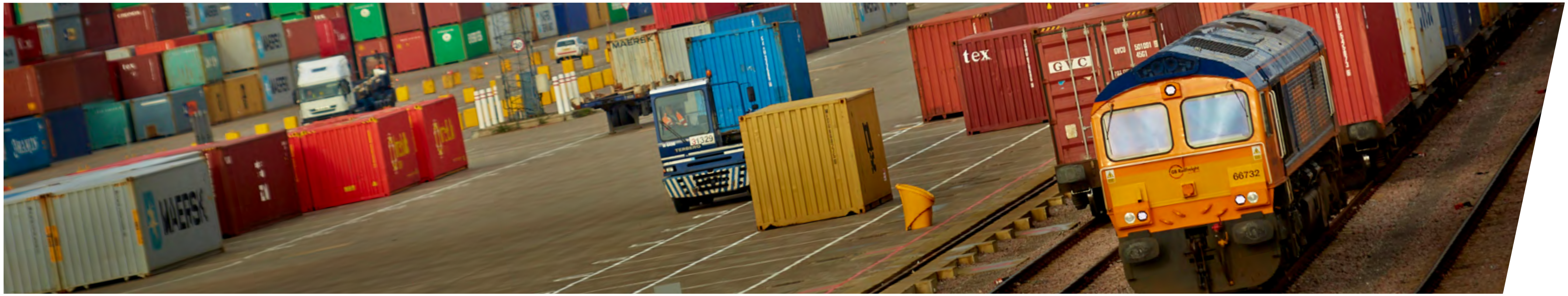
Freight Network Study

Long Term Planning Process

April 2017



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Foreword

Network Rail is pleased to publish the Freight Network Study, which considers the future development of rail freight across the rail network in Great Britain. This study forms part of the rail industry's Long Term Planning Process (LTPP), which looks at the requirements of the rail network over the next 30 years and is intended to support the series of Route Studies that have been published or are under development.

Today, the railway carries hundreds of millions of passengers and tens of millions of tonnes of freight a year. Rail freight volumes have increased significantly in the last twenty years, and the value of goods carried today is estimated to be in the region of £30 billion annually[1]. Working closely with industry stakeholders, Network Rail is delivering an ever-expanding service provision for freight users and passengers. Demand for rail freight is expected to continue to grow, as it is increasingly recognised as an economically attractive and environmentally efficient form of transport. Growth is expected to be particularly strong from ports such as Felixstowe, London Gateway and Southampton. We are also anticipating and supporting growth at Northern ports, including Liverpool, the Humber and ports in the North East. This success brings challenges. Currently, a programme of works is being undertaken to enhance rail freight access to these ports. Investment in schemes such as the Felixstowe branch capacity project and train lengthening enhancements on many routes seek to support the development of rail freight.

To ensure that we build on this programme of works and successfully meet the challenges ahead, Network Rail has established a virtual route for freight and national passenger operators[2]. This will stand alongside the geographical routes and better enable us to protect and enhance the interests of our freight customers as we further devolve as a business.

Developing longer-term plans for the network to 2043 is important. It enables consideration of these changes in the context of major schemes being developed, such as High Speed Two.

It also guides the prioritisation of shorter-term requirements. Using future service characteristics (such as capacity, frequency, and journey times) which the industry aspires to deliver over the next 30 years, this study has developed potential options to deliver these outputs subject to value for money, deliverability and affordability. Consideration has been given to where the capacity and capability of the network will be insufficient to accommodate these requirements once existing schemes have been delivered. A number of possible choices are presented for consideration for future investment in the sector.

The Freight Network Study recognises the current challenging economic environment and the potential options that it presents are proposed within the context of ongoing affordability challenges. The dominant issue is the need to create the capacity and capability to serve the future needs of the rail freight market, enabling the sector to remain competitive and to expand. In addition to the recent growth, the nature and the geography of freight carried by rail is changing. Catering for this requires careful assessments of the possible options to ensure that the extra demand is met in a sustainable way. It recognises the need to improve resilience of the railway in order to maintain connectivity.

The study seeks to outline what the rail industry considers to be the future priorities for enhancing the rail freight network. Through the LTPP, it takes account of the needs of the passenger sector. We would like to thank industry stakeholders for their participation in the LTPP to develop this potential strategy. Details on the consultation process can be found in Chapter 10.

Network Rail has led the production of this Network Study on behalf of the industry and as such, it has been developed collaboratively with industry partners and wider stakeholders, including passenger and freight operators, Rail Freight Group, Freight Transport Association, Department for Transport, Transport for London, Local Authorities and Local Enterprise Partnerships. We thank them all for their contribution.

Jo Kaye

Director,
Network Strategy
and Capacity Planning

Paul McMahon

Managing Director,
Freight and National
Passenger Operators

1 Rail Delivery Group (2015) Freight Britain

2 A virtual route is based on Network Rail's geographic routes which have responsibilities for different parts of the network.

Executive Summary

The Freight Network Study forms part of the wider rail industry Long Term Planning Process (LTPP). Network Studies look at network-wide issues and consider future capacity and capability related challenges for the railway.

This study was commissioned to consider the possible requirements of the rail freight industry in future control periods[1] to present funders with choices and options. The Freight Network Study brings together the strategic freight recommendations from individual Route Studies and provides an outline of the wider priorities for the capacity and capability of rail freight that is not route specific.

The remit agreed for the Network Study was developed by the Rail Industry Planning Group, which governs the study. The scope of the study is intended to:

- Provide an overview of the current plans for the enhancement of the rail freight network in Great Britain
- Propose a range of future capacity options for the enhancement of the rail freight network including a summary of Route Study recommendations
- Consider the short and longer term capability requirements to increase the availability and efficiency of the network, assessing the case for investment
- Provide a range of possible options for investment over a number of key rail freight corridors for a 30-year period.

Rail freight is increasingly recognised as an economically attractive and environmentally efficient form of transport and the sector is a significant and growing part of the national economy. Total volumes increased by over 65% from 13 billion net tonne kilometres in 1995/96 to over 22 billion in 2014/15. In 2015/16 volumes fell by about 20%, primarily due to a decline in coal traffic to power stations, but 2015/16 total volumes are still over 30% above 1995/96 levels[2]. It has been estimated that in 2013/14 rail freight delivered productivity, congestion and environmental benefits totalling over £1.6 billion per year to the British economy[3].

As the rail freight sector has grown, the markets served have evolved. This has seen a geographical shift in freight flows towards busier rail corridors.

1 Control Periods are Network Rail's five-year funding cycles.
2 Data are from ORR and refers to financial years. Data excludes Network Rail engineering.
3 Rail Delivery Group (2015) Freight Britain.

This transition, coupled with the growth in passenger numbers, has led to increasing capacity constraints on the rail network. Investment in infrastructure is necessary to unlock the potential of key sectors of the market and accommodate anticipated growth on the network.

The Freight Network Study takes account both of the freight forecasts, which were published in the Freight Market Study (FMS) in 2013, and of recent market developments. The FMS projected annual growth in total rail freight volumes of about 3% per annum to 2043 . Intermodal volumes were forecast to increase by over 5% per annum, construction volumes were forecast to grow by 1% per annum, while coal volumes were forecast to fall. It should be noted that such growth is based on an unconstrained network, that is, the network has sufficient capacity to accommodate projected growth in rail freight.

Since the FMS was published, intermodal volumes have increased by only about 0.5% per annum, relative to the FMS base year of 2011. There are several reasons for this, including weaker than expected growth in deep-sea container trade volumes, lower than forecast oil prices and the delay in completion of some rail capacity enhancement projects. Construction volumes have increased by about 3.5% per annum since 2011, well in excess of the FMS's central case forecasts. The biomass, waste and automotive sectors have also seen strong growth since 2011. The coal sector has declined as forecast, although the average annual rate of decline has been much quicker than that anticipated by the forecasts.

This study assesses the future requirements for the rail freight market post baseline[4], focusing on a number of individual corridors. A summary of these corridors and the location of some of the key challenges for rail freight in the future are shown in Table 1.

In addition to the capacity gaps, the study has considered requirements for the capability of the freight network, including average speed (increasing line speeds), train length, axle loads, and gauge.

4 Baseline position is defined in Chapter 4 and is taken to include enhancements proposed to the network during Control Period 5 (CP5; April 2014 to March 2019) and those committed to be delivered shortly thereafter.

Table 1: Key freight corridors and location of infrastructure constraints

No.	Corridor	Locations of key capacity constraints
1	West Coast Main Line	• North of Preston to Scotland • Between Crewe and Warrington
2	East Midlands and Yorkshire	• South Yorkshire Joint Line
3	Felixstowe[6] to the West Midlands and the North via London or Ely	• 'Cross Country' via Ely and Leicester
4	Southampton to the West Midlands and the West Coast Main Line	• Didcot and Oxford areas • Basingstoke area
5	Channel Tunnel	• Channel Tunnel classic routes (i.e. the non-HS1 routes)
6	Cross London flows including Essex Thameside	• Looping availability on the North London and Gospel Oak to Barking Lines
7	South West and Wales to the Midlands	• Water Orton Area and Cross Birmingham
8	Northern Ports and Transpennine	• Transpennine flows via Diggle, Calder Valley and Hope Valley routes • Access to Ports, including Liverpool and Teesport
9	Midland Main Line	• Bedford, Leicester area and Sheffield
10	Great Western Main Line	• Didcot area
11	Anglo-Scottish and Northern regional traffic	• East Coast Main Line (north of Newcastle upon Tyne) • West Coast Main Line North of Crewe

In 2011, the Rail Value for Money Study[5] recommended that the rail freight industry has a priority to maximise the use of network capacity. Recognising this, Network Rail and the freight industry are working together to actively identify methods to best utilise existing capacity on the network.

The strategy contained within this document focuses on developing capacity and capability, primarily for intermodal commodities from the major ports and the Channel Tunnel to key terminal locations. The short-term[7] strategy proposes the creation of a core arterial, nationally cohesive freight network with complete 'line of route'[8] enhancements to reflect the forecast growth in intermodal traffic.

5 'Realising the Potential of GB Rail', Sir Roy McNulty, May 2011

6 Including the Haven ports.

7 Short-term refers to the period over the next 10 years, including options for consideration in the next funding period (Control Period, CP6, 2019-24)

8 The study recognises the cross-boundary nature of rail freight and adopts a line of route approach to enhancements. This provides consistency across route boundaries and the alignment of outputs, ensuring the enhancements deliver the intended benefits to rail freight across the corridors.

Of the 11 corridors detailed, the key priorities, as identified by the freight industry, for investment in support of this are:

- Felixstowe to the West Midlands and the North via Ely
- Southampton to the West Midlands and West Coast Main Line
- Channel Tunnel
- Cross London flows including Essex Thameside
- Northern Ports and Transpennine.

Options for funders

This study sets out the short, medium and long-term schemes that have the potential to be funded, or part funded, in the period beyond 2019. Short-term schemes are taken to be those prioritised for completion in the next 10 years, including options for consideration in the next funding period (Control Period, CP6, 2019-24). Medium-term schemes are those expected for completion over approximately the next 20 years and long-term those for approximately the next 30 years. Such funding sources are likely to include dedicated funds from the United Kingdom Governments, but with the opportunity for more local or private sector funding in addition.

The full range of options for funders identified by this study and classified as short term is extensive and may not be affordable over this timeframe. During this document's consultation period, an exercise was conducted to consider the relative priority of short-term interventions. Criteria to score each individual scheme were developed, enabling all short term schemes to be ranked as being high, medium and other priority, based on the relativity of their individual scores.

The short-term priorities for investment, as categorised in Tables 2,3 and 4, have been agreed by the Freight Network Study Working Group. Following this prioritisation exercise, the development and implementation of individual schemes will still be subject to business case work, as required by funders.

Capacity

Schemes proposed as short-term priorities include those that are also likely to have passenger benefits and many that could be primarily driven by passenger demand. In the longer term, it is expected that significant investment will be required in order to accommodate overall rising demand and changes to each market sector. An example of a larger long-term project is the introduction of sections of four-tracking to the existing two-track railway between Carlisle and the Carstairs area.

The proposed short-term capacity enhancements for consideration as possible options for funders are shown in Table 2, categorised according to prioritisation.

Table 2: Short term capacity options for funders

Category	Priority and corridor	Scheme
Highest priority	1. Felixstowe to West Midlands & the North[9]	• Loop facility at Haughley Junction, including doubling of the junction • Headway reductions at Bury St Edmunds • Full doubling between Soham and Ely • Infrastructure works at Ely • Signalling enhancements Syston east Junction to Peterborough • Leicester area capacity
	2. Cross-London inc. Essex Thameside	• Cross London freight capacity
	3. West Coast Main Line	• Doubling of Stafford South Junction • Preston station area capacity enhancement and remodelling
	4. Southampton to West Midlands & West Coast Main Line	• Didcot East Junction to Oxford north Junction: Grade separation at Didcot East Junction and – Either: grade separation at Oxford North Junction and improvements at Oxford station – Or: four- tracking Didcot to Oxford
Medium priority	1. Felixstowe to West Midlands & the North	• Further doubling of the Felixstowe branch
	2. West Coast Main Line	• Dynamic down loop Tebay to Shap Summit in Cumbria • Dynamic up loop between Carlisle and Plumpton (near Penrith) • Dynamic up loop between the Eden Valley (near Penrith) and Shap Summit • Remodelling of Carstairs Jn to improve freight regulation • Reduction of headways on Northampton loop and remodelling of Northampton station to allow higher line speeds
	3. Northern Ports & Transpennine	• Transpennine freight capacity
	4. Cross-London inc. Essex Thameside	• Infill electrification Junction Rd Junction to Carlton Rd Junction and to London Gateway port
	5. Anglo-Scottish & Northern	• Dynamic loops on ECML at Grantshouse (near Berwick-upon-Tweed)
Other options	1. Anglo-Scottish & Northern	• 4 tracking existing 2 track railway in the Hare Park Junction area, south of Leeds • Edinburgh Suburban Line capacity improvements • Freight loop at Camperdown (north of Dundee) • Looping strategy for freight between Dundee and Aberdeen
	2. Channel Tunnel	• Electric traction capability for all Channel Tunnel routes, addressing the Redhill track circuit
	3. Northern Ports & Transpennine	• Level crossing enhancements: Teesport to Northallerton • Level crossing enhancements at East Boldon and Tile Shed for increased Tyne Dock traffic
	4. Southampton to West Midlands & West Coast Main Line	• Electrification of the diversionary route via Andover and potentially Eastleigh to Romsey[10]

9 Ely to Soham doubling and Leicester area capacity schemes were announced by Government to be funded for delivery in CP5 (2014-19) but have been deferred and are established priorities for delivery in CP6 (2019-24). Doubling refers to the provision of a two track railway in place of a single line.

10 Subject to electrification capability having been delivered on the core route via Winchester and north of Basingstoke

Capability

The Freight Network Study also considers schemes to enhance the capability of the infrastructure. These are schemes which have significant benefits for rail freight and, in some cases, also passenger services. These include an aspiration to reduce end-to-end journey times through increased line speeds, delivering significant energy savings, particularly on the West Coast Main Line. The industry has also established an aim to make 775m the minimum baseline for intermodal train length across the core network, exploring opportunities for greater lengths beyond this benchmark where feasible.

There are aspirations to increase the gauge of the core intermodal network to W10 and W12 standard. This will enhance the operational and economic advantages for rail freight, enabling it to carry taller shipping containers, accommodating a wider range of wagon and load unit combinations and increase network routeing options.

Table 3 shows the prioritised short-term gauge schemes, and Table 4 the prioritised short-term capability schemes (excluding gauge).

Projects (or programmes) identified in this study are at different stages of development and although costs are included where possible, this information is not available for all of them. As projects (or programmes) are developed further and costs and benefits become more defined, appraisals will be carried out in line with relevant appraisal guidance.

The production of this study has been facilitated by Network Rail on behalf of the Freight Network Study Working Group. The Working Group includes representatives from Governments, freight operators, trade associations, Transport for London, the Urban Transport Group, and the Office of Rail and Road as an observer.

A Draft for Consultation document was published in August 2016 with a three month consultation period, which closed in November 2016. A strong response was received during the consultation period, and we would like to thank everyone who provided responses. A summary of the responses received is provided in Chapter 10, and the content of this final document has been updated as appropriate to reflect the points raised.

Table 3: Short term gauge options for funders

Category	Priority and corridor	Scheme
Highest priority	1. Channel Tunnel	• W12 gauge clearance between the Channel Tunnel and Wembley via Maidstone and/or Tonbridge
	2. West Coast Main Line (WCML)	• WCML W12: Midlands Terminals to Wigan / Trafford Park • WCML W12: Wembley to Midlands terminals
	3. Northern Ports and Transpennine	• W12 Transpennine clearance
	4. East Midlands & Yorkshire	• W12 South Yorkshire Joint Line
Medium priority	1. West Coast Main Line	• WCML W12: Wigan to Coatbridge • W12 WCML to Grangemouth
	2. Felixstowe to West Midlands & the North	• Line of route gauge upgrade to W12, on the cross country route via Ely (subject to emerging market demands)
	3. Southampton to West Midlands & West Coast Main Line	• Bathampton Junction to Bradford Junction W8/W10 (Dundas Aqueduct) • W10 Diversionary Route via Westbury and Melksham
	4. Midland Mainline	• W12 London (Gospel Oak to Barking) to Bedford
Other options	1. Great Western Mainline	• W12 infill between London, Bristol and Cardiff
	2. Midland Mainline	• Infill W10 between London and Bedford
	3. South West & Wales to the Midlands	• Bristol to West Midlands W10

Note: Schemes listed for W10 enhancement will be also considered for W12.

