the main lines • reconstruction of platforms at Water Orton Station • upgraded signalling between Wichnor Junction and Kingsbury Junction.	• Reinstatement of Platforms 2 and 3 at Kings Norton • electrification infill • track remodelling at Kings Norton • new station facilities at Kings Norton.
Output assessment	• Additional station capacity in Central Birmingham • up to 10 additional trains per hour into central Birmingham • rerouteing opportunities for existing services • improved interchange with HS2 services at Curzon Street • performance improvements and increased resilience • opportunity to optimise flows through Birmingham New Street • opportunities for new local services and stations in south Birmingham.	• Additional station capacity in Central Birmingham • extension of London terminating services from Birmingham Moor Street to Birmingham Snow Hill • unlocks platform capacity at Birmingham Moor Street • improved operational flexibility • stabling facilities for up to16 vehicles.	• Enables additional passenger services between the East Midlands and Birmingham • capacity for freight growth • improved operational flexibility through separation of traffic flows • improved access to terminals at Kingsbury junction • improved performance • journey time improvements through the Water Orton area.	• Facilitates additional trains services and changed routeings into central Birmingham • increased capacity in the Kings Norton area • cross platform interchange to maintain connections to University and Selly Oak stations • improved station facilities • improved performance.
Indicative cost	£175-375m	£35-75m	£100-250m	£10-20m
Prioritisation assessment	Taking account of the opening of Curzon Street Station in 2026 and demand forecasts, this package of works should be considered for delivery in the medium term.			
Value for money assessment	Medium value for money. Wider economic benefits are being assessed by Midlands Connect partnership. It is anticipated that these will further strengthen the business case.			
Midlands Connect including Wider Economic Benefits	Very high value for money - up to £2bn in Wider Economic Benefits over 30 years			

Figure 5.10: Interventions between Bordesley and Birmingham Moor Street

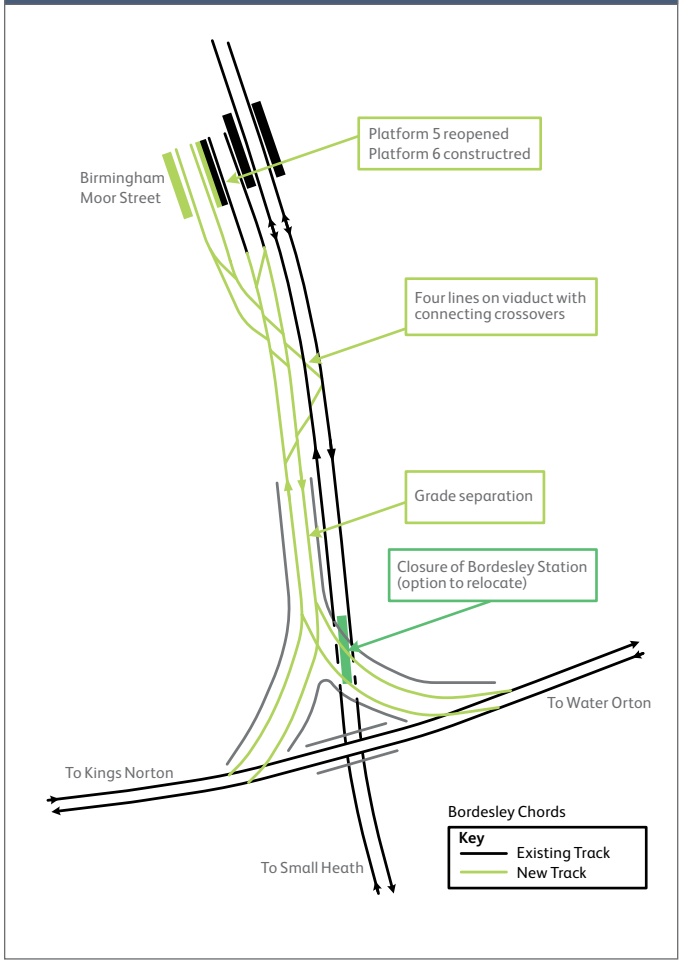


Figure 5.11: Interventions in the Water Orton area (medium term)

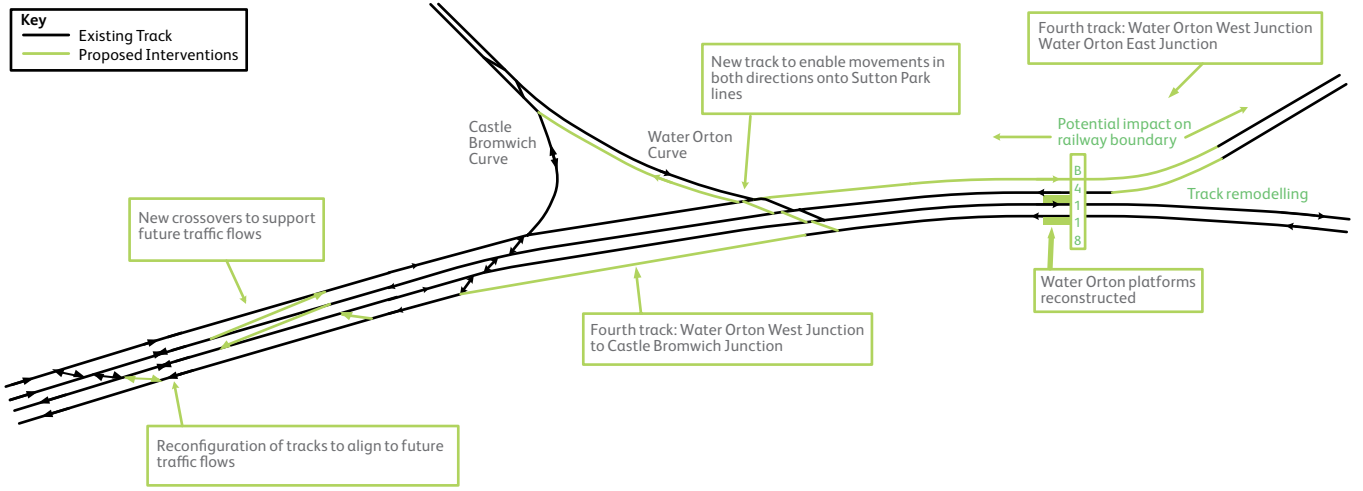


Figure 5.12: Interventions in the Kings Norton area (medium term)