Capability types (excluding gauge)	
Speed	Remove sections of low line speed for freight trains to: - reduce journey times - provide a more consistent speed profile - make better use of line capacity.
Loop entry and exit speed	Increase the speed of loop entry and exit to make better use of line capacity.
Heavy Axle Weight (HAW)	Remove speed restrictions for heavy axle weight traffic by addressing structures that carry the railway.
Train length	Provide infrastructure to allow increased freight train length enabling more commodity per train to be carried.

Table 4: Short term capability (excluding gauge) options for funders

Category	Priority and corridor	Scheme name
Highest priority	1. Cross-London inc. Essex Thameside	Cross London Heavy Axle Weights (HAW)
	2. West Coast Main Line	West Coast North loop entry and exit speed
	3. Felixstowe to West Midlands & the North	Anglia speed
	4. West Coast Main Line	Northampton station speed
	5. West Coast Main Line	West Coast West Midlands to North West speed
	6. Cross-London inc. Essex Thameside	London Gateway 775m train length
	7. Cross-London inc. Essex Thameside	Cross London speed
	8. Midland Main Line	MML North speed (from less than 60mph)
	9. Midland Main Line	MML South speed (from less than 60mph)
	10. West Coast Main Line	West Coast South loop entry and exit speed
Medium priority	1. Midland Main Line	Corby HAW
	2. Great Western Main Line	Acton speed
	3. Midland Main Line	MML South HAW
	4. Felixstowe to West Midlands & the North	Anglia HAW
	5. South West & Wales to the Midlands	West Midlands HAW
	6. Northern Ports & Transpennine	Transpennine HAW
	7. West Coast Main Line	West Coast HAW South
	8. West Coast Main Line	West Coast 775m train length North West to Scotland
	9. West Coast Main Line	West Coast 775m train length West Midlands to North West
	10. Anglo-Scottish & Northern	East Coast North HAW
	11. Northern Ports & Transpennine	North East and Humber HAW
	12. Felixstowe to West Midlands & the North	West Midlands 775m train length
Other options	1. East Midlands & Yorkshire	East Coast Speed North
	2. Felixstowe to West Midlands & the North	East Midlands HAW
	3. Northern Ports & Transpennine	North West HAW
	4. Northern Ports & Transpennine	East Lancashire HAW
	5. South West & Wales to the Midlands	Western speed
	6. Midland Main Line	Sheffield HAW
	7. Midland Main Line	MML North speed (from 60mph or above)
	8. Northern Ports & Transpennine	Immingham speed
	9. East Midlands & Yorkshire	East Midlands & Yorkshire HAW
	10. Northern Ports & Transpennine	Liverpool speed
	11. Midland Main Line	MML South speed (from 60mph or above)

1. Background

1.1 Long Term Planning Process

The Freight Network Study is a key output of the rail industry's Long Term Planning Process (LTPP), which has been designed to consider the role of the railway in supporting the UK economy over the next 30 years. The LTPP comprises a set of activities and documents 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 continuing rail investments
- Present funders with choices and options to accommodate demand and future aspirations.

The LTPP consists of a number of different elements, which seek to define the future capability of the rail network:

- Market Studies, which forecast possible future rail demand and develop conditional outputs for future rail services. These outputs are based on stakeholders' views of how rail services can support delivery of the industry and Government's strategic goals. The market studies include the Freight Market Study.
- Route Studies, which develop possible options for future services and for investment in the rail network[1]. 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, which considers possible options for services that run across multiple routes to make consistent assumptions in respect of these services.
- Network Studies (formerly Network Route Utilisation Strategy (RUSs)) look at issues affecting the whole national rail network and consider future capacity and technology-related issues for the railway.

The LTTP assumes the delivery of a new north – south high speed line (HS2); however, its scope is limited to the 'classic' (non-high speed) rail network.

The Rail Delivery Group (RDG) also develops strategy in a number of areas. The relationship between the LTPP, RDG work streams and the Periodic Review process is shown in Figure 1.1 below (the Network Study is referred to as 'Network Wide Studies').

1.2 Role of the Network Study

The Network Study considers issues which potentially affect the entire rail network of Great Britain. Its network-wide perspective is supported by a stakeholder group with wide expertise enabling the development of a consistent approach on a number of key strategic issues to support the planning of the future development of the network.

Six Network RUS documents have been published and established with the Office of Rail and Road (ORR). These documents are listed below and are published on Network Rail's website.

- Scenarios and long distance forecasts (published and established June 2009)
- Electrification Strategy (established October 2009)
- Stations (established October 2011)
- Passenger Rolling Stock (established November 2011)
- Alternative Solutions (established August 2013)

In addition to these RUS documents, where appropriate, Network Rail produces guidance documents, examples of these include Investment in Stations and Depots planning guidance.

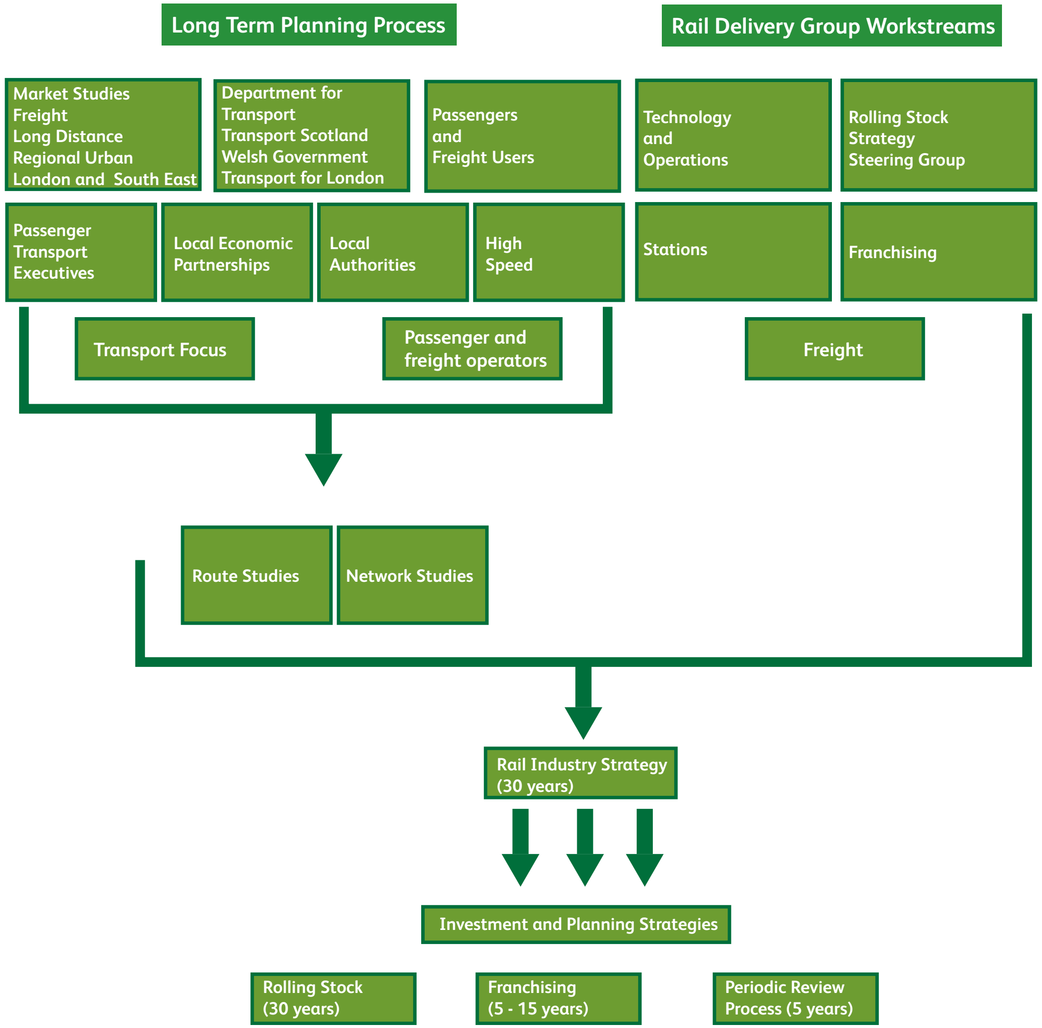
The Network Study enables the industry, its funders, users and suppliers to develop possible strategies, which are underpinned by a network wide perspective of rail planning. The development of such strategies ensures that issues, which by their very nature cross route boundaries, are dealt with consistently throughout the long-term planning framework, drawing upon best practice for different sectors of the railway.

1 Route Studies are broadly aligned to Network Rail's devolved routes, but have also been designed to reflect train operator franchise areas and timescales, resulting in a total of 12 route studies.

The purpose of the Freight Network Study is to develop possible options for future market demands and for investment in the rail freight network. These options will support rail freight expansion in Great Britain whilst stimulating wider economic growth and environmental benefits.

Options take account of demand forecasts from the Freight Market Study and recent market developments.

Figure 1.1: Periodic Review Process



1.3 Scope of the Freight Network Study

A previous iteration of the Freight Network Study was published in March 2007 and was titled the Freight RUS. This strategy brought together in one document the key strategic issues facing the future of rail freight and identified a strategy for accommodating growth and changes in current demand on the network. The 2007 RUS presented a view of the freight growth and alterations in existing traffic flows that could reasonably be expected to occur on the network by 2015. It presented a strategy to address the key issues arising in accommodating these changes.

The Freight Network Study considers the possible options for rail freight over the next 30 years and defines delivery priorities. Rail Industry Planning Group (RIPG), the governing body for Network Studies, proposed and agreed the following as the remit for the study:

1. Provide an overview of the current plans for the enhancement of the rail freight network in Great Britain
2. Propose a range of possible future capacity options for the enhancement of the rail freight network including a summary of Route Study recommendations
3. Consider the short and longer-term capability requirements to increase the availability and efficiency of the network, assessing the case for investment
4. Provide a range of possible options for investment over a number of key rail freight corridors for a 30-year period.

Baseline: This study takes, as its starting point, the current capacity and capability of the rail network to carry freight traffic. It reflects the extent of enhancements proposed to the network during the current Control Period 5 (CP5; April 2014 to March 2019), and those committed to be delivered shortly thereafter.

Gaps: The study identifies the freight capacity and capability of the railway likely to be required beyond currently committed schemes. It also outlines what measures may be required to meet forecast future demand for rail freight.

Options: This section proposes a range of possible choices for funders to meet the gaps outlined in the previous chapter. This includes an indication, based upon development to date, of the cost range and likely output of the schemes, where available.

Strategy: This section proposes the priorities for implementation from the range of options reported. The strategy seeks to balance the potential short, medium and long-term needs of the rail network to meet future growth and the requirements and aspirations of the rail freight industry. The strategy is intended to provide a series of possible options for investment in the industry that meet the needs identified.

1.4 Governance

1.4.1 Rail Industry Planning Group

The LTPP is designed to be as inclusive as possible with contributions encouraged from both the rail industry and wider stakeholders. Overall governance responsibility for the process lies with the RIPG, whose membership comprises:

- Department for Transport (DfT)
- The Freight Operating Companies (FOCs)
- Freight Transport Association (FTA)
- London TravelWatch
- Network Rail
- Office of Rail and Road (ORR)
- Transport Focus
- Rail Delivery Group (RDG)
- Rail Freight Group (RFG)
- Railway Industry Association (RIA)
- Rolling stock leasing companies (ROSCOs)
- Transport for London (TfL)
- Transport for the North (TfN)
- Transport Scotland
- Urban Transport Group (formerly Passenger Transport Executive Group)
- Welsh Government.

RIPG usually meets bi-monthly to provide strategic direction, informed challenge, and endorsement of the constituent publications of the LTPP.

1.4.2 Working Group

The Freight Network Study Working Group ('working group') consists of members of the following organisations:

- The Freight Operating Companies (FOCs)
- DfT
- FTA
- London TravelWatch
- ORR (in the capacity of observer)
- Network Rail
- Transport Focus
- Urban Transport Group
- RDG
- RFG
- RIA
- TfL
- TfN
- Transport Scotland
- Welsh Government.

1.5 Time horizon

In common with the rest of the LTPP, the Freight Network Study adopts a 30-year planning horizon. Whilst planning over 30 years clearly involves uncertainties, the approach is designed to provide flexibility in order to adapt to potential structural changes in the economy and changes to government social and environmental strategy. This enables the rail industry to respond to change over the long-term life of the assets used to operate the rail network and to avoid inefficient investments that are inconsistent with longer-term strategy.

1.6 Cross-boundary issues

A large proportion of freight trains cross the geographical boundaries of the Network Rail Route Studies. For example, an export automotive train travelling from a manufacturing facility in the North West or Midlands to Southampton Port could run through West Midlands and Chilterns, West Coast Main Line, Western and Wessex. Freight services that cross the boundaries of the Route Studies cannot, therefore, be addressed by individual Route Studies. Rather, it is necessary to co-ordinate the treatment of these services through a cross-boundary approach, to ensure that entire lines of route are considered holistically.

The Freight Network Study and the Route Studies use aligned, nationally consistent, assumptions. Where they have been established, the outputs of the Route Studies have been incorporated into this document.

In addition to providing a network wide perspective of the path[2] of a freight train, the cross-boundary methodology also encourages resilience across the network. For example, by exploring alternative options such as routeing traffic which typically uses the West Coast Main Line via the East Coast Main Line.

As part of the LTPP, a Cross-Boundary working group meets to receive and approve proposals from the Route Studies to amend the cross-boundary specification (for both passenger and freight services). It also advises on resolving capacity issues affecting more than one Route Study. As the Route Studies do not run in parallel, the cross-boundary process is a continuous one.

1.7 Document structure

Chapter 2 summarises the policy context and the relationship between the Freight Network Study and related policy issues that are being considered by the industry and its funders.

Chapter 3 summarises the market context for future development of the freight network.

2 A train 'path' is the schedule assigned to a specific train service along its route of travel

Chapter 4 presents the baseline for the study, current and future usage and committed enhancements.

Chapter 5 details the capability aspirations of the freight industry, highlighting how enhanced capability benefits both the rail freight industry and the wider rail network.

Chapter 6 considers the gaps between the current capacity of the network and what may be required in the future.

Chapter 7 summarises the gauge aspirations of the freight industry, identifying the gaps that currently exist between the network today and the aspirations for the future.

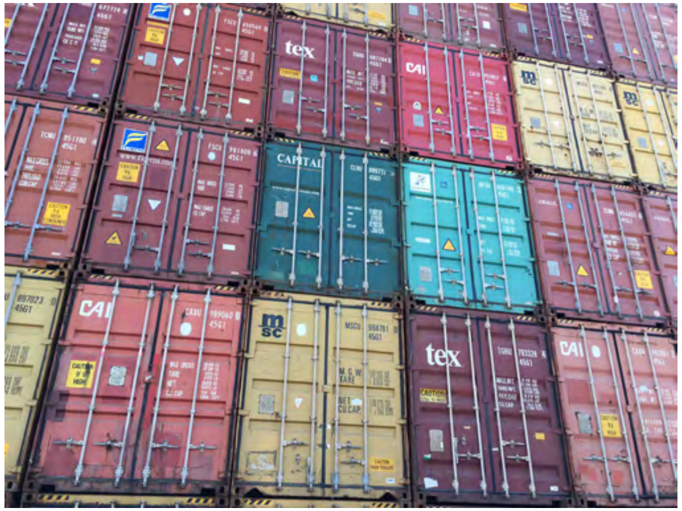
Chapter 8 summarises the potential priorities for funders which are proposed by the Freight Network Study to bridge the capacity and capability gaps, including gauge enhancement.

Chapter 9 presents the potential strategy itself. It covers the key considerations and possible options for a future rail freight enhancement programme.

Chapter 10 describes the consultation process and the revisions made to the document prior to final publication.

2. Policy and planning context

This section describes the evolution of rail freight policy in Great Britain. It also outlines the existing strategies where rail freight enhancement is considered, including the twelve geographic Route Studies.



2.1 England and Wales

A wide variety of commodities are carried by rail freight across England and Wales, to and from regions with distinct characteristics and demands on the network. This study considers these differences and reviews both established and emerging strategies developed by industry partners across the countries.

The Network RUS: Freight was published in March 2007 and set out a strategy to accommodate the forecast growth in rail freight over the next 10 years. Following the publication of the RUS, in 2009, the Department for Transport (DfT) published a document titled 'Strategic Rail Freight Network: The Longer Term Vision'. This document outlined the vision for a Strategic Freight Network (SFN), designed to optimise freight performance across the rail network, allowing the efficient operation of more, longer and selectively larger freight trains. The SFN defined interventions required to realise at least one of the nine core principles for investment:

- longer and heavier trains;
- efficient operating characteristics;
- seven-day/24-hour capability;
- W12 loading gauge on all strategic container routes;
- European (UIC GB+) loading gauge from High Speed 1 (HS1) to the Midlands;
- increased freight capacity;
- electrification of freight routes;
- development of strategic rail freight interchanges and terminals; and
- protection of strategic freight capacity.

These nine objectives underpinned the funders' choices of schemes in the freight element of the 2012 High Level Output Statement (HLOS) which set out what the DfT and the rail industry wanted to be achieved by the railway in England and Wales during Control Period 5 (CP5; April 2014 to March 2019). The baseline of committed rail freight enhancements is detailed in Chapter 4.

In September 2016, the DfT published its Rail Freight Strategy, setting out a vision for rail freight in the UK and identifying actions that Government, industry and others can take to support the industry to reach its potential. The Strategy identifies a number of priority areas for rail freight:

- Network capacity. It recognises the need for future investment in the network after 2019 and refers to the role of this study in identifying investment priorities. It refers to the need to ensure that the allocation of network capacity balances the needs of all users, including freight.
- Strategic capacity. The Strategy considered whether improvements to processes could improve the management and development of strategic capacity. In particular, the strategy discussed mechanisms to protect the outputs of freight enhancement schemes using 'Secured' Strategic Capacity.
- Innovation and skills. It recognises that ports intermodal and construction provide an opportunity for growth in order to help fill the gap left by rail's traditional bulk commodities. In addition to rail's traditional sectors, the Strategy highlighted the potential for new innovative services, such as delivering parcels into city centres using spare capacity on off-peak passenger services. It also highlighted how new technology could improve industry performance and provide a better service for customers.
- Track access charging. It refers to the ORR's review of track access charges from 2019. It recognises the environmental and road congestion benefits of rail freight and acknowledges that these benefits are not currently reflected in the track access charging regime. It recognises that further support from the Government for rail freight may be required in future, to reflect these benefits.
- Telling the story of rail freight. It refers to initiatives to improve communications, such as the development of a single portal for up to date information on rail freight.

The Welsh Government has stated its commitment to maximising the potential for rail freight, whilst recognising that responsibility and funding for rail infrastructure has not been devolved from the United Kingdom Government. It also promotes exploring methods of supporting modal shift from road to rail, including working with Network Rail and other industry partners as part of the Long Term Planning Process (LTPP), in order to maximise environmental and social benefits across Wales[1].

1 http://gov.wales/topics/transport/freight/wales-freight-working-group/?lang=en

Acknowledging that a single plan for freight across the North of England has never been produced before, Transport for the North (TfN) published a multi-modal strategy for freight and logistics during September 2016. Identifying 650 freight distribution sites employing 133,000 people across the North of England, TfN acknowledges the need for investment in the rail infrastructure, including train lengthening and gauge upgrades, in order to take advantage of increasing warehouse capacity and demand. Achieving this is consistent with the aims of the Freight Network Study and will require a collaborative approach from all parties over the duration of the plan. Recognising this, both TfN and the Welsh Government have signed a Memorandum of Understanding[2] with Network Rail to support collaborative working.

There is clearly strong policy support and an acceptance of rail freight as an economically and environmentally effective method of transporting goods.

To develop the freight network in England and Wales during CP5, £235m has been allocated to a SFN fund. The funding is governed by a SFN Steering Group, which comprises representatives from across the rail freight industry.

To ensure the delivery of this programme of works, and in order to successfully meet the challenges ahead, Network Rail is establishing a virtual route for freight and national passenger operators. This will stand alongside the geographical routes and better enable Network Rail to protect and enhance the interests of freight operating customers at a national level.

2.2 Scotland

Through executive devolution, Scottish Ministers have statutory powers to establish a freight strategy and specify funding outputs. Transport Scotland's rail freight strategy, which was published in March 2016, highlights the importance of freight for the competitiveness of the Scottish economy by providing a "safer, greener and more efficient way of transporting products and materials"[3] .

2 An official but not legally binding agreement

3 Delivering The Goods: Scotland's rail freight strategy published 22nd March 2016, http://www.transport.gov.scot/report/delivering-goods-scotlands-rail-freight-strategy-9044

The strategy includes four key themes:

- Innovation – new, efficient ways of delivering
- Facilitation – building strong, lasting partnerships
- Promotion – showcasing the benefits of using rail freight
- Investment – maximum return for whole system investment.

It identified the following critical success factors:

- A sustainable rail freight industry, with identifiable growth potential over time
- Creating increased opportunities for Scottish exports
- A high performing, resilient, strategic freight network for Scotland, fully aligned with cross-border flows
- Strong partnerships across the industry, focusing on doing the right things for customers
- High value returns on public and private investments.

In December 2008, Transport Scotland published its Strategic Transport Projects Review (STPR). The STPR indicated the Scottish Government's 29 transport investment priorities for the next 20 years and provided the basis for the funding options in the current funding (control) period. Six of these included schemes to increase the volume of freight transported by rail through the provision of infrastructure enhancements including:

- Rail enhancements on the Highland Main Line between Perth and Inverness
- Grangemouth road and rail access upgrades
- Rail enhancements between Aberdeen and the Central Belt
- Rail enhancements between Inverclyde / Ayrshire and Glasgow
- Enhancements to rail freight between Glasgow and the Border via the West Coast Main Line
- Inverkeithing to Halbeath Rail Line.

A Scottish Strategic Rail Freight Investment Fund of £31million was specified by Scottish Ministers in the High Level Output Specification for CP5. It was specified for improvement initiatives that encourage growth and productivity in rail freight, reduce emissions and road congestion. This has allowed funding contributions for schemes such as:

- Enhancement of Carmuirs Aqueduct, near Falkirk, which will contribute to enabling W12 gauge capability
- Electrification of the Grangemouth branch (in conjunction with the Rolling Programme of Electrification)
- Mossend (near Glasgow) capacity enhancement
- Route Availability enhancement of Waterloo Branch in Aberdeen
- Enhancement of Inverness Yard
- Signalling capacity enhancement on the Shotts line between Glasgow and Edinburgh
- Signalling capacity enhancement between Stonehaven and Aberdeen and provision of a south facing crossover out of Craiginches yard
- Central Scotland gauge capability and clearance.

The Scotland Route Study, which was established in July 2016, provides the medium term choices for funders with the purpose of accommodating forecast freight demand as well as providing a robust and resilient network. These options are reflected in this study.

2.3 European Freight Corridor

The United Kingdom is currently a member of European Rail Freight Corridor 'North Sea-Mediterranean'[4], under which the national infrastructure managers establish a 'pool' of pre-arranged paths for international freight services. At present, this Corridor applies to three 'classic' rail routes between the Channel Tunnel and London. Pre-arranged paths on these three routes are being advertised currently for use in the Corridor's 2017 Working Timetable. It is currently expected that, from 2018, paths to a further four destinations will need to be provided (subject to market demand). These designated locations are Felixstowe and Southampton ports and Glasgow and Edinburgh. No specific routes have been identified at present.

4 http://www.rfc-northsea-med.eu/

The corridor concept is intended to improve the competitive performance of rail freight across Europe by simplifying the procedures for establishing cross-border traffic. Market studies are produced to assess the likely future demand for rail freight traffic on these corridors and highlight capacity interventions to meet this expected demand in the future. In the case of the UK, this applies solely to rail freight services through the Channel Tunnel.

This study has considered the market for Channel Tunnel rail freight and the future investment that may be required for such services. The recommendations of this study represent what the rail freight industry in Great Britain believes to be the priorities for future investment to develop the market in this country. Network Rail will work with partner members of the Corridor to identify potential growth and any investment required to support this. The Management Board of the Corridor is a European Economic Interest Group for the purpose of seeking funding for future internationally driven capacity schemes.

Network Rail will continue to liaise closely with Government to ensure that any implications arising from the UK's withdrawal from the European Union (EU) are considered.

2.4 Trans-European Transport Network (TEN-T) objectives

The Trans-European Transport Network (TEN-T) is comprised of roads, railway lines, inland waterways, inland and maritime ports, airports and rail-road terminals throughout the existing 28 Member States of the EU which currently includes the United Kingdom. The TEN-T regulations define core passenger and freight rail networks on the existing and planned infrastructure of the Member States of the EU. The Member States are required to provide specified capabilities on these networks by 2030, or demonstrate that there is no socio-economic business case for doing so.

This study will consider which of the remaining gaps in delivering TEN-T objectives the rail freight industry in Great Britain views as priorities to deliver in the next 30 years.

Figure 2.1 below shows the core passenger and freight rail networks, as defined by the TEN-T regulations.

The objectives that primarily relate to future freight requirements and strategy are route availability and train length availability.

Figure 2.1 TEN-T core passenger and freight rail networks

Rail: Core Freight Network

Rail: Core Passenger Network

Rail: TEN-T Corridor

Route Availability
The TEN-T objective is that the entire Core Freight Network be able to accommodate 22.5 tonne axle loads at 100kph by 2030.

The ability to accommodate a 22.5 tonne axle load is the equivalent of the UK's RA8 standard. This document has assessed compliance with RA8 on all areas of the Core Freight Network and found the current infrastructure almost entirely meets the standard. There are two areas that do not:

- Ipswich – Felixstowe
- Swansea – Llanelli

Train Length
The TEN-T network requirement is that the entire Core Freight Network is able to accommodate 740m trains by 2030.

There is currently only one substantial section of the Core Freight Network that meets the TEN-T requirement: the West Coast Main Line from London to Crewe. In addition, short sections in the Swansea area, from Ipswich to Felixstowe and from Ashford to the Channel Tunnel also meet the requirements. During CP5, a scheme to increase train length on the route from Southampton to the West Midlands, via Reading, Didcot and Oxford, is being delivered, which will increase available train length to be compliant with TEN-T.

It should be noted that the bulk of the rail network in Great Britain will not meet the train length requirements of the TEN-T Core Freight Network, even following the implementation of funded schemes in CP5.

Electrification
A TEN-T objective is also further electrification of the network. Several routes for electrification identified within the TEN-T requirements also form part of the strategic freight network. The approach to future route electrification and upgrades will be set out in due course.

Line Speed
Connected to the route availability TEN-T requirement, all parts of the core network should also allow the operation of freight trains at 60mph by 2030. Analysis shows that most sections of the core network allow speeds greater than this, and that most of the gaps in this capability are for very short sections, such as those at junctions or through city centres. Key gaps include some short sections of the Felixstowe to the West Midlands and the North corridor, some parts of the route from Grimsby to Derby, and also parts of the Great Western Main Line in south Wales.

3. Market context

This chapter seeks to provide an overview of the rail freight market in Great Britain. It contains a summary of the benefits of rail freight and the role of the freight operators. Thereafter, it provides an overview of recent trends in the rail freight sector and of forecasts for the future, assessing the trends and forecasts for selected key commodities. Finally, the chapter details the freight flows on each of the 11 key corridors.

3.1 The benefits of rail freight

Rail freight is a key part of the national supply chain, serving a diverse range of sectors. The transportation of bulk goods remains a key strength of rail freight, while the burgeoning consumer goods market has driven significant growth in the intermodal sector (containerised goods, as discussed in Section 3.5.1). There have been a number of studies examining the benefits of rail freight to the national economy. Some of these benefits that have been identified include[1]:

- **Productivity** - the rail freight sector delivered productivity benefits for businesses of £1.1 billion in 2013/14
- **Congestion, environmental and safety** - the rail freight sector delivered £0.5 billion worth of such benefits in 2013/14 and rail freight produces 76% less carbon dioxide per tonne of cargo relative to road haulage[2] and each freight train removes up to 76 lorries from the roads
- **Efficiency** - On average, a gallon of fuel is able to move a tonne of goods 246 miles on the railway but only 88 miles by road[3]

There are also a number of facts which highlight the significance of the rail freight sector as a whole. These include:

- Between 2003/04 and 2013/14 freight train movements fell by 30% but freight tonnes lifted increased by 30%, resulting in an increase in tonnes lifted per train of over 80%
- Between 2003/04 and 2013/14 freight tonnes moved per staff member increased by over 60%
- Each year the major freight operators transport goods worth over £30 billion
- Rail freight moves one in four containers that enter the UK
- Overall the rail freight sector is estimated to remove 9.9 million Heavy Goods Vehicle (HGV) journeys and 1.5 billion HGV kilometres (kms) from the roads annually[4]

1 Source (unless otherwise stated): Rail Delivery Group (2015) Freight Britain

2 Network Rail (2013) Value and importance of rail freight.

3 Network Rail (2013) Value and importance of rail freight.

4 ORR data. This relates to 2014/15, the latest year for which data is available.

- Rail freight produces up to ten times less small particulate matter than road haulage and as much as 15 times less nitrogen oxide for the equivalent mass hauled.

In order for rail freight to continue to prosper and to increase its market share relative to that of road, it requires a network that enables it to offer a quality and competitive service to its customers. To support this, the rail freight industry has an objective to develop strategic rail corridors that provide for longer trains, enhanced gauge, quicker end-to-end journey times, increased axle weights and seven-day access to the network.

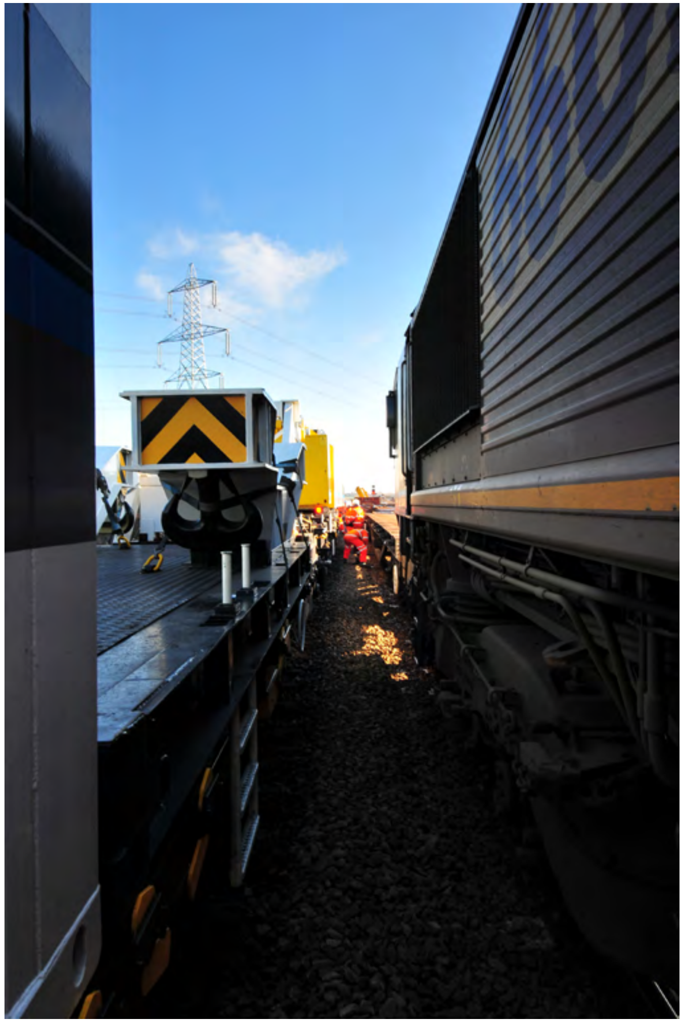
3.2 Rail freight operators

There are currently in excess of ten Freight Operating Companies (FOCs) licensed to run services on the network. Each operator is classified as 'open access', which means that they can bid to run services on any part of the national rail network.

The largest rail freight operators are currently Colas, DB Cargo UK, Direct Rail Services (DRS), Freightliner Heavy Haul, Freightliner Limited, and GB Railfreight.

Since the mid-1990s, the operators have invested over £2 billion in new locomotives, wagons and other capital equipment to enhance capacity and improve performance.[5] They have introduced new wagons to cater for new flows, for example wagons designed to handle biomass and aggregates traffic. They have also introduced new diesel locomotives to haul longer and heavier trains, from the now omnipresent Class 66 to the Class 70 'Powerhaul' locomotives for Freightliner and Colas, as well as DRS's Class 68 and electric/diesel Class 88 locomotives.