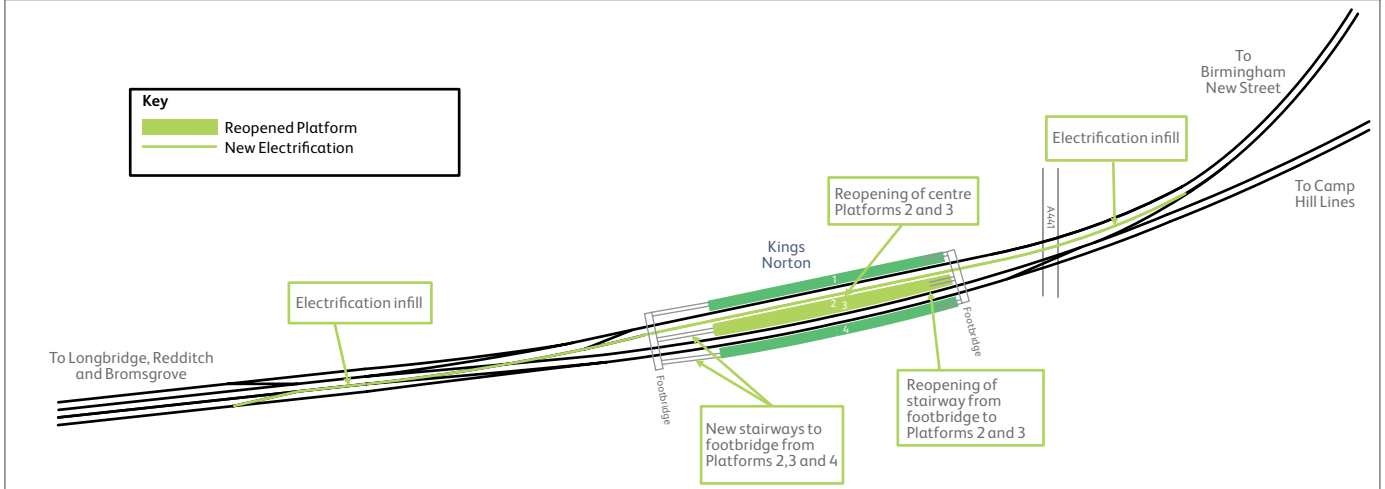
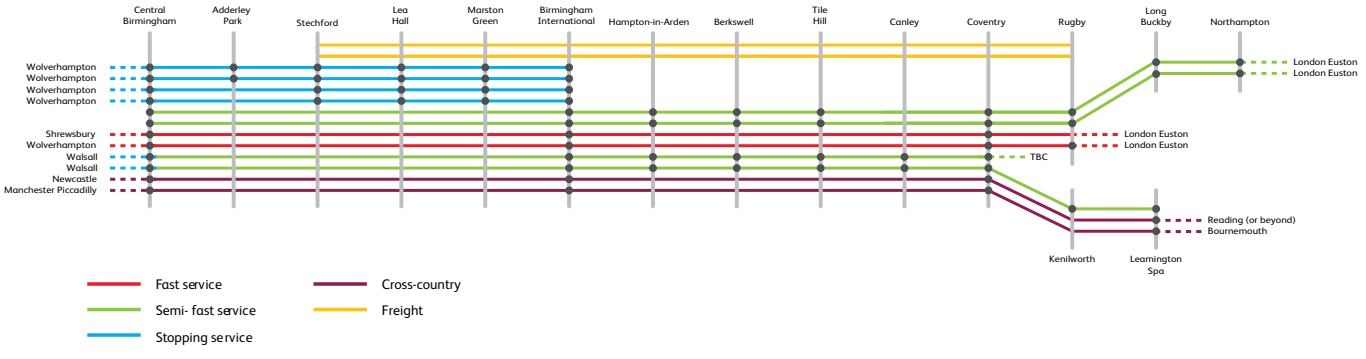


Figure 5.13: Potential post HS2 service structure on Coventry corridor



Coventry Corridor choices

HS2 Released capacity

Options for 2026 and for 2043 have been considered. In order to align with HS2 in 2026 there is an opportunity to make better use of the existing infrastructure through the use of the released capacity from the arrival of HS2. By changing the service structure to 15 and 30 minute intervals, it is possible to maximise the use of the corridor, and better serve intermediate stations on the corridor.

Existing analysis has identified two train service options that maximise the released capacity. The first option shown in Figure 5.7 consists of:

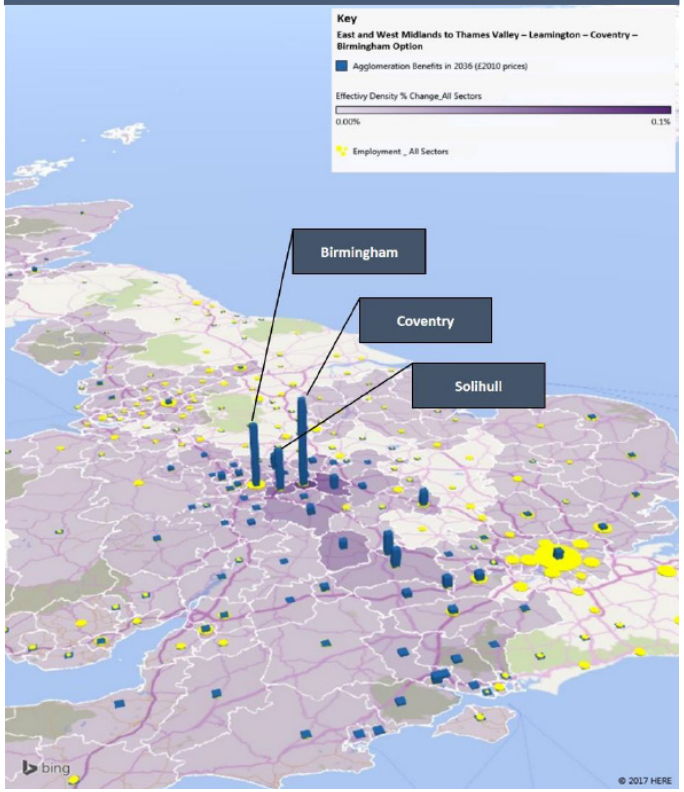
- two fast London services
- two long distance cross-country services
- two semi-fast London services via Northampton
- two semi-fast services to Coventry and beyond
- four local services (to Birmingham International)
- two freight services.

This option would result in an increase in a small increase in journey time of four minutes between Birmingham and Coventry on the fastest journey times on the long distance London services, but would accommodate an increase of three trains per hour from the 2019 baseline position.

In order to accommodate this level of service without an impact on journey time would require infrastructure interventions; these are presented as a 2043 choice for funders in option table 8.

The second option, which retains the existing journey time, is to reduce the quantum of local services to two, but this does not provide as much capacity and would result in an increase of one train per hour from the 2019 base. Further work will be undertaken, as part of the overall planning process to understand the best way to maximise released capacity following the introduction of HS2. This work will inform the West Coast Partnership (WCP), the franchise competition to operate InterCity West Coast services from April 2019. The WCP will also be tasked with planning for the introduction of HS2 services from 2026.

Figure 5.14: Midlands Connect Leamington Spa to Coventry economic benefit diagram



Leamington Spa to Coventry

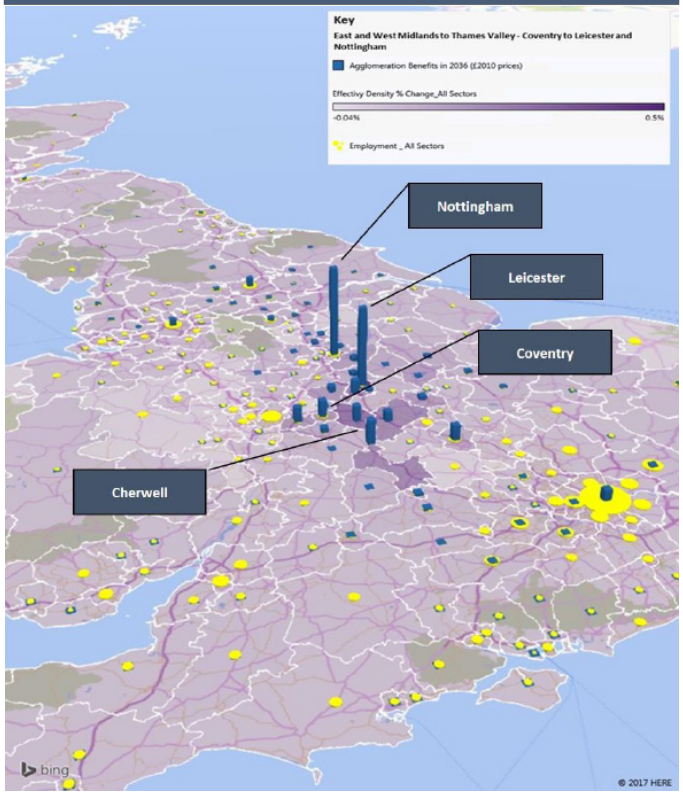
The routeing of an additional cross-country service via Coventry and Birmingham International, and away from its current routeing via Solihull is an important element in maximising the use of released capacity on the Coventry corridor following HS2. To support this change Additional infrastructure is required between Milverton Junction and Kenilworth, as outlined in option table 7.