5 Rail Delivery Group (2014) Keeping the lights on and the traffic moving.

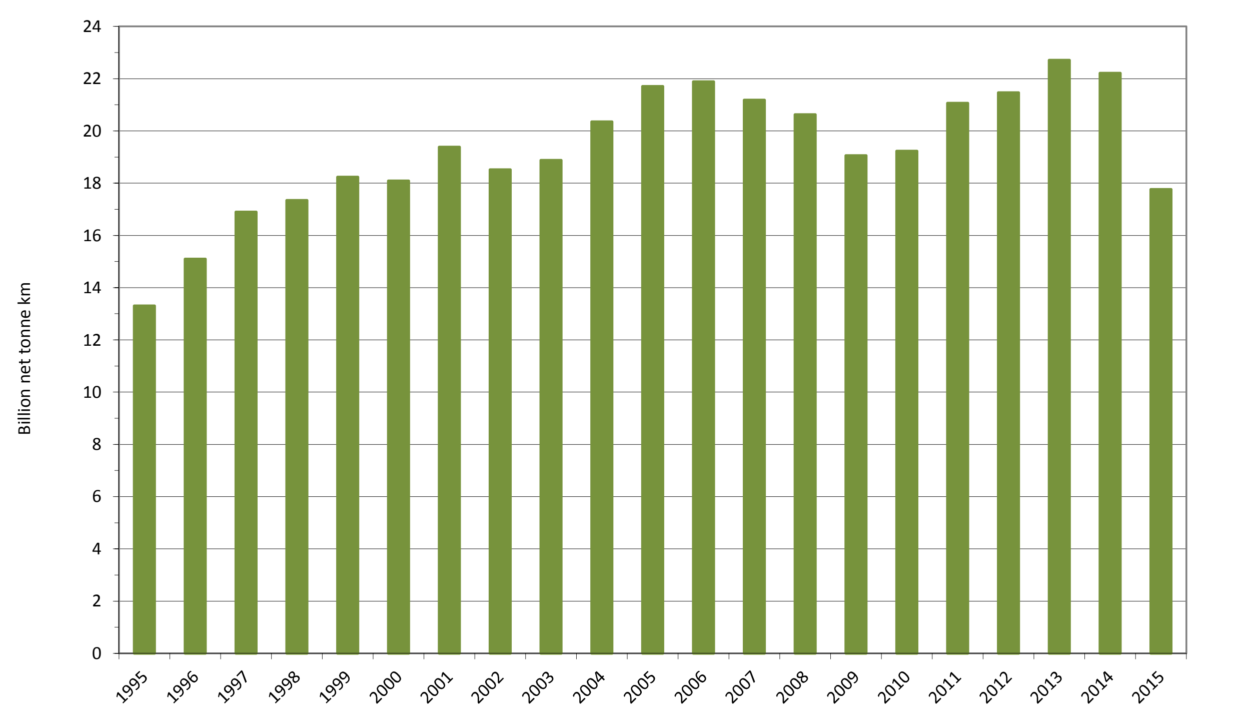


3.3 Recent market trends: an overview

The size of the rail freight market has increased significantly since privatisation in the mid-1990s. As shown in Figure 3.1 below, the total freight moved has increased, from about 13 billion net tonne kms in 1995/96 to approximately 22 billion in 2014/15. The reduction in 2015/16 to 17.8 billion is due to the decline of coal traffic, and is explained below.

These figures exclude Network Rail engineering traffic[7]; since this amounted to 1.7 billion tonne kms in 2015/16 (see Figure 3.2), the total including this traffic was approximately 19.5 billion net tonne kms in 2015/16.

Figure 3.1: Total rail freight moved in Great Britain: 1995 to 2015 [6]



6 Data is provided by the ORR and refers to financial years. Data excludes Network Rail engineering traffic.

7 Network Rail engineering traffic relates to the renewal, maintenance and enhancement of the rail network.

Figure 3.2 shows changes by commodity sector since 1998[8]. It shows that the fall in total rail freight volumes in 2015/16 is mainly due to the fall in Electricity Supply Industry (ESI) coal volumes. Coal volumes fell by 64% between 2014/15 and 2015/16. This reflects the doubling of the UK's top-up carbon tax in April 2015 and the closure of coal-fired power stations during this period.

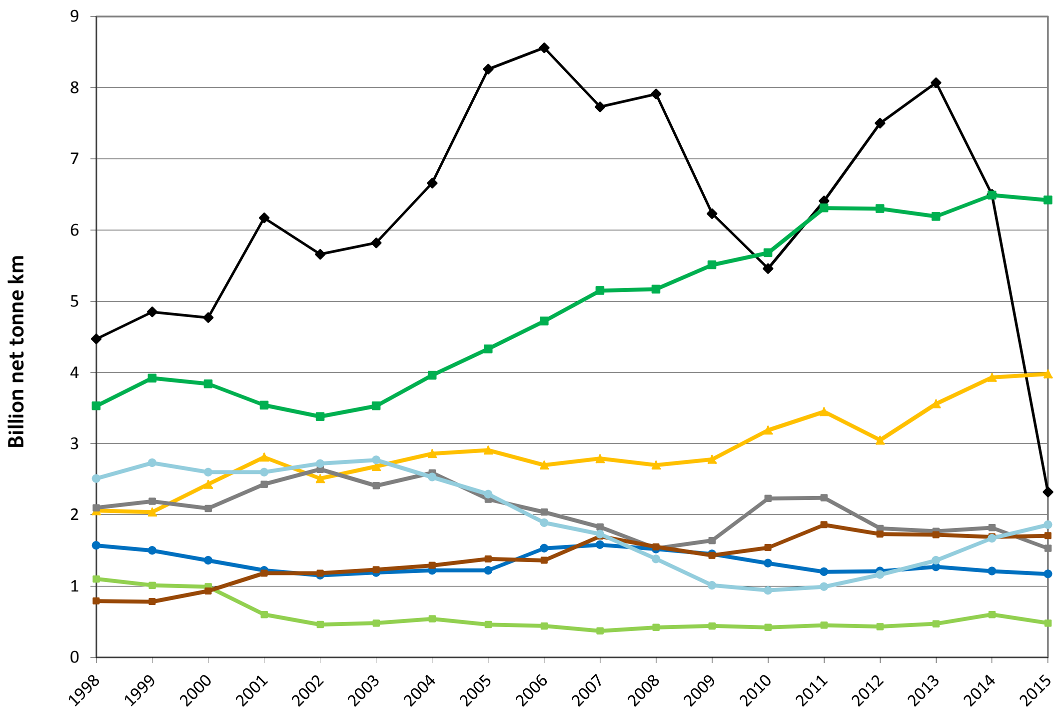
Figure 3.2 also reveals the growth in the intermodal and construction materials sectors since the early 2000s. By 2015/16, the intermodal sector was the largest commodity sector, followed by construction materials and coal.

The metals sector has declined since 2004/05. Channel Tunnel through rail volumes have had increased by 62% between 2007/08 and 2014/15 before declining by 20% in 2015/16 due to security problems. Network Rail engineering volumes have increased by 26% between 2006/07 and 2015/16. The 'Other' commodity sector has seen significant growth since 2010: this reflects growth in biomass and automotive volumes in particular.

The trends in recent years shown in Figure 3.2 represent the continuation of a structural change in the rail freight market, which first became evident over a decade ago.

Figure 3.2: Rail freight moved by commodity sector in Great Britain: 1998 to 2015

- Coal (ESI & other)
- Ports & domestic intermodal
- Construction materials
- Metals
- Petroleum
- Channel Tunnel through rail
- Network Rail engineering
- Other



8 Data is provided by the ORR and refers to financial years. Data by sector is only available from 1998. ORR data refer to Channel Tunnel through rail traffic as international traffic and refer to ports and domestic intermodal as domestic intermodal.

The size of the manufacturing sector has declined as a proportion of the national economy and there has been an increase in the volume of imported manufactured goods. This has affected rail freight in two ways:

- Traditional bulk markets for rail, such as ESI coal (both domestic and import) and raw material supply for domestic steel production, have diminished substantially
- The import of goods through major ports, particularly involving shipment from the Far East.

The net effect of these changes, together with the recent decline in flows linked to coal imports for the electricity supply industry, is that intermodal freight has become the largest single commodity sector conveyed by rail.

For rail to make this structural change, it has had to convert itself from a mode carrying largely low value, bulky goods to a mode serving a market increasingly influenced by fast moving consumer goods. In order to penetrate the retail market, rail has had to seek business in competition with road hauliers. This has required step changes in productivity and service standards (see Section 3.1), which rail has negotiated successfully, gaining market share relative to road. Rail freight must continue to ensure that it is able to adapt to the distribution requirements of the retail sector.

Similarly, this structural change has affected the geographic focus of rail freight. Whereas previously much of the freight traffic travelled on sections of the network with relatively low, or no passenger services, now more freight services require to travel towards population centres. This necessitates freight running on key passenger arteries, e.g. the East and West Coast Main Lines. This presents a capacity challenge, which this document seeks to address.

The volume of traffic on these busy corridors necessitates more regular maintenance possessions than is the case on lines primarily used by freight traffic. At the same time, traffic types such as intermodal are dependent on a high level of service continuity, since they form just one leg of a wider, often international, supply chain which frequently operates on a 'just in time' basis. Furthermore, unlike some bulk products, there is no scope for these commodities to be stockpiled in order to manage interruptions to deliveries.

As a result, it is essential that diversionary routes are available alternatives to the core route. It is an aspiration that these provide the same gauge and length capabilities. This is necessary to ensure that freight operators can continue to provide the service their customers require when the core route is unavailable due to essential maintenance works.

Between the early 1980s and the mid-1990s, rail's share of the market fell, but it has since increased its market share of the surface transport market from about 8 per cent to 11 per cent in 2010, in terms of tonne kms moved.[9] Nonetheless, road continues to dominate the domestic freight market, accounting for approximately 89% of the surface transport market, and 68% of the total domestic freight market (after allowing for coastal shipping and pipeline traffic).

3.4 Freight forecasts: an overview

As a component of the rail industry's Long Term Planning Process (LTPP), the Freight Network Study derives its forecasts from the Freight Market Study (FMS), which was established by the Office of Rail and Road (ORR) in early 2014 through an industry-recognised regulated process. The FMS was published by Network Rail in October 2013 and its forecasts were developed in collaboration with stakeholders, including rail freight operators, the Rail Freight Group, the Freight Transport Association and the Department for Transport. A public consultation on the FMS and forecasts was conducted in April 2013.

Future rail freight volumes were considered for the years 2023, 2033 and 2043. These forecasts considered the following commodity sectors: intermodal, ESI coal, biomass, construction materials, metals, petroleum, industrial minerals, chemicals, automotive, ore, domestic waste, non-ESI coal and Network Rail engineering. Three intermodal sub-sectors were considered: ports, domestic and Channel Tunnel; these are discussed further below. For all sectors, the FMS presented central case forecasts. For selected sectors, the FMS presented higher and lower scenarios to reflect some of the uncertainties involved.

The forecasts (i.e. the central case forecasts, and the higher and lower scenarios) have contributed to the Route Studies and to this Freight Network Study, in particular to the identification of gaps between the capacity and capability of the network and the projected levels of demand. Recent market developments since the publication of the FMS in 2013 (and since the forecast base year of 2011/12) have also been taken into account in this process.

9 Freight Market Study (2013).

The central case forecasts were based on certain assumptions, including the following:

- The forecasts were not capacity-constrained. The forecasts were produced without addressing the ability of the rail network to cater for the demand. It is these constraints that are addressed by this study.
- The UK and global economy experiences continued growth. This is significant, especially for the ports intermodal sector, which is linked to trade volumes, and to the domestic intermodal sector, which correlates with domestic economic activity.
- Labour and fuel costs increase during the forecast period in line with the DfT's appraisal guidance. This improves rail's competitiveness relative to road, given that drivers' wages and fuel costs are a lower proportion of total costs for rail.

Further details of the assumptions are shown in Appendix 4. The forecasts (including the scenarios) were based on MDS Transmodal's Great Britain Freight Model.

The central case forecasts for selected commodities are shown in Table 3.1.

The central case forecasts show strong growth in the intermodal and biomass sectors and modest growth in the construction materials sector. This growth is partly offset by a sharp decline in ESI coal. Overall, rail freight volumes are forecast to increase by around 3% per annum during the forecast period, assuming that there exists sufficient capacity on the network.

Table 3.2 shows the lower scenario forecasts for selected commodities and years. For intermodal, this assumed slower growth of rail-connected warehousing sites relative to the central case (see Appendix 4). For biomass, it assumed lower biomass conversion rates for power stations. The lower scenario forecasts showed lower growth in the intermodal and biomass sectors, although growth was still at high levels – over 4% per annum.

Noting that the FMS forecasts are unconstrained, the Department for Transport (DfT) assessed rail freight growth potential by commodity on a constrained network in their Rail Freight Strategy of September 2016. This assessment was neither intended to replace nor to be directly comparable with the FMS figures, and the rail freight industry endorsed the use of the FMS forecasts to inform future industry investment choices.

3.5 Recent trends and forecasts by commodity sector

3.5.1. Intermodal sector

The FMS central case forecasts show average annual growth to 2033 of 5.2% for ports and Channel Tunnel intermodal and 11.9% for domestic intermodal (see Table 3.1). These increases reflect the general assumptions listed above, particularly economic and trade growth and increases in labour and fuel costs. In addition, the growth reflects the assumption that rail-connected warehousing sites will expand significantly over the forecast period – see Appendix 4.

The FMS presented lower and higher growth scenarios alongside these central case forecasts. The lower scenario forecasts are shown in Table 3.2 and reflected slower growth in rail-connected warehousing sites.

As shown in Figure 3.2, ports and domestic intermodal volumes have increased by about 0.4% per annum on average between 2011 and 2015. This is significantly lower than implied by the FMS central case forecasts, although the FMS only includes forecasts for 2023, 2033 and 2043, not intermediate years.

This lower growth partly reflects much weaker than expected growth in deep-sea container trade volumes, with a small decline in volumes between 2011 and 2015.[10] It may also reflect current rail freight capacity constraints, which were not taken into account in developing the forecasts (see above). Constraints on the network including those due to delayed delivery of some enhancements may have contributed to slower than expected growth.

Further factors behind lower growth include fuel prices, wage growth and growth in rail-connected terminals all being lower than expected.

Diesel prices declined by about 17% between 2011 and 2015, while the forecasts assumed diesel price increases over this period.[11] Fuel costs are a much higher proportion of total costs for road than they are for rail, and it was the rise in oil prices that provided the initial stimulus amongst shippers for the modal shift from road to rail.

This represents a significant variance from the forecasts, and the

10 Department for Transport's Port Statistics. PORT0210. Data refer to GB totals in million tonnes for calendar years.

11 Department of Energy and Climate Change. Table 4.1.2: average UK diesel retail prices. There was a 2% increase between 2011 and 2012, followed by a 19% decline between 2012 and 2015.

reduction in fuel prices has stifled intermodal rail freight volumes.

The low rate of growth in rail-connected terminals is also a relevant factor in explaining the lower than forecast growth in ports and domestic intermodal volumes. Rail-connected terminals are a key enabler in delivering growth in intermodal traffic, and without a substantial increase in the current number (and total area) of rail-connected warehousing sites across Great Britain, significant growth will not be delivered.

Make-up of the intermodal sector

Within the intermodal sector, the main sub-sector is ports intermodal: intermodal flows between UK ports and inland terminals. This sub-sector accounts for approximately 80% of total intermodal tonne kms[12].

Key movements include trains out of the ports at Felixstowe and Southampton towards the Midlands, Yorkshire, the North-West and Scotland.

The second most important intermodal sub-sector is domestic intermodal: intermodal flows between terminals, which are not related to international trade. This sub-sector accounts for approximately 18% of total intermodal tonne kms. These flows are currently dominated by retailer related traffic.

Table 3.1: Freight Market Study (2013) central case forecasts for rail freight in Great Britain

Commodity sector / sub-sector	Actual billion tonne kms in 2011	Forecast billion tonne kms in 2023	Forecast billion tonne kms in 2033	Forecast billion tonne kms in 2043	Forecast average annual growth 2011 to 2033
Ports & Channel Tunnel intermodal	5.3	11.0	16.1	21.7	5.2%
Domestic intermodal	1.1	7.1	13.4	21.2	11.9%
Electricity Supply Industry (ESI) coal	5.8	1.6	0.6	0.6	-9.9%
Biomass for ESI	0.2	2.3	2.3	2.3	13.2%
Construction materials	3.5	3.6	4.2	4.7	0.9%
Network Rail engineering	1.9	1.7	1.7	1.7	-0.5%
Other	5.1	5.2	5.4	5.5	0.3%
Total	**22.9**	**32.5**	**43.7**	**57.7**	**3.0%**

Notes: Other includes metals, petroleum, ore, industrial minerals, non-ESI coal, domestic waste, chemicals and automotive sectors. Forecasts for each of these sectors are shown in the FMS. Years refer to financial years.

Table 3.2: Freight Market Study (2013) lower scenario forecasts for rail freight in Great Britain

Commodity sector / sub-sector	Actual billion tonne kms in 2011	Forecast billion tonne kms in 2023	Forecast billion tonne kms in 2033	Forecast average annual growth from 2011
Ports & Channel Tunnel intermodal	5.3	N/A	14.6	4.5% (to 2033)
Domestic intermodal	1.1	N/A	9.2	10.1% (to 2033)
Biomass for ESI	0.2	1.7	N/A	21.9% (to 2023)

12 Freight Market Study (FMS) data for the base year (2011/12).

The third sub-sector is Channel Tunnel intermodal: international intermodal train services which use the Channel Tunnel and connect to inland terminals within the UK. These are included within the 'Channel Tunnel through rail' category shown in Figure 3.2. This sub-sector accounts for approximately 2% of total intermodal tonne kms.

Taking account of the weak growth in intermodal volumes since 2011 and discussions with stakeholders, the FMS central case intermodal forecasts will be challenging to meet. The forecast scenarios for the intermodal sector (and other sectors) will therefore be kept under review, in the context of market developments and changes in key assumptions such as oil prices and trade growth. Irrespective of the specific forecasts, significant intermodal growth can continue to be expected over the forecast period, assuming sustained economic and trade growth over this period.

Key issues for the intermodal sector, which are considered by this study, include:

- Remaining sections of single track between Felixstowe and Ipswich which constrain growth
- Train lengthening and improved gauge clearance to improve the competitiveness of rail freight in the market
- Electrification of further core routes to improve rail's competitiveness.