Midlands Connect supports this option in their strategy and see strong benefits in improving links between the Thames Valley, Coventry, Birmingham Airport and the East Midlands. The analysis of wider economic benefits is shown in Figure 5.14 and reflected in option table 7.

This option would also allow changes to the timetable structure on the Birmingham to Leamington Spa via Solihull corridor, which could enable journey time savings and/or additional train services to be operated.

Option table 7: Leamington Spa to Coventry capacity enhancements	
Assessment of option	Leamington Spa to Coventry capacity enhancements
Summary of intervention	• Track redoubling between Milverton Junction and Kenilworth North Junction • track lowering to be incorporated to make provision for potential future electrification of the route.
Output assessment	Increased capacity between Coventry and Leamington Spa to support additional passenger services and improve connectivity.
Indicative cost	£100m to £250m
Prioritisation assessment	Would be needed to facilitate the released capacity options following the introduction of HS2 in 2026
Value for money assessment	TBC
Midlands Connect including Wider Economic Benefits	Medium value for money

Figure 5.15: Midlands Connect Coventry to Leicester economic benefit diagram



East Midlands – West Midlands connectivity

Options for improving connectivity between the East Midlands and West Midlands are being assessed. The 2043 ITSS shows additional services between Birmingham and the East Midlands which will contribute to reducing generalised journey times. As reported in Chapter 4, Midlands Connect have undertaken additional analysis into the Wider Economic Benefits of improved connectivity between;

- Birmingham to Nottingham
- Birmingham to Leicester
- Coventry to Leicester

These WEBs across these three corridors have been analysed as worth £500 million to the UK economy over 30 years.

The rail industry are working with Midlands Connect to produce a series of corridor studies focussed on investigating the options for improving journey times between the East Midlands and West Midlands, both using the existing network and future high speed network.

In order to directly connect Coventry to Leicester there will need to be an intervention at Nuneaton. This option has not been developed within the Route Study, but is being evaluated by the Midlands Connect partnership as part of the corridor studies.

Worcester area

Options have been considered to enhance the layout in the Worcester area as part of a future Worcester area resignalling scheme. This work has assumed that the Henwick turnback has been delivered by 2019, which enables services to turn back at Worcester. The options summarised in option table 14 have been developed to address constraints in the current layout. Midlands Connect has aspirations for additonal services to Worcester and Hereford, and these would require upgraded infrastructure.

Option table 8: Worcester area interventions		
Assessment of option	Worcester area interventions	
Summary of intervention	A new track layout in the Worcester area could include: • Double tracking the Droitwich to Worcester Foregate Street curve with new crossovers between Rainbow Hill Junction and Foregate Street Station • new crossover at Worcester Shrub Hill after Tunnel Junction • improved turnback capability in the Malvern area • upgrading Wylds Lane Junction to passenger standards.	
Output assessment	Delivers increased capacity and service flexibility into Worcester Foregate Street and Worcester Shrub Hill stations from the Birmingham and Oxford/Bristol directions. The new layout would also allow services from Worcester Shrub Hill to access Worcester Foregate Street Platform 2 and vice versa. The turnback option would support longer and multiple turnarounds of services operating to Great Malvern in the future ITSS.	
Indicative cost	Worcester stations interventions	£5m -£15m
	Malvern turnback	up to £10m
Prioritisation assessment	Future signalling renewals will present an opportunity to deliver incremental enhancements. It is proposed that these options are developed further as part of this renewals project.	
Value for money assessment	N/A	

Single track line between Coventry and Leamington Spa

Option table 9: Birmingham tunelling and additional platforms	
Assessment of option	Birmingham tunnelling and additional platform capacity
Summary of intervention	• Provision of additional capacity in Birmingham through tunelling and subterranean platforms at New Street • Provision of access from exisiting New Street station concourse to subterranean platforms.
Output assessment	This concept will provide additional capacity into and through central Birmingham, offering the opportunity to seperate local and long distance services.
Indicative cost	£5bn-£10bn
Prioritisation assessment	This option may be required to meet forecast demand following the completion of the Midlands Rail Hub.
Value for money assessment	N/A

The longer term view to 2043 and beyond

Central Birmingham

Following the delivery of the Midlands Rail Hub, there is limited capacity to run additional or longer trains in to central Birmingham. Further options would need to be considered to provide additional capacity and platforms.

The strategy has considered an option to tunnel under the existing New Street station, with tunnel portals in the Five Ways and Duddeston areas and a sub-terranean station to provide additional platforms. This would enable additional services to operate in to and through Birmingham. The option is outlined in Option table 9.

Coventry Corridor

In order to accommodate all of the passenger and freight services in the full 2043 specification without impacting on long distance services journey times additional infrastructure would be needed between Birmingham International and Stechford. An existing study investigating options to increase capacity between Coventry and Birmingham was reviewed to inform the strategy. This work assessed the option of four tracking between Stechford and Birmingham International, taking into account the impact on station platform arrangements. The option details are outlined in Option table 10.

On the Leamington to Coventry corridor accomodating the full 2043 level of services would require further doubling of the route, between Kenilworth and Coventry. This would enable up to six trains per hour in each direction to operate on the route, including a second service calling at Kenilworth. Additionally, this option would allow greater flexibility of freight routeings. This section of route was built as a single track railway and would therefore require additional planning consents and agreements.