3.5.2 Electricity Supply Industry (ESI) coal sector

The FMS central case forecasts showed that ESI coal was forecast to fall from 5.8 billion tonne kms in 2011 to 1.6 billion tonne kms in 2023 and 0.6 billion tonne kms by 2043 (see Table 3.1). The energy generation market is strongly influenced by UK Government policy and a reduction of coal use in the electricity supply industry had become public policy. The forecasts were based on the Department of Energy and Climate Change's projections of energy use, published in October 2012.

Figure 3.2 shows a sharp fall in coal volumes (ESI and non-ESI) in 2015/16. This official data suggests that most of the decline in coal volumes forecast to occur by 2023/24 has already taken place by 2015/16.

Discussions with stakeholders suggest that the demand for coal is expected to become a more seasonal market, limiting the coal distribution opportunities for rail.

Due to the reduction in coal volumes across the network, the potential exists for the rail industry to use the spare resources in another form, ranging from train paths, assets such as coal hoppers, and power station land usage to take advantage of existing rail connections. Additionally, maintenance strategies, volumes and possession requirements may enable an improved freight performance should a more seasonal coal demand occur.

3.5.3 Biomass sector

The biomass sector only emerged as being potentially significant for rail in 2010. It has the potential to grow as a rail market and major investment is already taking place in rail-based supply chains. There is, however, considerable uncertainty around the volume of biomass likely to move by rail to fuel power stations during the forecast period. The uncertainty is driven by government energy policy which is directly linked to the conversion of existing coal fired power stations. As with ESI coal, the biomass forecasts reflected government energy policy at the time that the FMS was prepared.

As shown in Table 3.1, the FMS central case forecasts projected that by 2023, biomass rail freight volumes would amount to approximately 2.3 billion tonne kms and would exceed ESI coal volumes, reflecting the switching of some power stations from coal to biomass. It should be noted that biomass has a lower calorific value than coal and, therefore, requires a greater volume of rail freight per unit of electricity generated.

The FMS presented lower and higher growth scenarios alongside these central case forecasts. The lower scenario forecast for 2023 is shown in Table 3.2.

The official data in Figure 3.2 does not show biomass separately. The 'Other' category includes biomass, which probably accounts for most of the growth shown in this category. Industry sources indicate that biomass volumes have increased significantly since 2011, albeit that they are not anticipated to come close to reaching the volumes attained by coal. Discussions with stakeholders suggest that the FMS central case forecasts are unlikely to be met.

A key challenge for rail is how to facilitate biomass flows from ports such as Immingham, Tyne, Liverpool and Hull to key power station destinations.

3.5.4 Construction materials sector

The FMS indicated that the construction materials sector is expected to show consistent slow growth over the next 30 years. The FMS central case forecasts in Table 3.1 show growth in this sector of approximately one per cent per annum to 2033. This growth reflected labour and fuel cost increases and projected population growth. The forecast increases did not take full account of projected increases in infrastructure spending. The central case forecasts therefore probably understate growth prospects for this sector.

To address this concern, a higher growth scenario has been developed by the Network Study Working Group. This was not included in the FMS, but was developed following discussions within the group and with the Mineral Products Association (MPA).

The higher scenario for this sector reflects forecast growth in infrastructure expenditure and a projected increase in rail's market share. Examples of this include High Speed Two (HS2), Highways England's investment programme, new nuclear power stations and increased house building are all expected to contribute to growth in infrastructure spending, and all present opportunities for rail freight. Rail's market share is projected to increase as the trend towards larger (rail connected) quarries is expected to continue.

The higher scenario shows average annual growth of about 2.8% per annum, from 3.5 billion tonne kms in 2011 to 6.4 billion by 2033. This compares with growth of approximately 1% per annum under the central case (see Table 3.1).

Figure 3.2 shows strong growth in construction materials volumes over recent years. Between 2011 and 2015 average annual growth was 3.6%, more in line with this higher scenario than the central case forecast.

The key issues for construction sector growth are (i) the availability of railhead sites in London, the South East, and principal cities nationwide and (ii) the capability of existing sites to accommodate optimal trains.

3.5.5 Automotive sector

The FMS also suggested that the automotive sector, for finished vehicles, is expected to show modest growth over the next 30 years. The FMS central case forecast for this sector shows growth of 0.8% per annum on average to 2033. This growth is included within the 'Other' category in Table 3.1. It is a small part of this category, accounting for 0.1 billion tonne kms in 2011/12.

The official data in Figure 3.2 does not show the automotive sector separately. The 'Other' category includes a small proportion of automotive traffic. Industry sources indicate that automotive volumes have increased over recent years (since 2009), well in excess of the modest growth forecast by the FMS. This has been driven by an upturn in global demand for UK manufactured vehicles that satisfy demand for luxury brand vehicles in emerging economies. This growth has been matched by domestic demand for imported vehicles. Rail currently holds around a 10% market share of export and import finished vehicle movements, with certain rail connected automotive plants dispatching up to 40% of their finished vehicle volume by rail.

The FMS did not include a higher scenario for this sector and the Network Study Working Group has not defined such a scenario since the FMS was published. However, discussion with stakeholders since the publication of the FMS in 2013 suggests that automotive traffic could double over the next decade. These discussions suggest that the FMS central case forecasts understate the growth prospects for this sector.

In addition to capacity constraints, a number of other factors limit the sector's growth potential, including:

- Lack of storage space at both manufacturing locations and ports necessitates that consistent throughput of vehicles is essential
- The availability and physical limits of rail wagons can limit aspirational demand
- Road haulage remains competitive in cost terms, although rail benefits from a higher yield of vehicles moved
- There is a lack of incentive for FOCs or third-parties to invest in wagons, locomotives and terminals because of the fixed timescale of standard logistics contracts
- The capability and connectivity of the rail network can be restrictive. For example, further opportunities for rail growth within automotive sector opportunities will be frustrated without the development of either rail connections directly into, or facilities adjacent to, three of the UK's principle manufacturing plants (Nissan at Sunderland, Toyota at Burnaston, near Derby and Jaguar Land Rover at Solihull, West Midlands)
- The risk of damage through vandalism in transit remains, despite ongoing mitigation work.

A key aspiration amongst rail users and customers in the automotive sector is the exploration of increased capability of the national rail network, including accommodation of longer trains with greater payload capacity, enhancements to loading gauge, electrification of core routes and increased capacity.

In future, closer collaboration between Network Rail, the Rail Freight Group, operators, third-party logistics suppliers, facility operators, manufacturers, developers and automotive trade bodies will help to capitalise on the sector's potential growth. Reducing costs, development of automotive wagons and integrating strategy will be priorities.

3.5.6 Emerging Markets – Express Freight & Urban Logistics

In addition to the above established rail freight commodity sectors, operators are exploring new markets; a key example being the express rail freight sector.

Operationally similar to existing Royal Mail services and utilising traction and rolling stock with passenger running characteristics, conceptually this sector will exploit the superior transit speed offered by rail over road to affect faster and more carbon efficient movements of parcels and retail/consumer goods.

Such express services would typically operate between rail served hubs but could also involve the servicing of key population centres where there is an opportunity to use existing city centre passenger stations outside peak hours. More generally, higher speed rail freight operations has a potentially significant role to play in achieving a lower carbon solution for retail and commercial logistics into congested urban centres, with electric last mile delivery thereon.

With two successful concept-proving trails of express freight services in the last five years utilising London Euston station, Network Rail are positively engaged with the key proponents in this emerging market.

Another potential new market for rail freight is airborne freight traffic. There exist opportunities for rail to replace, or support, airborne traffic. In addition to city centre passenger stations and nodal yards, airports could become potential origins/ destinations for rail freight.

3.5.7 Rail Connections

Section 3.5.1 notes the importance of developing rail-connected terminals to support growth in intermodal traffic. This principle applies to all traffic types, not just intermodal. A key example is construction, where demand for rail freight is growing, and an increase in the number of rail connected aggregate and cement handling sites is required to ensure the growth can be realised.

Given the costs associated with connecting a new site to the network, existing rail-connected sites have an intrinsic value. Therefore, this study promotes the protection and potential re-use of disused rail-connected sites, e.g. former power stations, and requests that local authorities consider this as part of their planning policy.

3.6 Key freight corridors

The nature of the freight market means that certain rail corridors are of vital importance for particular commodities, with flows of goods correlated to shipping movements, industry and wider market forces. In order to ensure that the Freight Network Study sets out an effective, long-term vision for the future of the rail freight sector, the Study focusses on the movement of freight across the eleven key corridors, as shown in Table 3.3.

Table 3.3: Key freight corridors and current commodities

No.	Corridor	Key commodities
1	West Coast Main Line	Ports & domestic intermodal, Automotive, ESI Coal, Biomass, Construction materials, Mail and Timber
2	East Midlands and Yorkshire	ESI Coal, Biomass and Ports Intermodal
3	Felixstowe to the West Midlands and the North	Ports & domestic intermodal and Construction materials
4	Southampton to the West Midlands and the West Coast Main Line	Ports & domestic intermodal and Automotive
5	Channel Tunnel	Automotive, Channel Tunnel intermodal and Metals
6	Cross London, including Essex Thameside	Ports & domestic intermodal, Construction materials, Automotive and Mail
7	South West and Wales to the Midlands	Construction materials, Metals, Petroleum and Ports & domestic intermodal
8	Northern Ports and Transpennine	ESI Coal, Biomass, Ports intermodal, Petroleum, Construction materials, Waste and Metals
9	Midland Main Line	Construction materials, ESI Coal, Automotive, Metals, Petroleum and Ports intermodal
10	Great Western Main Line	Construction materials, Ports intermodal, Metals, Petroleum, Automotive and Waste
11	Anglo-Scottish and Northern regional traffic	Ports & domestic intermodal, ESI Coal, Construction materials, Timber, Waste and Biomass

Note: The corridors are not intended to be mutually exclusive, and there is overlap. For example, a train from London Gateway could use Corridors 3 and 6.

4. Baseline

4.1 Baseline position

The baseline freight network adopted for this Freight Network Study includes the schemes that comprise Network Rail's Control Period 5 (CP5) Enhancements Delivery Plan. This includes a number of freight schemes, some of which are funded through the Strategic Freight Network (SFN) fund, but also other enhancement schemes that will provide benefits to rail freight.

Baseline capacity and capability schemes funded in CP5 through the SFN fund include:

- Southampton to the West Midlands freight train lengthening
- Felixstowe Branch capacity enhancement
- Northern Ports and Transpennine Capacity: Port of Liverpool freight capacity
- Ipswich Yard capacity enhancement
- Great Western Main Line W12 gauge clearance of the Severn Tunnel
- Creation of a nodal yard at Ripple Lane West near Barking, East London
- Peak Forest train lengthening
- East Coast Main Line W12 gauge clearance
- North Lincolnshire resignalling enhancement.

Baseline schemes with freight benefits (non-SFN funded) include:

- Stafford Area Improvement Scheme, including Norton Bridge grade separation
- Enhanced capacity in the Reading Station area as part of the station redevelopment scheme
- Gospel Oak to Barking electrification
- Bedford to Kettering capacity
- Oxford Corridor Capacity Improvements
- Electrification of the Falkirk to Grangemouth branch (in conjunction with the Scottish rolling programme of electrification)
- Mossend Yard capacity enhancement, near Motherwell.

Following Sir Peter Hendy's review into Network Rail's enhancement programme in late 2015, some CP5 Enhancements Delivery Plan schemes were deferred to CP6. Projects with freight benefits that have been deferred to CP6 are assumed to be delivered and form part of the baseline position. Schemes which are assumed to be deferred include:

- Leicester Area Capacity enhancements
- Ely to Soham track doubling
- Syston to Stoke gauge clearance
- Grade separation of Werrington Junction on the East Coast Main Line[1].

The output of the Freight Network Study is to describe the interventions needed, over and above this baseline position.

4.2 Capability baseline

Sections 3.2 and 3.3 detailed a profile of the current freight market and the baseline level of demand. To enable freight operators to deliver a commercially viable service to their customers, they require high quality paths, whereby the network has the capability to enable the running of trains of appropriate gauge, length and weight, and at a competitive journey time. Availability of such high-quality freight paths is critical to operators' business models. Current infrastructure constraints in relation to speed, length, weight and gauge restrictions affecting key corridors are set out in this section in order to establish the baseline level of capability, against which this study sets out options for improvement.

1 The full list of the revisions to the CP5 Enhancements Delivery Plan can be found in 'Report from Sir Peter Hendy to the Secretary of State for Transport on the replanning of Network Rail's Investment Programme'; November 2015.

4.2.1 Average speed

Reduced end-to-end journey time is a crucial factor in enabling rail freight to offer a viable alternative to road haulage and in encouraging modal shift to rail. At present, end-to-end journey time of freight flows on some key corridors can be very long and average speed very low, restricting rail freight's ability to offer a competitive service and price to its customers. The key drivers of reduced end-to-end journey time are the line speed capability of the infrastructure and the quality of the train path (in terms of minimising the number and duration of stops made in passing loops). in terms of maximum line speed and the number of sections of low line speed (e.g. permanent speed restrictions).

Improvements to line speed capability can includes both increasing the maximum line speed on a route and reducing the number of sections of low line speed (e.g. permanent speed restrictions). The latter is particularly critical, since if a heavy freight train is required to slow to a low line speed (e.g. 15mph to enter a loop), accelerating back up to full speed takes considerable time.

The tables below give two examples of restrictive average speeds based on actual train performance, highlighting the current reality of end-to-end journey times and the need for this study to provide an aspiration to increase average speed.

Table 4.1 Immingham – Drax Biomass: Average Speed on 55 trains	
Origin	Immingham Biomass Loading Point
Destination	Drax power station
Average Journey Speed	17mph
Distance	58.5 miles
Maximum Average Journey Speed	26mph
Minimum Average Journey Speed	9mph
Sample	All (55) trains between 24/11/2015 and 30/11/2015

Example 1 - Biomass train for electricity generation travelling from Immingham port in Lincolnshire to Drax Power Station, near Selby, in North Yorkshire.

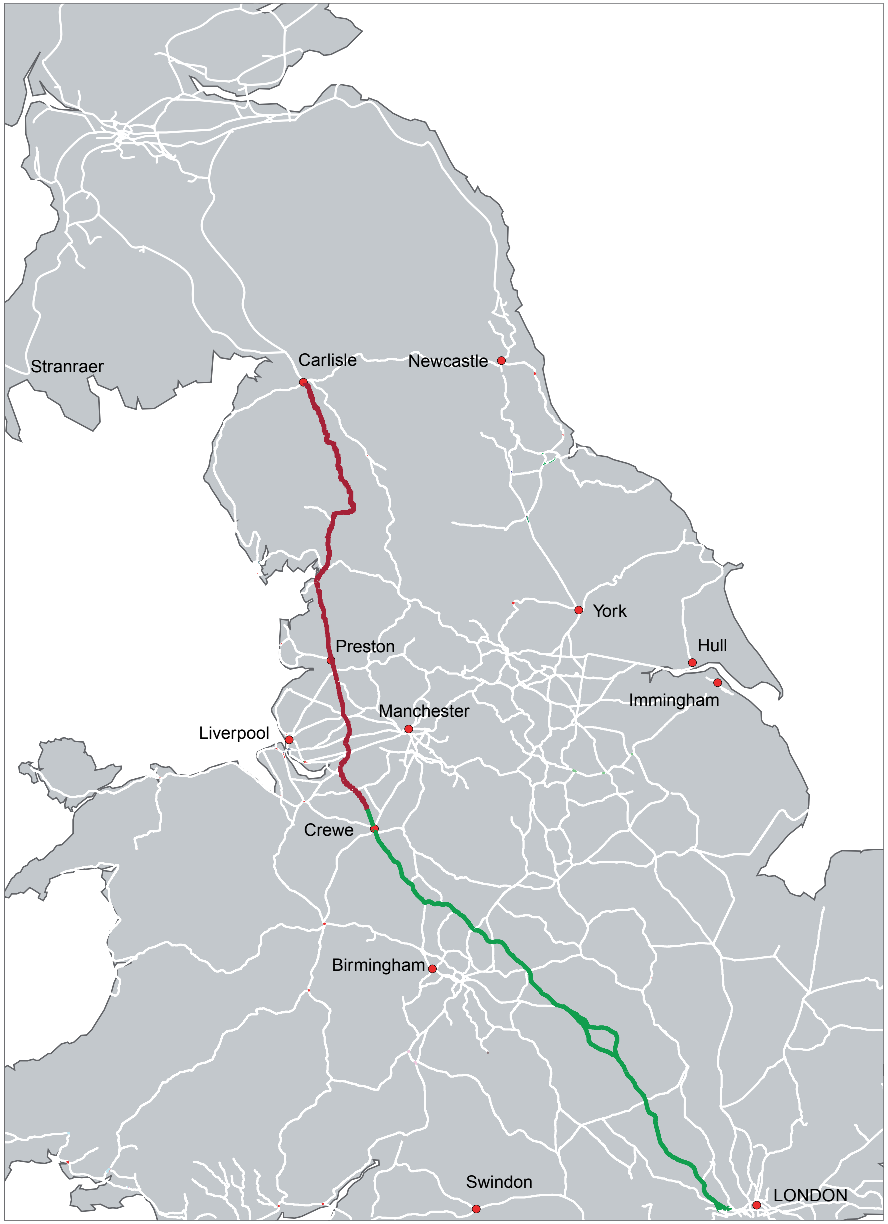
As the biomass sector continues to grow, it is important to ensure reliable average speeds increase. At present, the slowest train over the course of a week averaged 9mph between Immingham and Drax Power Station. The fastest still took 2 hour 16 minutes, averaging 26mph. The same journey by road would typically take around an hour. The majority of biomass services departed Immingham overnight or outside of peak hours, with just 12 out of 55 trains departing between 0900 and 1800.

Example 2 - Intermodal train travelling from one of the south-eastern ports to terminals in the North West.

Analysis of average speeds in the down direction between Norton Bridge and Winsford in Cheshire highlights that the section of the West Coast Main Line around Crewe is a speed constraint to freight services. Although one freight service averaged 73mph, 24 out of 26 trains had average speeds below 50mph, with the slowest train taking over four hours to cover less than 27 miles, averaging just 7mph.

Table 4.2 West Coast Main Line Northbound through Crewe: Average Speed on 26 trains	
Origin	Norton Bridge
Destination	Winsford
Average Journey Speed	25mph
Distance	26.7 miles
Maximum Average Journey Speed	73mph
Minimum Average Journey Speed	7mph
Sample	26 freight trains between 14/12/2015 and 16/12/2015

Figure 4.1: Baseline train length position for West Coast Main Line



4.2.2 Length limits

Another key driver of rail freight's advantage relative to road is its ability to carry a greater volume of goods per journey. Where the length of trains is restricted by infrastructure limitations, this competitive advantage is diminished.

Relatively light goods, primarily intermodal and automotive, are the main beneficiaries of longer trains as the traction power necessary to haul them is more readily available. For intermodal trains, the current aspiration is to achieve a length of 775m (including locomotive), and this is formalised as the baseline for all SFN train lengthening schemes. A long-term aspiration exists across the industry to research the possibility of running trains of even greater length, for example 1500m for automotive trains.

By contrast, for heavier commodities such as aggregates, the tractive capability of locomotives and coupling strength are more of a constraint on train length, with 450m trailing a more typical train length for the construction sector, and 600m a long term aspiration.

The primary infrastructure constraint on train length is the ability to fully accommodate trains at regulating points, such as within loops or on chords, without affecting trains on other tracks (or blocking level crossings). Network Rail publishes length limits for all of its routes. These represent the maximum length of train that an operator can expect to run, provided a suitable path can be identified within the timetable.

A process exists to allow operators to exceed the published length limit on some nominated services. This is known as the Service Plan Review (SPR) process. In addition to identifying a suitable path, it must be demonstrated that the over-length train does not have an adverse impact on network performance. This is achieved by operating at the enhanced length for an agreed trial period.

Even if a train complies with the length limit, not all of the regulating points along the route will necessarily be able to accommodate it. As a result, the published length limit represents a trade-off between ensuring there are sufficient locations available to regulate full-length trains and maximising the train length that operators can run without the procedural burden of the SPR process. The ability to achieve the desired timetable pattern and the impact on network performance are key considerations when determining length limits.

This study treats 775m as the baseline train length which new and enhanced infrastructure should accommodate. However, where this is not achievable, it is still an aspiration to maximise the possible train length given the local constraints. A shorter loop will not necessarily reduce the overall length limit of the route, only the length of trains that can be regulated at that point.

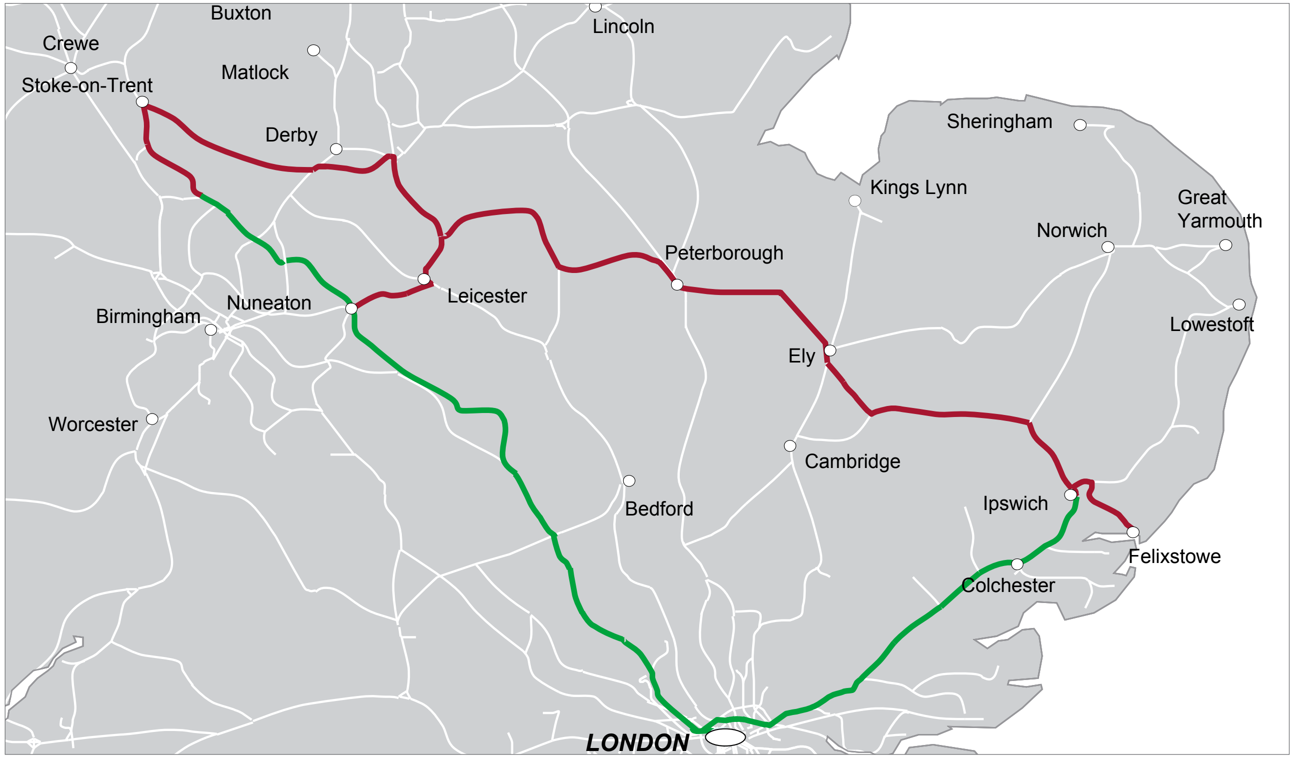
Train length capability is also reliant on adequate loading and unloading facilities at ports and terminals, highlighting the need for integration across the industry. A high-level study of the potential to form longer trains using nodal yards, for example between Crewe and the Scottish Central Belt, may facilitate additional long-term capability where port and terminal facilities are not capable of handling longer trains. The concept of nodal yards is discussed further in Section 5.4.6.

The maps below show the baseline position, i.e. the current committed 775m capability at the end of CP5[2], for the four primary intermodal corridors. It is important to note that 775m trains may be able to run on sections that are not 775m certified if authorisation is obtained through the SPR process.

Figure 4.1 shows that 775m trains are cleared as far as Winsford Junction, north of Crewe on the West Coast Main Line.

2 Including freight schemes deferred to CP6, as noted in Section 4.1

Figure 4.2: Baseline train length position for Felixstowe to the West Midlands and the North

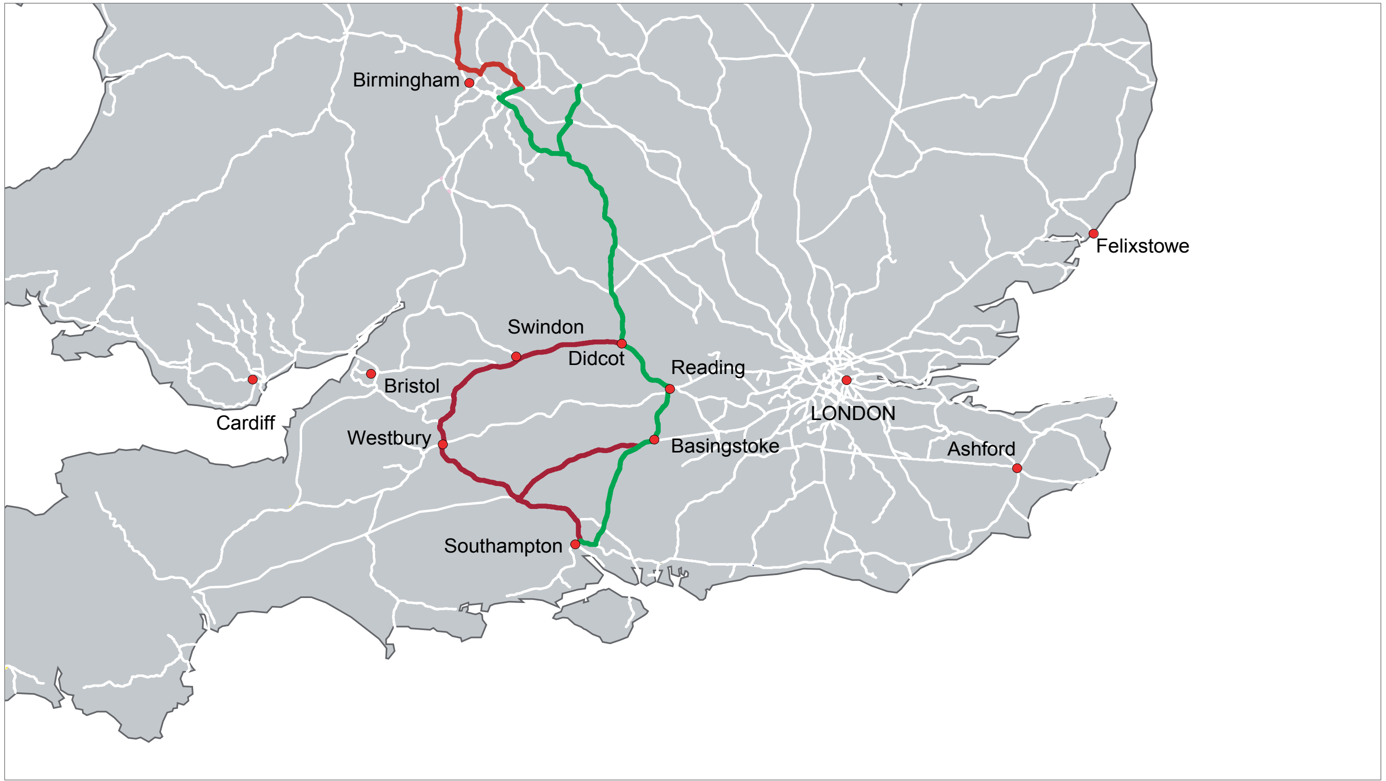


Route cleared for 775m trains

Route not cleared for 775m trains

Although the Ipswich Chord is cleared for 775m trains, constraints across the Felixstowe to the West Midlands and the North route limit train lengths meaning that traffic is not cleared for 775m at present. There is, however, an alternative routeing option available using the Great Eastern Main Line, North London Line and West Coast Main Lines, which are 775m cleared (subject to yard and terminal constraints).

Figure 4.3: Baseline train length position for Southampton to the West Midlands and the West Coast Main Line

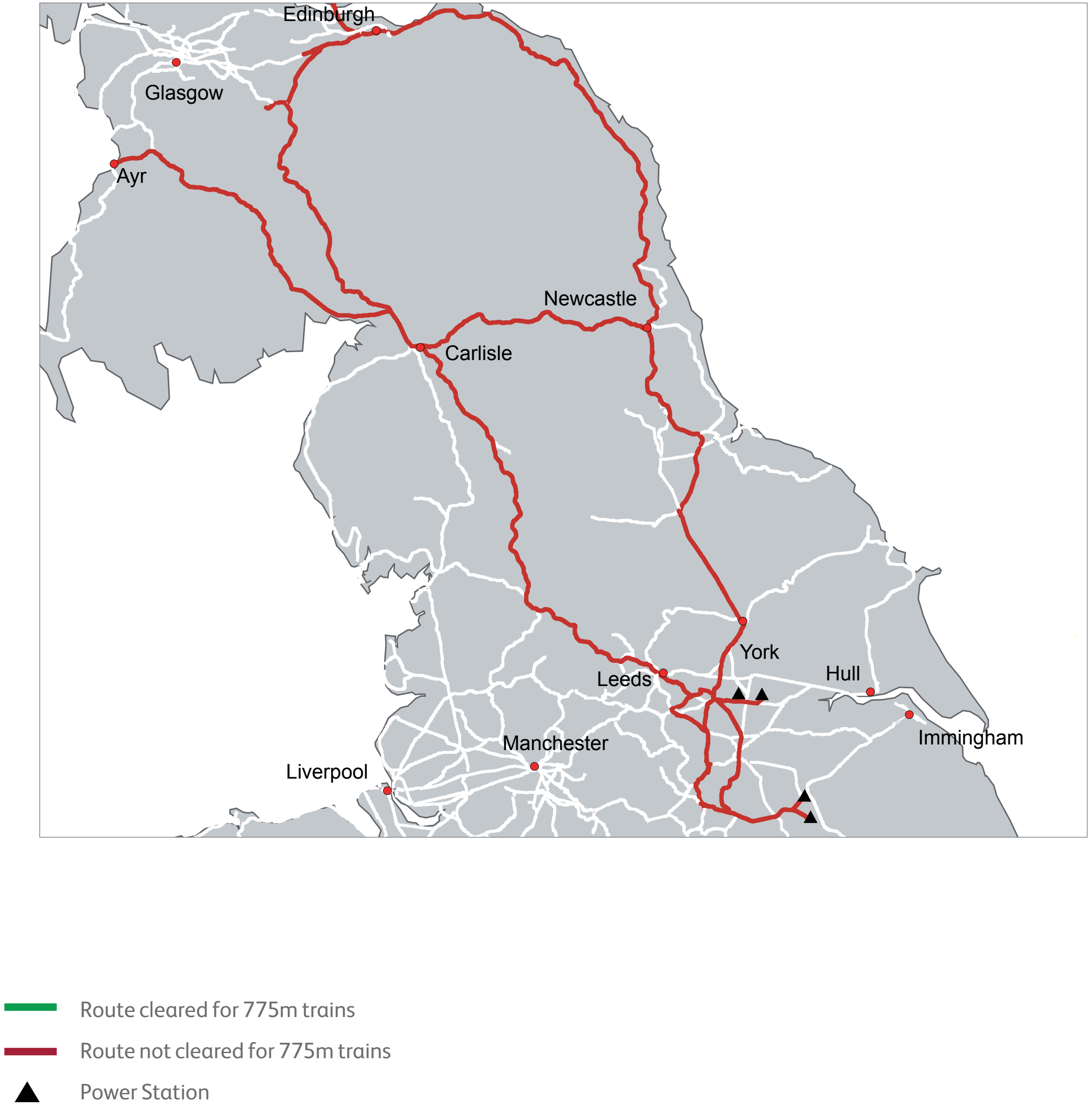


Route cleared for 775m trains

Route not cleared for 775m trains

At present, 775m freight train capability between Southampton and the West Midlands is expected to be delivered by the end of CP5 (2019) through the SFN fund provision. This will create a core route for 775m services but length restrictions remain on the W12 gauge clearance diversionary route via Andover and the longer diversionary route via Westbury and Swindon. In addition to infrastructure capability, it should be noted that running 775m trains also requires adequate traction power.

Figure 4.4: Baseline train length position for Anglo-Scottish traffic



No sections of the Anglo-Scottish corridor are currently cleared for 775m trains.

Key corridors for the construction sector include flows from the Mendips, East Midlands and Peak District to London and the South East. Noting the length aspirations for construction traffic, where routes are shared with intermodal traffic, loops which are only required to accommodate construction trains (which typically travel at a lower velocity than intermodal services) could be specified to a shorter length than 775m without detriment to the length limit of the route.

4.2.3 Weight restrictions

The Route Availability (RA) measure used by Network Rail defines the maximum axle weight of services that can be conveyed over any given route. RA ratings are primarily determined by the strength of underline bridges.

The rail network has a strong baseline RA position. The core network is generally compliant with the RA8[3] rating required for all current locomotive types and many types of freight traffic, including intermodal services. Some commodities, such as construction and coal, are often conveyed in wagons with a RA rating of up to RA10. Although these exceed the route RA over much of the network, they can be allowed over selected routes through a mechanism known as the Heavy Axle Weight process, which permits derogations. It should be noted, however, that limitations in the network capability of route availability can restrict optimum routeing of services. For example, a train with an RA10 rating may be forced to travel additional distances with reduced speeds if the direct route has insufficient RA.