Option table 10: Four tracking between Stechford and Birmingham International	
Assessment of option	Four tracking between Birmingham International and Stechford
Summary of intervention	• Provision of additional capacity through four tracking between Birmingham International and Stechford.
Output assessment	This concept will help to maximise route capacity and enable additional services to operate without impacting on long distance journey times. It would also help to facilitate opportunities to provide a 24 hour service to Birmingham International Station and the airport.
Indicative cost	£175m-£375m
Prioritisation assessment	Should be considered as a longer term option to deliver the 2043 ITSS for passenger and freight services.
Value for money assessment	N/A

Figure 5.16: Water Orton area 2043 interventions

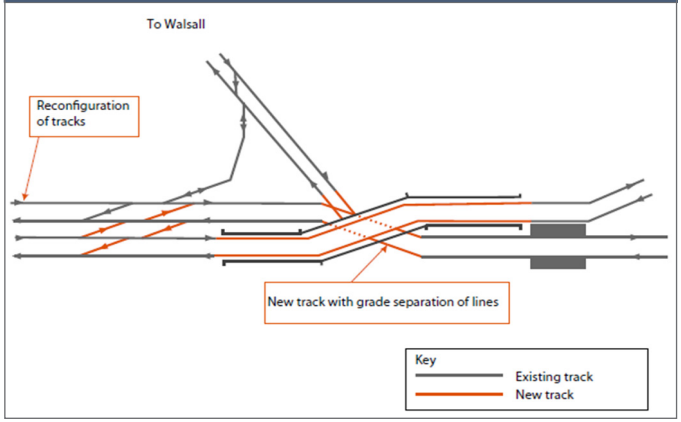
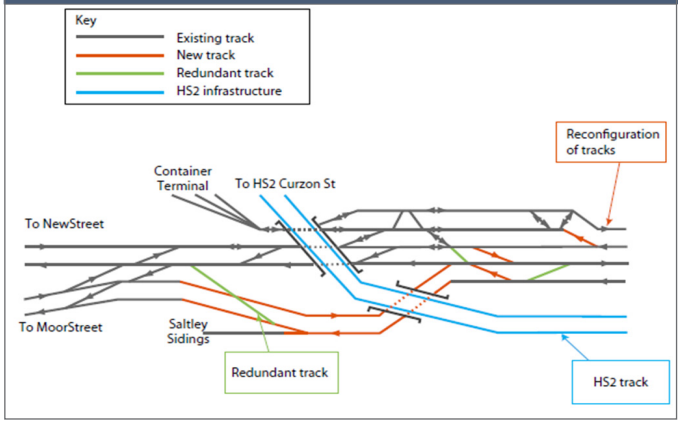


Figure 5.17: Landor Street Junction area 2043 interventions



Birmingham to the East Midlands

Increasing numbers of passenger and freight services in the full 2043 ITSS for the Birmingham to Nottingham/Leicester corridor cannot be fully accommodated on the infrastructure options identified as part of the Midlands Rail Hub. Depending on how traffic develops on this route, and service choices made by funders by 2043, there would be a need to separate traffic flows. This would allow freight movements to and from the Walsall area to be segregated from fast passenger services and otherfreight flows.

The option of grade separation has been investigated and is presented in option table 11 and Figure 5.16 and Figure 5.17.

The increase in passenger and freight services needed to deliver the full 2043 ITSS, lead to a further requirement to change the infrastructure in the Landor Street area. This takes account of the routeing of passenger services into central Birmingham and the impact of HS2. Figure 5.17 shows the proposed changes in the Landor Street Junction area to deliver the ITSS and align with HS2. The concept is outlined in option table 12.

The 2043 ITSS includes an increase in freight services along this corridor, and a further option has been assessed which could offer an alternative routeing for some freight services by providing an alternative route between Stourbridge, Walsall and Lichfield. This could reduce capacity pressures in the Water Orton area and a potential alternative to options between Barnt Green and Kings Norton (outlined in Option table 14).

Assessment has shown that if there is an increased level of freight from Bristol and the South West this option could provide additional capacity. Depending on the destination of the freight services this may need to be delivered in addition to the 2043 options.

Option table 11: Water Orton grade separation (2043)	
Assessment of option	Grade separation, with fast lines over slow.
Summary of intervention	• Grade separation, with fast lines over slow.
Output assessment	This concept will help to maximise route capacity and reduce potential crossing moves between passenger and freight services in the Water Orton area.
Indicative cost	£250m - £500m
Prioritisation assessment	Should be considered as a longer term option to meet the 2043 ITSS for passenger and freight services.
Value for money assessment	N/A

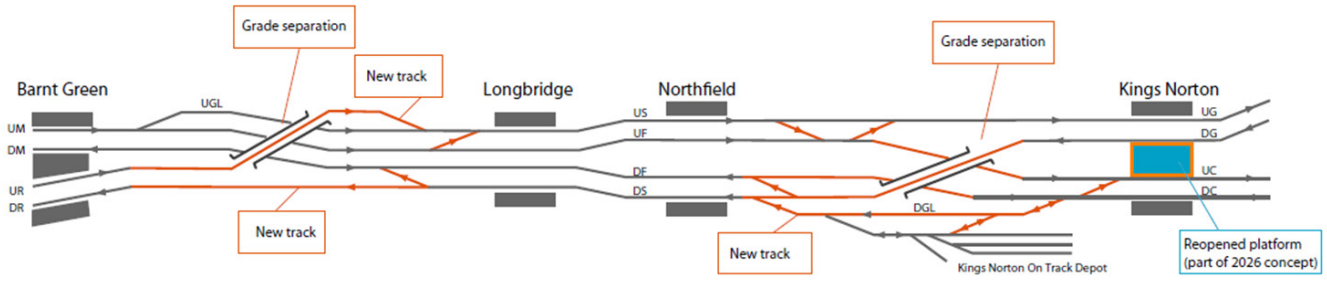
Option table 12: Landor Street area interventions (2043)	
Assessment of option	Landor Street Junction area interventions 2043
Summary of intervention	• Additional tracks including switches and crossings to create two track sections from the Water Orton area towards St Andrews Junction (Moor Street routeing) and towards Grand Junctions (New Street routeing). Track layout will be reconfigured to align to passenger train routeings.
Output assessment	This concept will help to maximise route capacity into central Birmingham, taking into account the new layout in the Landor Street Junction area following the arrival of HS2.
Indicative cost	£35m - £75m
Prioritisation assessment	Should be considered as a longer term option to meet the 2043 ITSS for passenger and freight services.
Value for money assessment	N/A

Birmingham to Worcester/Hereford via Bromsgrove

To meet passenger and freight user demand out to 2043, analysis has identified the opportunity for grade separation and remodelling of the line between Barnt Green and Kings Norton. This option may be needed, depending on how traffic flows develop in the future, to separate and accommodate the flows of traffic to maximise the route capacity. This option is particularly sensitive to the demands of freight markets.

This concept is outlined in option table 12 and Figure 5.10.

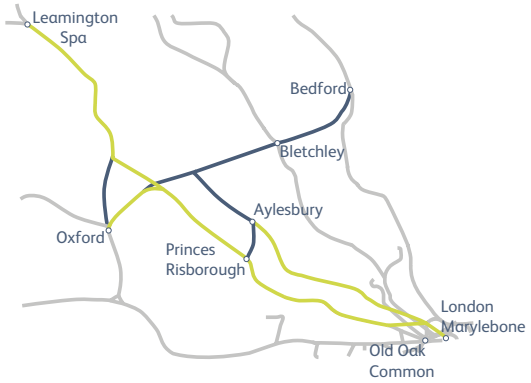
Figure 5.18: Kings Norton – Barnt Green 2043 interventions



Option table 13: Alternative route for freight via Stourbridge-Walsall-Lichfield (2043)	
Assessment of option	Alternative route for freight via Stourbridge-Walsall-Lichfield
Summary of intervention	• Reopening or upgrade of disused or abandoned lines to provide a two track route for freight services.
Output assessment	This concept could provide an alternative routeing to be utilised by some freight services which are currently routed through the West Midlands area via Bromsgrove, Landor Street and Water Orton.
Indicative cost	£375m - £875m
Prioritisation assessment	This option has not been prioritised as the forecast growth in traffic is not expected be routed via this corridor.
Value for money assessment	N/A

Option table 14: Barnt Green and Water Orton area grade separation (2043)	
Assessment of option	Barnt Green and Kings Norton grade separation
Summary of intervention	• Grade separation in the Barnt Green and Kings Norton areas, and remodelling of the route.
Output assessment	This concept will help to maximise route capacity and reduce potential crossing moves between passenger and freight services.
Indicative cost	£250m - £500m
Prioritisation assessment	Should be considered as a longer term option to meet the 2043 ITSS for passenger and freight services.
Value for money assessment	N/A

Figure 5.19: Chilterns and East West Rail



Chilterns and East West Rail Strategy

The Chiltern route provides access to London from the West Midlands, Warwickshire and Buckinghamshire with services into London Marylebone. In 2015 a new route between Oxford and London Marylebone via Bicester was launched, which will generate additional growth in passenger numbers. This will be extended through to Oxford in 2016.

London Marylebone Station is approaching capacity, both in terms of the number and length of trains it can serve and the passenger handling capability on the station. The station itself and its approach tracks are in a very constrained location. Already high passenger demand in the morning peak sees queues on the concourse, through the main ticket gate lines from all platforms and at the London Underground ticket gate line, resulting in delays to passengers' journeys.

The Chiltern route is currently diesel operated, and it is likely to form a high priority for future electrification. This should be aligned with fleet replacement in the 2020s as part of an overall modernisation of the route.

Wider developments in London include Crossrail, and HS2 at Old Oak Common, potentially as part of a wider, large-scale regeneration and consequent change in travel patterns.

In order to accommodate forecast demand to 2023 train lengthening was identified as the appropriate solution. To accommodate this, a number of platforms would need to be lengthened, to enable longer distance trains to operate at nine-car length. Passenger handling constraints at London Marylebone have been identified, with queuing at the gate line in the morning and evening peaks. Options to improve the passenger flow through the gateline have been identified to improve this position.

However, train lengthening alone does not entirely deliver the conditional output for meeting forecast demand, with platform lengths at Marylebone Station constraining train lengths on the route. Options were developed to create additional capacity at Marylebone, investigating the maximum length of platforms that could be provided in the existing railway footprint. This option, while technically possible from an engineering perspective, would lead to additional walking time for passengers, both to the station exit and to interchange with the London Underground. While supporting train lengthening options, this approach would limit the number of services that could be operated at the same level that operates during peak times today. Analysis shows that the increased capacity delivered by train lengthening would not be sufficient to support forecast demand in the medium term, so could only be a short-term solution. Lengthening platforms at Marylebone would also require alterations to the track layout and signalling which would be significantly costly and disruptive to passengers.

An alternative approach was developed through the provision of an additional terminus for the route at Old Oak Common, connecting to Crossrail and HS2 services. This option has been further developed, identifying the potential for an additional four trains per hour from the Chilterns into Old Oak Common. It is now being actively considered as part of the design for the new station at Old Oak Common. A Strategic Outline Business case is being developed to further demonstrate the case for this option.

In order to accommodate the full 2043 specification, further upgrades across the route would be required, with constraints at Princes Risborough Junction, between Princes Risborough and Neasden Junction, and between Princes Risborough and Aylesbury.

The Chiltern route has been identified as a likely priority route for future electrification. This would provide an opportunity to align with the planned resignalling of the route, including the rollout of ETCS, providing additional performance and capacity benefits. The current rolling stock on the route is also due to be replaced in the 2020s.

These works are packaged within this strategy as the Chiltern Capacity Package, as there are clear advantages in approaching this as a comprehensive route upgrade.

East West Rail

East West Rail is a major project to establish a strategic railway connecting East Anglia with Central, Southern and Western England.

The 'Western Section' is now a committed scheme to re-introduce passenger and freight services between Bedford and Oxford, Milton Keynes and Aylesbury. It involves upgrading and reconstructing sections of existing and disused railway.

The project is being developed and delivered by the rail industry in conjunction with the East West Rail Consortium, a group of local authorities and businesses with an interest in improving access to and from East Anglia and the Milton Keynes South Midlands growth area. Train services on the new route are forecast to help create up to 12,000 new jobs and generate approximately £73m a year for the economy.

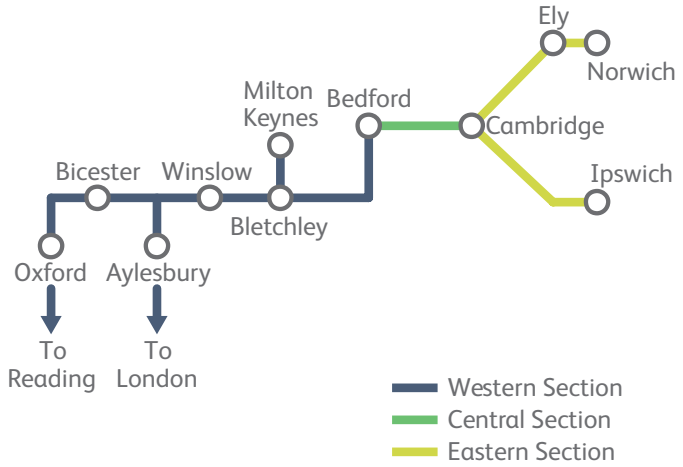
The industry is also working to develop a business case to extend the railway from Bedford to Cambridge to enable train services to continue to Norfolk and Suffolk, referred to as 'The Central Section'. This is reported in the East Midlands Route Study.

The East West project has been developed taking into account two train service specifications, known as 'core' and 'incremental'. The incremental specification aligns with the Route Study 2043 ITSS. Both specifications and the infrastructure required have been developed to GRIP 2 level by the East West Rail project team. Development of the Core TSS has continued into GRIP 3 and 4.

The outputs, scope cost and business case are currently being reviewed and developed to GRIP 4, with milestones outlined in Network Rail's Enhancement Delivery Plan. As part of this work, options to accommodate East West Rail services on the West Coast Main Line will need to be developed, taking cognisance of strategic analysis of the future use of the WCML following the introduction of HS2.

In order to deliver the full 2043 ITSS, further infrastructure will be required. This would be aligned as part of the wider Chiltern Capacity Package.

Figure 5.20: East West Rail sections



Chiltern Choices for funders

The choices presented by the strategy can be broken down into three key themes:

- meeting forecast demand to 2024
- opportunities to maximise the benefits of HS2 in 2026
- the longer term view to 2043

The first theme concentrates on accommodating the demand outlined in Chapter 3, both on trains and at stations. The second theme ties into the opportunity presented by the arrival of HS2 and Crossrail at Old Oak Common. The final theme focuses on the longer term view, and the level of interventions required to accommodate the full 2043 ITSS.

Figure 5.21: London Marylebone train lengthening options

Service Group	Capacity required to meet growth to 2023 - passengers (vehicles)	Option number	Option infrastructure AFC	Number of vehicles tested for business case	Value for money rating	Sensitivity test: Value for money (assuming 2015 operating costs)
Kidderminster/Birmingham/ Oxford to London Marylebone	900 (13)	S4A	Up to £10m	8	Low	High
	900 (13)	S4B	£20 - £50m	10	Low	Medium
Gerrards Cross/High Wycombe/ Princes Risborough to London Marylebone	450 (4)	S5A	None	4	Poor	Low
		S5B	None	2	Low	High

Option number S4C is currently an alternative/incremental option to S4A which will be evaluated during the consultation period

Meeting forecast passenger demand on trains

Forecast demand will require additional seats for passengers otherwise crowding will worsen. This analysis has identified a number of corridors into Marylebone that require additional capacity to meet forecast demand. Options are set out in Figure 5.21.