4.2.4 Gauge clearance baseline

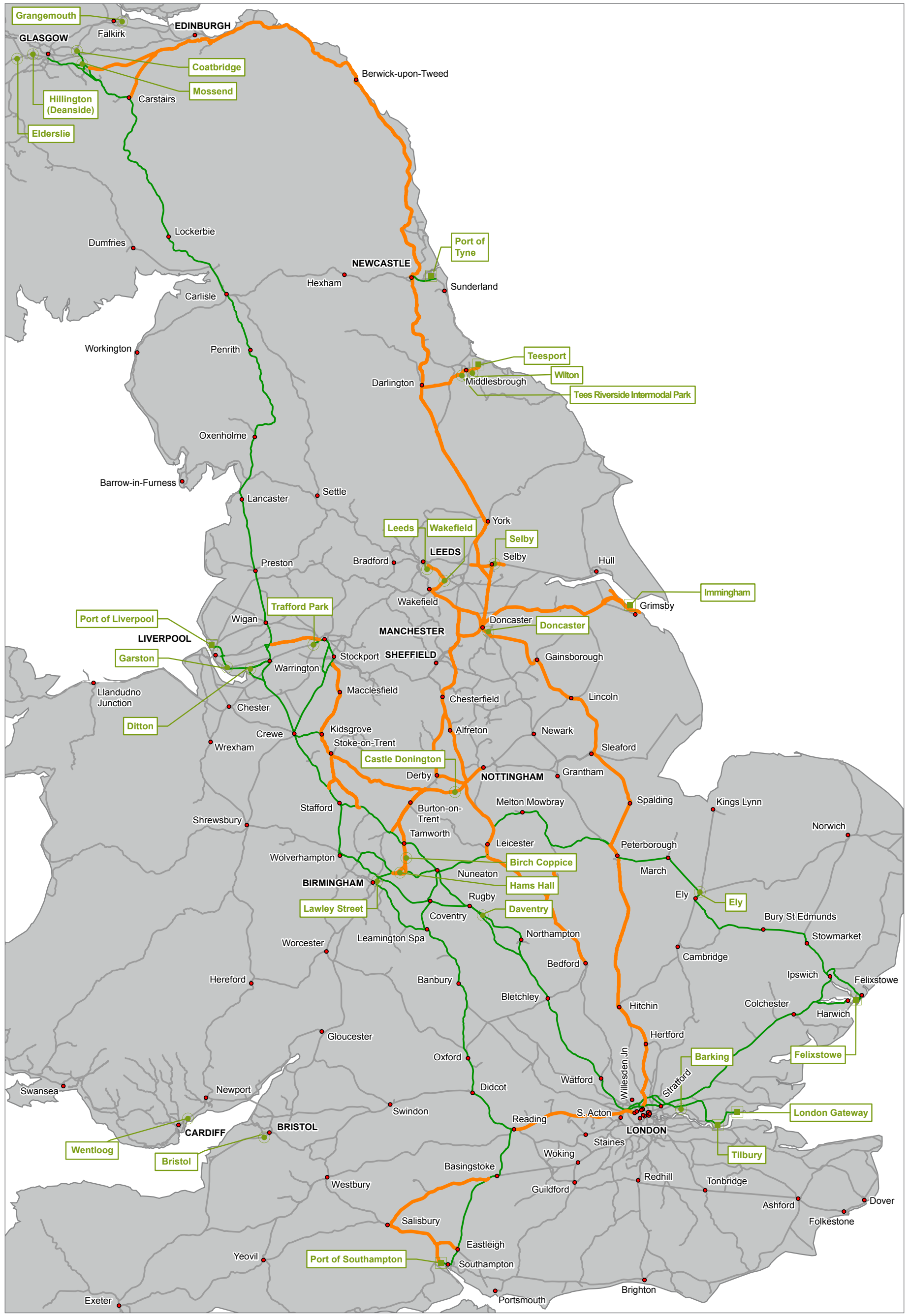
W10 Gauge

9ft 6in height International Organization for Standardization (ISO) containers are now the dominant size in the deep sea maritime sector. In order for rail freight companies to transport this size of container on a standard height wagon, the W10 gauge is required. W10 gauge clearance from the key intermodal ports of Southampton, Felixstowe, Tilbury, London Gateway and Liverpool, not only acts to grow the rail freight market but also the market capability of services from the port.

Although the use of low deck wagons can act as a solution to overcome infrastructure gauge constraints, these are an inefficient and therefore more expensive method of transportation due to factors including unused loadable train length, increased maintenance running costs and higher daily leasing costs.

3 Further information on RA levels and definitions can be found at http://www.networkrail.co.uk/aspx/10551.aspx

Figure 4.5: Baseline gauge position



UK Gauge Network (baseline position)

- Port of Liverpool — Key ports and terminals
- Other routes
- Baseline W10 loading gauge
- Baseline W12 loading gauge

These factors affect rail's competiveness with road resulting in restricted market growth.

W12 Gauge

The W12 gauge maintains the height of W10 (9ft 6in on a standard platform) but has an increased width of 2600mm, which accommodates wider intermodal unit sizes, typically required for pallet-wide swapbodies employed in domestic and continental intermodal traffic.

The increased gauge dimensions for W12 clearance often result in higher project costs, compared with W10, due to additional works required. The scope of works typically includes a greater number of structure rebuilds, lineside equipment alterations and arched structure adjustments. Routes where W10 is proposed will also be considered for W12.

Progress to date

Following the gauge priorities listed in the 2007 Freight Route Utilisation Strategy (RUS), the SFN Steering Group has funded a number of W10 gauge enhancement schemes in the previous funding (control) period 2009-14. By the end of the control period, this started to create a comprehensive and joined up core network from UK ports with the capability to run W10 gauge intermodal traffic.

In addition to the W10 works, a number of W12 routes have started to be developed to enable the foundations for a W12 core network. Significant enhancements in the current and previous control periods include W12 gauge clearance of sections of the East Coast Main Line. The Midland Main Line (MML) Electrification Programme will provide W12 gauge clearance on the MML from Bedford South Junction to Tapton Junction (via Derby) and Corby. Although completion is deferred to CP6, this is assumed to form part of the baseline.

Figure 4.5 shows the baseline gauge position.

5. Drivers of change

5.1 Introduction

The Rail Value for Money Study ('Realising the Potential of GB Rail', Sir Roy McNulty, May 2011) stated the need to make best use of existing network capacity before considering infrastructure investment-based strategies to accommodate increasing demand. Recognising this, and the constraints of the current economic situation, Network Rail and the freight industry are working together to actively identify methods to make best use of existing capacity on the network. Non-infrastructure enhancement methods include:

- **Adjusting and optimising timetables**: Alterations to timetables can often create extra capacity through path optimisation and improved integration between freight and passenger services. This may involve retiming existing paths, changes to routeings, changes to stopping patterns or flighting of services. Furthermore, development and protection of strategic freight capacity can optimise freight paths within the timetable. Section 5.2 below introduces the concept of the System Operator function, and provides more detail on how this will be achieved.
- **Maximising utilisation rates**: Relinquishing paths that are unused back to the timetable planning process (see Section 5.3 below).
- **Optimising operational resources to maximise paths**: Achieved by maximising train lengthening, within current parameters, and optimising rolling stock and wagon combinations, to convey as great a volume of goods as possible per path.

Additionally, enhancements to the capability of the network can increase capacity for freight. For example, gauge clearance can enable new freight services to run in existing unused paths or increasing permitted train lengths on routes can enable additional volumes of goods per service.

Optimising timetables, utilisation of paths and capability aspirations are discussed further in this chapter.

5.2 System Operator function

The 2016 Shaw Report recommended the importance of a System Operator function within Network Rail. Originally described in the 2015 Network Rail Operating Model, the role of the System Operator is proposed to undertake functions on a cross-route basis with a national, network-wide overview.

The Shaw Report recommended the following items are in the scope of the System Operator:

- health and safety
- setting standards
- issue high-level guidelines
- information consolidation
- sale of access rights
- timetabling.

The System Operator can be defined as the body responsible for the creation, planning, and allocation of capacity to optimise the volume of traffic that can run on the network.

The principle of the System Operator is to own the national co-ordination of activities required to optimise the overall use of the national network for the benefit of all users. Key components include, but are not limited to, more focused, continuous long term planning, more robust clienting of projects and more effective planning of timetables and granting of access. Outputs that benefit rail freight include higher quality freight paths and the creation of strategic capacity for rail freight in the timetable.

In practice, the System Operator is expected to be responsible for:

- Definition and Goals; including strategic planning

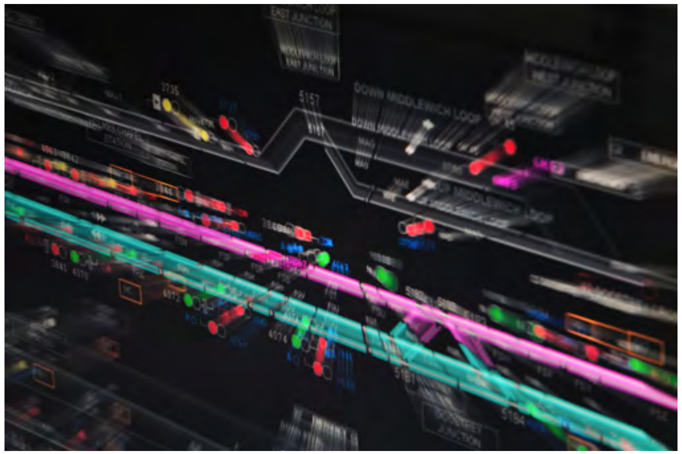
- Capacity Allocation; including sale of access rights and timetable production

- Operate and Review; including real time operations.

During the publication of the Freight Network Study, Network Rail has been responding to the recommendations and developing the final organisational structure for a System Operator function.

5.3 Utilisation of paths

The rail freight industry has an ongoing challenge to increase path utilisation rates across the network. The industry requires flexibility



within the timetable to enable different volumes, destinations and days of operation to ensure it can provide the required service levels for its end customers. This is essential in enabling it to compete with road transport. Out of necessity, this results in more freight paths being booked in the Working Timetable than are actually used on any given day.

There are a number of reasons why freight path utilisation will never reach 100%. For example, in the construction sector booked paths may not be required every day of the week due to market demand and external factors such as weather and seasonal variations. Similarly, diversionary routes are booked to provide resilience and flexibility for freight, which will be required when the usual route is closed during engineering possessions.

The competitive nature of the rail freight sector is also relevant. Freight Operating Companies (FOCs) compete for contracts, and where customers utilise more than one FOC it is inevitable that some duplication of paths will result.

To meet the challenge of increasing utilisation, a ‘Capacity Management’ work stream was established in May 2014 with the aim of reviewing unused freight schedules. This is a collaborative work stream between Network Rail and all freight operators, intended to generate additional freight capacity without the need for infrastructure enhancements.

To date, over 3,522 freight schedules have been relinquished by freight operators with 2,710 completely removed from the timetable. The schedules cover all commodity types across the entire rail network.

The removal of freight schedules from the timetable will provide greater flexibility in future timetable production, improve existing schedules to make better use of capacity and enhance performance. Additionally, a proportion of relinquished schedules, which have strategic value for the future, are being preserved for freight.

5.4 Capability aspirations

Having considered the baseline capability of the network in Chapter 4, this section details the aspirations of the industry for future network capability. These aspirations can help to create additional capacity and are the starting point in forging the strategy, as detailed in Chapter 9.

5.4.1 Average speed

The limitations on speed for freight across the network have been identified and raised by FOCs, industry working groups and through the Long Term Planning Process, as a capability constraint for rail freight. The primary objective of the industry is to increase the average speed of freight services. This would enable improved journey times, enhanced service levels to end customers, reductions in operating costs and increased network capacity.

Improvements to average speeds on routes typically fall into two categories; increases to maximum line speed and enhancements to low line speed sections.

Increases to maximum line speeds: Increasing line speed from 60mph to 75mph would enable journey time improvements and the capability for freight services to run at speeds more aligned to passenger services. This would serve to increase route capacity. Reductions in end-to-end journey times also reduce operating costs in terms of driver hours, equipment utilisation and turnaround, although there may be implications such as increased fuel usage, maintenance and track access costs.

Enhancements to sections of low line speed (including removal of specific heavy axle weight restrictions): This would enable a higher average speed for freight services by avoiding the need to slow at speed restrictions, helping them to maintain a consistent speed. Key examples for enhancement include loop entry and exit speeds and removal of historical permanent speed restrictions and RA10 dispensation requirements. Higher average speeds would enable operational savings for freight operators, both through reduced journey times and improved fuel efficiency (due to the reduction in braking and acceleration).

Opportunities for increased average line speed have been identified for each line of route considered in this document and are assessed in Section 8.3.

5.4.2 Length

The aspiration for longer trains was identified in the 2009 Strategic

Freight Network: Longer Term Vision document as published by the Department for Transport (DfT). Since then, the Strategic Freight Network (SFN) Steering Group has chosen to fund freight train lengthening schemes in both the previous and current funding periods (Control Periods CP4 and CP5) as it recognises the benefits to the freight industry. Adapting the infrastructure to cater for longer freight services, this enables operators to increase tonnage per path, enhancing path utilisation, operational and timetable efficiency. The SFN has the long-term aspiration of achieving 775m intermodal freight train lengths across the network. In addition to this, the aspiration also exists to increase the length of other commodity types, for example construction traffic, to enable an increased volume of product per service.

The rail freight industry has requested future research and development work to investigate the technical and economic feasibility of increasing freight train lengths, for example to 1,500m as per the Community of European Railway and Infrastructure Companies (CER) trial of 1,500m trains. Increasing freight train length capability on the network over the future 30 year period would enable not only enhanced freight volumes per service, but also continental lengths to be achieved, enabling new freight flows.

5.4.3 Route Availability (RA) & Axle Weights

Stakeholders have discussed aspirations for enhancements to RA over the future years considered as part of this study. The immediate area of interest for freight operators would be to enable an increase in the permitted axle weight of the current fleet of wagons. Hauling a greater tonnage per wagon could help to accommodate the forecast increase in demand, reducing the need for additional freight paths.

As detailed in Section 5.5, a theoretical study into increasing axle weights has identified the need for fatigue life modelling and simulation of axle dimension requirements in order to allow existing wagon stocks to run with increased loads. An interdependency of increased axle weights, as reported in the study, is the requirement to assess the braking capability for wagons running with increased loads and review of RA10 route speed restrictions.

5.4.4 Digital Railway

The Digital Railway is a rail industry-wide programme designed to benefit the economy by accelerating the digital enablement of the railway. The Digital Railway programme is setting out to build the industry business case in a number of areas, including infrastructure, train operation and capacity allocation.

Key benefits for the freight industry that the Digital Railway could provide centre around the following areas:

- **Additional capacity** through enhanced signalling system capability and sophistication including enhanced freight consistent speed and reductions to headways[1]. For example, on the Felixstowe to the West Midlands and the North corridor, there are headway constraints between Syston and Peterborough and Bury St Edmunds and Haughley Junction, north of Stowmarket.

- **Improved quality of freight paths and enhanced traffic management capability**. Improved network traffic management, adapting to the live situation for cross route flows from joined up regional control centres, has the potential to improve the quality of paths, interaction with passenger service and overall network management for freight services. Digital Railway could also optimise the nodal yard concept to align train paths by optimising of live network timetable data.

- **Train control and operation** could be optimised to time with passenger services if the system were to dynamically model the capability of freight rolling stock.

- **Safety** through the ability to control trains in a safer manner and reduce lineside equipment and its associated maintenance.

The rail freight industry has identified two key elements that need to be considered and specified within the Digital Railway development process. Firstly, due to the nomadic nature of fleet flows, freight locomotives will have to be prioritised for initial European Train Control System (ETCS) fitment if line side signals are to be removed. Secondly, in order to realise the maximum benefits of the Digital Railway, the ETCS technical and operating parameters must be optimised to reflect the latest freight braking performance data to ensure that freight performance and capacity are not unduly restricted.

Whilst it is not yet possible to quantify the benefits of the Digital Railway, Network Rail and the wider industry are working together to ensure that the freight benefits are maximised.

1 The minimum safe interval between trains on a particular section of track

5.4.5 Freight electrification

There is currently a major programme of upgrades underway, which, will see significant electrification across many routes including the Great Western and Midland Main Lines. During 2016, Network Rail has considered the case for further electrification of the network beyond the schemes currently in delivery and development, including freight specific schemes. The approach to future route electrification and upgrades will be set out in due course.

Benefits of converting diesel freight services to electric traction

The conversion of the network to enable freight services to switch to electric traction is anticipated to have the following benefits:

- Increased network capacity through enhanced performance and average speed, enabling freight market growth
- Reduction in whole industry costs
- Improvements to capacity utilisation and network efficiency
- Environmental benefits when compared to diesel traction
- Improvement in the rail freight product to end users, for example through shortened journey times
- Industry confidence in the electrification programme to invest in electric locomotives.

Enabling factors

In order to derive benefit from using electric traction to haul freight trains, a holistic strategy for the industry is required, encompassing both public and private sectors. Funders are required to invest in electrifying the infrastructure, freight operators in electric locomotives and the ports and terminals in electrification capability. The key enablers are summarised below:

1. New electric locomotives may enable greater payloads per train and/or faster services in comparison with diesel locomotives, which may mean:
   - More attractive service to freight customers (faster and lower cost)
   - Electrically hauled freight may be able to integrate better with other services
   - Greater utilisation of freight train assets.
2. Investment in terminals to accept electrically hauled longer trains may attract greater volumes of electrified traffic to the terminal.
3. Investment in new electrification infrastructure, including power supply strengthening on existing electrified routes, which may enable improved utilisation of the network from:
   - Improved payload per freight path
   - Better integration of passenger and freight paths, enabling more trains to operate.

The rail freight industry recognises the benefits that electric traction can bring to rail freight and has a long-term aspiration for electric traction. The Network Study Working Group has identified key routes to maximise the ability for freight services to operate electrically.