It should be noted that to meet the forecast demand to 2024 on the longer distance services, an additional thirteen vehicles are required, but that the business case has only been tested for eight additional vehicles (option S4A) and 10 vehicles (option S4B).

This is due to a limited amount of platform capacity and approach routes at Marylebone. These are close to capacity in terms of number of trains and the length of these trains in the morning peak. Options have been considered to address the constraints at Marylebone, and these options are set out in the Chiltern corridor strategy.

Option S4A offers additional seats to passengers through the lengthening of trains calling at Gerrards Cross and Seer Green, this is set out in Option table 15. A further option was evaluated during the consultation period which look at providing additional longer train services supported by longer platforms at Seer Green, Gerrards Cross, Saunderton, Denham and West Ruislip this is set out in Option table 16.

An alternative option was also considered to better utilise capacity by lengthening platforms at stations which limit train lengths, to at least six cars. By alleviating the requirement for them to be served by short all-station stopping services, calling patterns could be altered to free up additional paths on the Chiltern route. This could be used to accommodate at least one additional semi-fast train per hour into London Marylebone.

This option has been further developed during the consultation period, and investigated extending platforms to at least six-cars long at the stations listed in Option table 17. This option could

potentially be supported by the lengthening of Marylebone Platform 4 to at least six cars in length.

Further work has demonstrated a high cost to deliver the required supporting infrastructure, and the additional path was not robustly identified. This meant that there was a detrimental impact on journey times for longer distance passengers from these changed calling patterns.

These additional vehicles will need to be stabled on the network when they are not in use. Additional stabling capacity will be delivered at Banbury by 2019 with the opportunity for the delivery of a new depot, with capacity for growth in the future.

Additional vehicles may drive a requirement for additional stabling capacity in the London area, and should be considered as part of further development work.

Option table 15: Chiltern main line platform lengthening	
Assessment of option S4A	Platform lengthening on the Chiltern main line
Summary of intervention	• Platform extensions to 9-car at Seer Green and Gerrards Cross.
Output assessment	Provides platform lengths which would support train lengthening options to deliver the capacity required to meet the anticipated demand growth to 2023.
Indicative cost	Up to £10m
Prioritisation assessment	Should be considered for delivery by 2024 to meet forecast demand
Value for money assessment	Low value for money. Sensitivity test: high value for money assuming 2015 operating cost.

Option table 16: Chiltern main line platform lengthening	
Assessment of option S4B	Platform lengthening on the Chiltern main line
Summary of intervention	• Platform extensions to 9-car at Seer Green, Gerrards Cross, Saunderton, Denham and West Ruislip
Output assessment	Provides platform lengths which would support train lengthening options to deliver the capacity required to meet the anticipated demand growth to 2023.
Indicative cost	£20m - £50m
Prioritisation assessment	Should be considered for delivery by 2024 to meet forecast demand
Value for money assessment	Low value for money. Sensitivity test: medium value for money assuming 2015 operating cost.

Option table 17: Chiltern main line platform lengthening	
Assessment of option S4C	Platform lengthening on the Chiltern main line
Summary of intervention	• Platform extensions to up to at least six cars long at inner London stations (Sudbury and Harrow Road, Sudbury Hill Harrow, Northolt Park, South Ruislip), Aylesbury Branch stations (Monks Risborough and Little Kimble), Kings Sutton.
Output assessment	Provides platform lengths which would support train lengthening and the potential delivery of over 600 additional seats per hour into and out of London Marylebone at peak times, to meet the anticipated demand growth to 2023.
Indicative cost	£20m - £50m
Prioritisation assessment	Further development is required to assess whether this option should be pursued for delivery by 2024 to meet forecast demand.
Value for money assessment	Low value for money.

Meeting passenger demand at stations

Passengers at London Marylebone experience congestion in a number of constrained areas across the station, in both morning and evening peaks, and also on Saturday afternoon during events at Wembley. Significant queuing occurs, starting from alighting the train in the morning peak and is compounded by conflicting passenger flows and the layout of the gate line, information boards and retail outlets on the main concourse. Interventions to improve passenger flows through the station have been considered and are presented in Option table 18. These would free up circulation space, reduce the queuing/walk times for passengers and provide more space for the predicted growth in numbers in the medium to long term.

Option table 18: London Marylebone Station capacity interventions	
Assessment of option	London Marylebone Station capacity interventions
Summary of intervention	• Gate line extension and reconfiguration • relocation of concourse facilities and ticket office.
Output assessment	By delivering these improvements, it is anticipated that forecast growth in passenger numbers will be accommodated at the station and walk times improved without increased safety risk.
Indicative cost	Up to £5m
Prioritisation assessment	Should be considered for delivery by 2024 to meet forecast demand
Value for money assessment	Financially positive

Opportunities to maximise the benefits of HS2 in 2026

Connectivity to Old Oak Common

London Marylebone is close to capacity and is located on a constrained site which limits train length to nine cars. Two concepts were examined to meet future demand, the first looking at options to enhance Marylebone, and the second assessing connecting into Old Oak Common.

At Marylebone the first option explored was to provide a number of platform extensions (see Option table 19). This was considered to be a less than optimal approach, as analysis undertaken identified that it provided limited usable additional capacity, capped at around just 600 additional seats. The option would also have a wider impact on platform lengths at other stations on the route, which are not required to be lengthened in order to meet demand and therefore do not form part of the train lengthening option outlined above. The option would also increase passenger walk times from the ends of the lengthened platforms and require major alterations to the track and signalling infrastructure which would be significantly costly and disruptive to passengers.

Further work has been undertaken to identify the scope and scale of works associated with the wider redevelopment of Marylebone station required to accomodate forecast passenger demand. This option would provide additional platforms and associated passenger facilities for the operation of additional trains. However, this would include the acquisition of additional land, not currently within the ownership of the rail industry. A high level assessment has indicated this would cost in excess of £700m.

The second conecpt considered was to provide an alternative terminus location for services using the Chiltern route. A link to the new Old Oak Common Station was identified as this could enable the provision of additional capacity on the route and provide good connectivity to Crossrail, HS2 and Great Western Main Line services. This option is shown in Option table 20.

Old Oak Common will benefit from excellent wider connectivity, with Crossrail, HS2 and other services. The area will also see wide spread regeneration, led by the Old Oak and Park Royal Development Corporation (OPDC) is leading the redevelopment of the wider Old Oak Common area, which could deliver up to 65,000 jobs and 25,500 new homes.

Analysis undertaken has shown that the interchange time between services from the Chiltern Route and Crossrail are critical in terms of attractiveness for passengers. The analysis has shown that commuters travelling to the City and Canary Wharf will use the new route, as this will be quicker than using the Jubilee line via London Marylebone and Baker Street.

Engineering development work has shown that it is feasible for Chilterns services to connect to new platforms at Old Oak Common without impeding the proposed Old Oak Common track layout. Work is under way to assure that the ongoing Old Oak Common station development does not preclude this option.

The business case has not yet been developed for this option as the benefit streams are still emerging.

Option table 19: Marylebone platform extensions

Assessment of option	Marylebone platform extensions
Summary of intervention	• Extension of Platforms 4,5 and 6 at Marylebone
Output assessment	Provides nine-car capability at Platform 4 and twelve-car capability at Platforms 5 and 6, accommodating around 600 additional seats
Indicative cost	£20m- £50m
Prioritisation assessment	This option is based on maximising the level of infrastructure that can be delivered within the existing railway footprint. This option would however be challenging and disruptive to deliver. This solution also has an impact on passenger walk times, and could exacerbate existing passenger congestion issues in Marylebone Station.
Value for money assessment	Option discounted

Option table 20: Old Oak Common connectivity interventions

Assessment of option	Old Oak Common connectivity		
Summary of intervention	• Upgrade of the Wycombe line between Northolt Junction and Old Oak Common and new terminus platform in the Old Oak Common development area. • double tracking and linespeed enhancement • remodelling of Northolt Junction • new platforms in the Old Oak Common station area.		
Output assessment	Provides an alternative terminus to Marylebone for Chiltern services to contribute to delivering forecast demand up to 2043 whilst also providing wider connectivity benefits.		
Indicative cost	Platforms and track connection at Old Oak Common	£50m - £100m	£210m - £360m
	Additional junction lead and enabling works to relocate platform at South Ruislip	Up to £10m	
	Double-tracking of Wycombe line and upgrade to 80mph	£150m - £250m	
Prioritisation assessment	Taking account of plans in the Old Oak Common redevelopment area (Crossrail and HS2) in 2026 and demand forecasts, this package of works should be considered for delivery in the medium term to meet forecast demand.		
Value for money assessment	TBC		

The longer term view to 2043

Chiltern Capacity Package

The Chiltern Capacity Package aligns a number of programmes in order to deliver a coherent upgrade plan for the route. The current rolling stock on the route is due for replacement in the 2020s, which drives the opportunity to ensure that the new rolling stock meets the future needs of the network.

The rail industry has identified that the Chiltern route should be a future priority for electrification. New rolling stock and the electrification will provide the opportunity to introduce ETCS in line with the Digital Railway strategy. This will help to deliver wider benefits in terms of performance and capacity.

Analysis has identified the requirement for additional infrastructure between Princes Risborough and Neasden Junction to enable the full 2043 ITSS to be accommodated. Options have been identified that provide four track sections at key locations on the route to maximise capacity for services. A concept which remodels the track layout through Princes Risborough Station to deliver increased capacity, including extension of Platform 1, has also been developed. These interventions are outlined in Option table 21. Further analysis will be required to identify the exact requirements for additional infrastructure, taking into account the benefits that would be delivered by ETCS.

In order to accommodate the full 2043 ITSS, the route between Princes Risborough and Aylesbury would need to be enhanced. This route is currently a low speed, single line route, which acts as a constraint to delivering future train services. The option developed for double tracking this route is presented in Option table 22.

As large scale residential and property development is planned in the area surrounding the Princes Risborough to Aylesbury line, we have undertaken work with the local authority to identify likely land requirements to enable the proposed enhancements.

Option table 21: Chiltern Capacity Package: Increased capacity Princes Risborough to Denham	
Assessment of option	Chiltern Capacity Package 1: Increased capacity Princes Risborough to Denham
Summary of intervention	• Additional track sections through Beaconsfield, Denham and Princes Risborough to create four track sections in the station areas. Reconfiguration of the layout at Princes Risborough Station to extend Platform 1 and create movements in both directions for Aylesbury services into and out of Platforms 1 and 2.
Output assessment	Increased capacity delivered by allowing faster services to overtake stopping services. This will support additional services to deliver medium term demand requirements.
Indicative cost	£100m-£250m
Prioritisation assessment	Additional track sections should be considered to support additional services as they are introduced.
Value for money assessment	TBC

Option table 22 Chiltern Capacity Package: Increased capacity Princes Risborough to Aylesbury	
Assessment of option	Chiltern Capacity Package 2 - Increased capacity Princes Risborough to Aylesbury
Summary of intervention	• Double tracking between Princes Risborough and Aylesbury.
Output assessment	Doubling of the route would enable the 2043 ITSS to be accommodated. Marsh Lane level crossing would also need to be replaced with a bridge, and provisions of additional platforms at Monks Risborough and Little Kimble. This route was built in a single track alignment and would require planning consents. Work would also be required to reconfigure Princes Risborough Junction.
Indicative cost	£75m-175m
Prioritisation assessment	To be considered as part of Chiltern Capacity Package
Value for money assessment	TBC

Aylesbury and Marylebone (via Amersham)

To maximise the benefits of the Chiltern Capacity Package, potential electrification options for the line between Aylesbury and Marylebone (via Amersham) have been considered. The route includes London Underground infrastructure which is shared with national rail services (Metropolitan line between Harrow on the Hill and Amersham) and is fourth-rail electrified. This makes it challenging to introduce AC electrification throughout the whole route. Any future development work assessing Chiltern main line electrification options should consider the potential for part-electrifying the Aylesbury and Marylebone route, excluding the section between Amersham and Harrow on the Hill. This would involve consideration of dual voltage or bi-mode rolling stock which could operate as a combined fleet on both the Aylesbury route and the main line.

The potential to use an independently powered (battery) EMU has also been considered, with initial modelling work supporting further development of this option. The wider industry applications of this technology are set out in the Network RUS Alternative Solutions.

06 Consultation

This chapter sets out:

- how stakeholders have been consulted to develop the West Midlands and Chilterns Route Study through the Draft for Consultation to the Final document
- the key themes identified within the consultation response.

Long Term Planning Process and governance

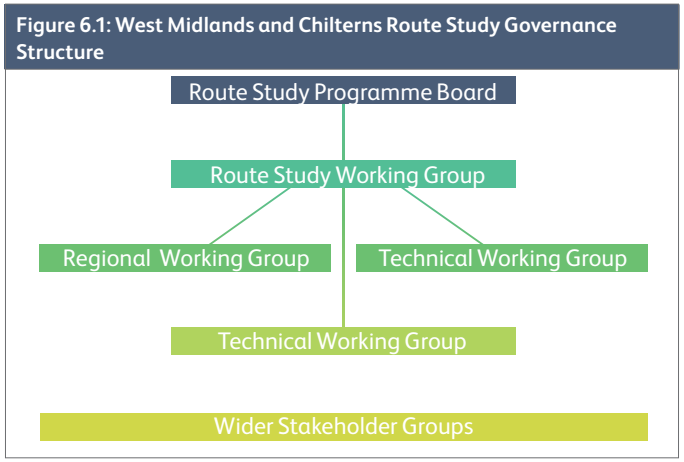
Network Rail is taking a collaborative approach to the development of the Long Term Planning Process. Development of the Route Studies follows publication of the four Market Studies at the end of 2013 which set out the conditional outputs to accommodate growth on the rail network over the next 30 years.

The suite of Route Studies is a key next step in the process to develop the case for investment in the rail network in the medium and longer term.

The West Midlands and Chilterns Route Study is an industry document that has been developed with the close involvement of a wide range of stakeholders. This has ensured that the work has been subject to comment and guidance as it has been developed.

The strategy and associated interventions have been developed in discussion with an audience of key stakeholders preserved by the Route Study governance structure (see figure 6.X). These groups have been complemented by one to one discussions with individual stakeholders during the development of this Route Study to discuss specific areas as required as work has developed. This input and steer has been paramount to ensuring the endorsement of the industry.

Figure 6.1: West Midlands and Chilterns Route Study Governance Structure



Consultation process

The West Midlands Route Study Draft for Consultation was published on the Network Rail website on 30th June 2016. A 90-day consultation period on the document closed on 22nd September 2016. The consultation draft document was a key opportunity to obtain a wider view on the propositions it set out, and ensured that all interested parties had the chance to comment before the publication and establishment of the final West Midlands and Chilterns Route Study.

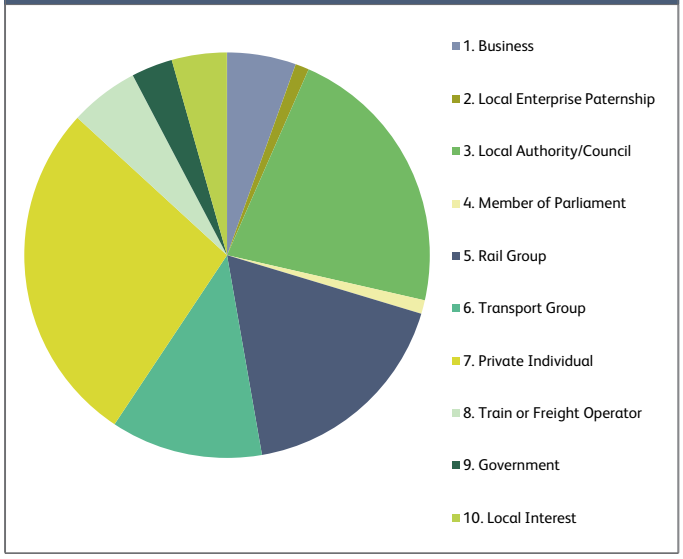
Formal comment on this document was welcomed from any interested party who wished to respond, irrespective of whether they had been involved in the development of the strategy.

Several processes that interface with the strategy outlined in the Route Study have taken place in the period following the publishing of the draft for consultation. These have been reflected as appropriate through the document to provide the most current and relevant strategy.

Table 6.1: West Midlands and Chilterns Draft for Consultation Responses

Responder	
Type	Quantity
1. Business	5
2. Local Enterprise Partnerships	1
3. Local Authority/Council	20
4. Member of Parliament	1
5. Rail Group	16
6. Transport Group	11
7. Private Individual	25
8. Train or Freight Operator	5
9. Government	3
10. Local Interest	4

Figure 6.2: West Midlands and Chilterns Draft for Consultation Response Proportions



Consultation responses

Quantity and types

In total, 91 responses were received from stakeholders, and these have been categorised as shown in Table 6.1. The consultation responses are published on the Network Rail website alongside this study.

Themes

Demand

Many correspondents noted their approval for the growth forecasts that were used in the Route Study. Conversely, some respondents to the consultation felt that the numbers weren't high enough and growth should be reflected as being larger.

The Route Study has adopted the numbers from the Market Studies as is the standardised methodology set out by the LTPP. Therefore, the approach that has been taken is to acknoweldge that the forecasts are accurate, but that in some places growth has accelerated ahead of the timescales initially envisaged. The strategy and requisite interventions have all been developed based upon the need to accommodate forcecast growth, and that some options may need to be delivered sooner.

Ambition

It was highlighted in some responses that the Route Study hadn't been ambitious enough when developing proposals to accommodate growth. This was particularly marked in relation to the provision of additional growth into and through the central Birmingham area. Some noted that whilst they supported the approach to the Midlands Rail Hub, they would like to have seen a more prominent mention of a solution to develop additional tunnelling into the city.

This option was included in the Draft for Consultation document. It is the view of Network Rail and Midlands Connect that Midlands Rail Hub is a medium term solution to enable growth into central Birmingham and the appropriate option to maximise the current network capability. However, as identified by the Route Study, to allow for long term growth figures beyond the introduction of Midlands Rail Hub, a tunnelled solution may well be the appropriate proposal.

Midlands Rail Hub and Camp Hill Lines

There was broad support for the proposed Midlands Rail Hub. Many commented on the additional paths into and through central Birmingham this would provide, and the opportunities the new infrastructure would offer regarding the provision of services on the Camp Hill Line.

Midlands Connect and Network Rail continue to progress the Midlands Rail Hub in line with the additional funding secured from Government to develop the proposal to Strategic Outline Business Case (SOBC) stage in order to make the case for further investment.

The introduction of trains serving new stations on the Camp Hill Lines remains a Transport for West Midlands (TfWM) aspiration. Any such services would be dependent on the commissioning of the Midlands Rail Hub. As a member of the Route Study stakeholder governance, TfWM in conjunction with Midlands Connect and Network Rail will continue to work collaboratively in the progression of these objectives.

East Midlands to West Midlands

There was strong support for the elements of the strategy relating to improved connectivity and journey times between the East Midlands and West Midlands.

Following the publication of the Draft for Consultation, work has been undertaken on behalf of Midlands Connect and with the input of Network Rail to better quantify the benefits of improved links across the Midlands. This work has fed into updating the strategy to reflect the greater clarity that can consequently be provided.

Leamington Spa to Coventry capacity enhancement

Forming a key part of the strategic case for the West Midlands and Chilterns, increasing capacity capability between Leamington Spa and Coventry was generally supported by responses to the Draft for Consultation.

It was noted that the proposal should not inhibit the ability to operate freight over this route with capabilities protected by the appropriate infrastructure provisions.

Alternative schemes were also suggested for this area of geography; however, the industry agreed and approved this as the correct scheme to deliver the required outputs.

06 Consultation

Midlands Connect

The close alignment of work undertaken for the West Midlands and Chilterns Route Study by the rail industry and Midlands Connect was recognised during the consultation. This close association of approach has been developed further in the interim period to strengthen the evidence base by attributing Wider Economic Benefits with interventions, and has been reflected throughout.

Geography

Several of the consultees felt that the extremities of the geography were under-represented in the Draft for Consultation, such as Hereford. During the development of the Route Study all locations have been considered and this is now reflected more strongly in the narrative of the document.

Old Oak Common

There was a consistently high level of support for the proposal of a link from the Chilterns to Old Oak Common. Further development has been undertaken during the consultation period to further define the benefits and scope of this choice for funders.

New stations

Multiple consultation responses referenced the support or desire to see the introduction of new stations across the network of the West Midlands and Chilterns. The Long Term Planning Process only considers new stations when they satisfy the conditional outputs set out in the Market Studies. However, the strategy does recognise local aspirations and where new station proposals have an impact on the train service specification, this has been considered as part of the development of future options.

Establishment

Network Rail will, in consultation with National funders establish this Route Study 30 days after publication unless the Office of Rail Regulation, in accordance with ORR's Long Term Planning Process objection procedure, publishes a notice of objection.

This Route Study forms an input into decisions made by the industry funders and suppliers on, franchise specification, investment plans and Government's High Level Output Specification (HLOS). The Route Study will also help to inform the allocation of capacity on the network through application of the normal Network Code processes.

Network Rail
1 Eversholt Street
London
NW1 2DN

www.networkrail.co.uk