Conversion to electric traction for rail freight is challenging. In addition to the level of investment in rolling stock required, the key issues for the freight industry to overcome include:

- Achieving a critical mass of electrified network, to make utilisation of electric locomotives viable, including diversionary route capability to ensure that electric freight services can run during times of disruption to primary routes
- 'Last mile' capability for electric traction to run into the terminals in order to make the use of electric traction economically viable
- Current limitations in loading infrastructure mechanisms at ports and terminals.

This is illustrated in Figure 5.1 below:

Notwithstanding the approach to future route electrification which will be set out in due course, the priority routes for investment in electrification to support the rail freight industry are shown in Table 5.1. The study notes that when mainline electrification schemes are delivered, it is essential to ensure freight needs are considered in the detail of the schemes (e.g. that freight loops and crossings are also electrified).

Figure 5.1: Role of organisations for investing in enabling freight electric traction

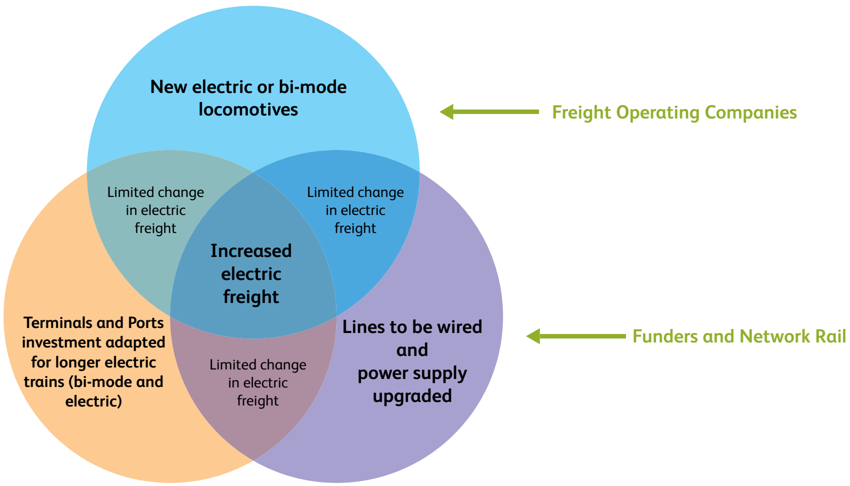


Table 5.1: Priority routes to support electrification of rail freight services		
Description of scheme	**Description of route**	**Current and anticipated passenger and intermodal freight services able to be converted**
Felixstowe to Ipswich	• East Suffolk Junction to Felixstowe	• Felixstowe - Ipswich • East of England - North London - various destinations
Birmingham to Nuneaton	• Grand Junction to Nuneaton	• West Midlands - East of England / South East and Channel Tunnel (via North London)
Nuneaton to Leicester followed by completion of route between Ipswich and Leicester	• Nuneaton to Wigston Junctions followed by Syston Junction to Haughley Junction via Peterborough	• Birmingham New Street - Leicester • East of England / East Midlands - Merseyside / Central Scotland
Gospel Oak to Barking extensions	• Electrification to Thames Gateway port • Junction Road Junction to Carlton Road Junction in North London	• Thames Gateway – Midlands – North
Avonmouth Terminal, near Bristol and Sutton Park Line, near Birmingham[2]	• Avonmouth to Patchway, Filton and Stoke Gifford Junctions • Castle Bromwich Junction and Water Orton West Junction to Ryecroft Junction	• Bristol - various destinations • Central Scotland - West Midlands / South West
Edinburgh south suburban line	• Niddrie South Junction and Portobello Junction to Slateford Junction and Haymarket West Junction	• Planned freight avoiding Waverley station enables electrified running of diverted passenger services, both long distance and local services
Yorkshire freight routes[2]	• Tapton Junction to Masborough via Beighton Junction • Beighton Junction to Woodburn Junction • Hare Park Junction to Leeds Stourton terminal Reception line • Stourton terminal to Whitehall Junction	• Felixstowe – Wakefield and Leeds • London Gateway – Wakefield and Leeds • Southampton – Wakefield and Leeds

2 Following completion of electrification of 'Cross Country' routes

5.4.6 Nodal yards

High quality freight train paths are required to support the development of freight growth. Historically, freight services have often suffered from paths which required them to wait in loops whilst faster trains passed them, increasing the overall journey time, impairing the operational efficiency for operators and delaying end customers. The creation of nodal yards can create the capability for freight to operate in paths that are more appropriate and deliver benefits such as improved timetable capacity and network performance.

Developed at strategic geographic locations, nodal yards act as freight traffic staging and regulation points at the confluence of adjacent route sections, enabling effective management of freight traffic flows and better exploitation of end-to-end freight path components. Occupancy of the yard is subject to a 'Yard Plan', in essence, a timetable for the yard to ensure optimum freight operations.

Where possible, nodal yards will be designed so as to potentially incorporate key ancillary services including wagon maintenance, locomotive fuelling and crew relief facilities. Additionally, new nodal yards would also cater for W12 and 775m services as standard, with increments to these standards being dependent on location and expected commodities. These facilities will also provide an opportunity for trains to combine and split in order to serve locations which do not demand a full length train, whilst taking advantage of the efficiencies of a long train on the core leg of the journey.

The overriding objective of the nodal yard concept is to achieve shorter overall journey times for customers by reducing or eliminating multiple stops on-route. Therefore, any nodal yard scheme must be evaluated on its ability to deliver this output.

5.5 Capability studies

In view of the aspirations expressed in Sections 5.3 and 5.4 above, this study commissioned assessments into a number of specific cases where a need has been identified for enhanced freight capability. These were twofold:

- To understand the practicality and benefit of increasing speed and/or axle weights for a range of commodities on key flows across the network
- To understand the technical feasibility of increasing speed and/or axle weight.

Benefits Study

To support the identification of options, the Network Study Working Group agreed to carry out specific modelling to ascertain the benefits of enhanced capability for rail freight services. Network Rail undertook analysis through its Capability and Capacity Analysis team on the following flows:

a) Increased speed for intermodal flows on the West Coast Main Line

b) Increased speed for biomass traffic on sections of the East Coast Main Line

c) Increased speed for bulk traffic on the Midland Main Line

d) Removal of the 45mph speed restriction for Class 7 traffic on the Great Western Main Line and Berks and Hants Line

e) Increased axle weight between Port Talbot and Llanwern in South Wales .

Summary of findings from benefits studies

a) Increased speed for intermodal flows on the West Coast Main Line

The study examined the route between Milton Keynes and Mossend, near Glasgow. Increasing the maximum speed of these services from 75mph to 90mph provides journey time improvement only if freight trains can be routed on the fast lines. Low line speeds on the slow lines, particularly around the Warrington Bank Quay, Wigan North Western, Preston and Carlisle areas, prevent freight services from taking advantage of the increased possible speed.

Substantial benefits could be gained from running electric freight trains (either Class 92 or TRAXX locomotives) rather than diesel traction, particularly for the section north of Preston, where there are significant gradients. Initial indications suggest there are identified potential benefits in a timetable context.

b) Increased speed for biomass on the East Coast Main Line

The study focused on the route between Colton Junction, south of York, and King Edward Bridge South Junction, in Gateshead. Raising

the maximum speed of Biomass freight trains from 60mph to 75mph offers improvements in journey time between 2½ and 5 minutes, dependent on weight and the extent to which regulation is required. The majority of this benefit was achieved between King Edward Bridge Junction and Northallerton (where the services switch to the slow line). The limited nature of the improvement is a result of low line speeds at adjoining sections of the route, limited capabilities of the traction (assumed to be Class 66) on gradients and the time it takes to accelerate above 60mph.

This study has shown that even these relatively small improvements could provide substantial benefits in conjunction with the additional loops being proposed on the East Coast Main Line and are worth investigating further. Journey times between these loops constrain the entire timetable and any improvement would increase flexibility whilst easing congestion.

The journey times could be improved further with the implementation of line speed improvements over the constraining sections of track. In particular, if the stretches of the route with low line speeds were raised (e.g. the Gateshead line, crossovers at King Edward Bridge Junction and through Thirsk station) the trains would not only be able to run faster through the route but also would accelerate from a higher speed. This would potentially allow further savings and strengthen the case for an increase in wagon speed.

c) Midland Main Line – Increased speeds for bulk flows

The study examined the route between London and Leicester. The scope for bulk traffic making use of line speeds above 60mph is very limited. This is predominantly due to the limited traction capability of the Class 66 under a heavy load and the gradients on the route limiting acceleration.

A more effective approach to overcome the capacity constraints from speed differentials to passenger services would be to mitigate the limitations of the traction, either through the use of electric locomotives or through double heading[3] Class 66s. Additionally, the removal of heavy axle weight restrictions and more effective train regulation will contribute to the reduction of speed differentials.

3 Double heading refers to freight services operated with two locomotives

d) Balance between train weight and speed and removal of speed restrictions on Mendips aggregates trains on the Great Western Main Line and Berks and Hants Line[4]

The study focused on the route between Westbury and Acton. Increasing the maximum speed to 60mph (from 45mph) through operation as Class 6 rather than Class 7 wagons would enable moderate journey time benefits. Further savings could be achieved through the use of electric traction, particularly if increased running speeds were feasible. Any speeding up of freight services would provide capacity benefits as a result of reducing speed differentials between passenger and freight services between Westbury and Southcote Junction, near Reading. Benefits to capacity between Southcote Junction and Acton Yard, West London are limited because junction constraints cannot be alleviated.

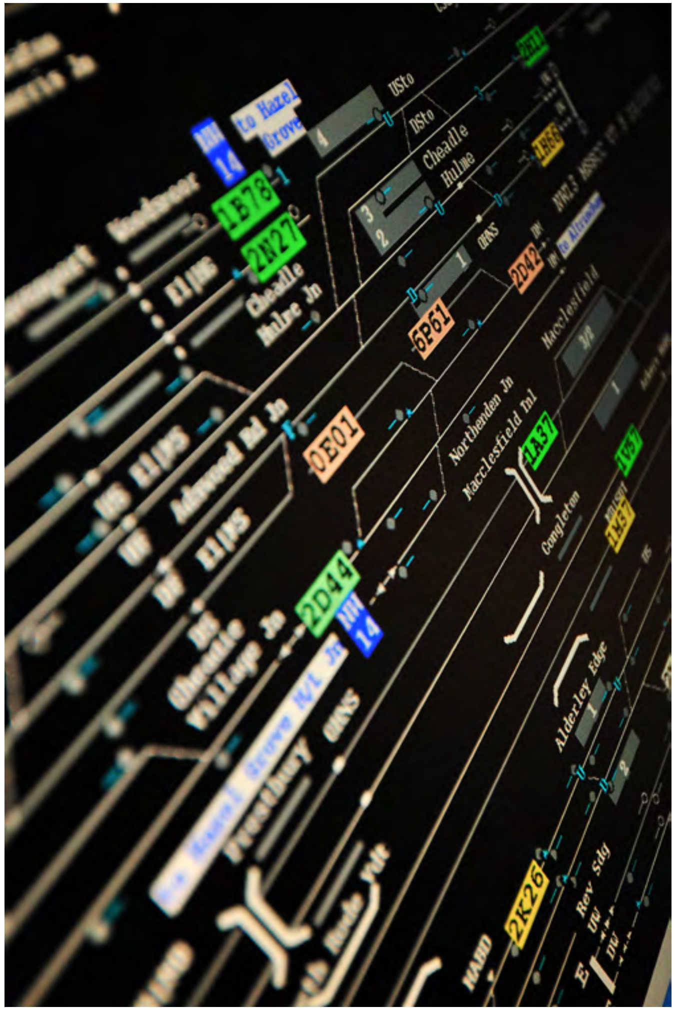
e) Increased axle weight between Port Talbot and Llanwern (east of Newport), South Wales

Increasing the weight of trains would require either electric locomotives or double heading. However, even with the provision of this, there would be insufficient capacity to run heavier trains on the route. This is due to the current and future constraints caused by the speed differential between conflicting traffic flows (west of Cardiff) and crossing moves (Cardiff Central, Severn Tunnel Junction and Maindee Junction).

Although there may be limited benefits gained from running electric rather than diesel locomotives, the Working Group agreed that there is little merit in considering this option further.

Table 5.2 summarises the findings of specific studies. The interventions coloured green will be considered further as future strategies in Chapter 8, Options for Funders.

4 Berks and Hants line is the route from Reading to Taunton via Newbury and Westbury



f) Technical feasibility study into increased speed/axle weights

A specific study was carried out to explore the feasibility of increasing freight train speed and/or axle weight. It posed two fundamental questions; can the train move with a heavier load/can the train achieve a higher top speed; and, can the train brake effectively in the same conditions?

The study focused on the limitations of the freight wagons that currently operate. They are considered rudimentary in comparison to modern passenger vehicles and their performance characteristics are key constraints to enhancing the performance of freight trains.

The technical detail of the study is contained in Appendix 1.

In conclusion, this study found that enhancing freight wagons to increased speed and weight capability is an area that the industry is keen to develop over the next 30 years. To do this and to provide definitive answers, more detailed studies are required. This study recommends that further work be undertaken to provide the industry with confidence that the solutions are both compliant and capable of the enhanced specifications.

Table 5.2 Summary of findings of specific studies

Increased speed for intermodal flows on the West Coast Main Line	Significant benefits from electrification but fast line running required to maximise increased speed
Increased speed for biomass on the East Coast Main Line	Journey time improvements if delivered with planned main line upgrades.
Increased speed for bulk on the Midland Main Line	No substantial capacity benefits
Removal of speed restriction of Class 7 traffic on the Great Western Main Line	Moderate benefits in loaded direction, greater benefits under electric traction
Increased axle weight between Port Talbot and Llanwern in South Wales	No substantial capacity benefits

6. Summary of capacity gaps

6.1 Introduction

This chapter seeks to identify the key capacity constraints on the network and highlights the choices for funders to enable future rail freight growth. As described in Chapter 3, the study is assessing eleven corridors to align with both the key cross boundary freight routes and the Route Study outputs. The Freight Network Study has reviewed both outputs from published Route Studies and schemes to be developed as part of ongoing Route Studies.

This chapter highlights the key strategic capacity gaps on each line of route for freight users that are forecast to constrain future growth. The output is intended to enable operators and funders to understand the implications of the constraints and identify solutions to facilitate forecast growth.

6.2 Methodology

The key capacity constraints identified in this chapter take account of the Freight Market Study (FMS) forecasts discussed in Chapter 3, including the higher and lower scenarios as well as the central case forecasts. They also take account of market developments since the FMS forecasts were published in 2013 and the views of stakeholders. They consider the position over the next ten years and to 2043. These forecasts have contributed to the capacity analysis work of the Route Studies.

As noted in Chapter 3, the freight forecasts were unconstrained. The study also assumes no reduction in current freight paths to accommodate growth in passenger services.

This study identifies a number of possible infrastructure enhancement options that meet the following criteria:

- enhancements required to increase capacity in order to accommodate freight growth
- opportunities where proposed enhancements can be delivered efficiently, for example, in conjunction with the planned renewal of life-expired assets
- outputs that stakeholders and funders have expressed an interest in prioritising
- outputs that cannot be met by enhancing the capability of freight services and improved operations.

The document is intended to inform cross boundary analysis for freight, as discussed in Chapter 1. By considering key lines of route for freight flows, this will provide a cohesive overview of the required enhancements in order to facilitate an increase in freight services.

6.3 Drivers of capacity gaps and key gaps identified

This section analyses the drivers of the capacity gaps on each of the eleven corridors, and lists the gaps identified. The capacity gaps take account of capability issues. Gauge gaps are discussed further in Chapter 7.

The key capacity gaps identified for each route have been summarised into the following six categories:

1. **Capacity Constraints**; Limited further growth in rail freight possible on the corridor
2. **Diversionary route capability**; including restrictions caused by limited train length, gauge and extent of electrification
3. **Operational and timetable constraints**; resulting from issues including lack of regulation points and junction restrictions
4. **Line speed constraints**; impacting upon journey times, operating costs and overall product to customers
5. **Insufficient gauge clearance**; to enable new commodity flows on existing routes
6. **Electrification of route**; impacting on capacity, operational and environmental efficiencies.

1. West Coast Main Line

The West Coast Main Line (WCML) is a key strategic freight route transporting a variety of traffic including intermodal, automotive, construction, coal and biomass. Running from the Wembley European Freight Operating Centre, the route conveys freight to key terminals in the West Midlands, North West and Scotland.

The interaction between passenger and freight traffic already creates capacity challenges on the route. With strong growth forecast in the key commodities carried on the WCML, coupled with the introduction of HS2 classic compatible services north of Manchester, a range of capacity gaps have been identified to enable the required future freight volumes to be delivered.

2. East Midlands and Yorkshire
The commodity types prevalent on the East Midlands and Yorkshire routes are coal and biomass for transportation from the key ports to power stations in the area. Coal traffic declined dramatically in 2015/16. The increase in volume of biomass traffic has offset the decline in coal to a degree. To support the challenge facing the rail freight industry of replacing coal traffic, gaps have been identified to gauge clear sections of the route to enable new commodities markets, primarily intermodal, to develop.

3. Felixstowe to the West Midlands and the North
Strong growth in the intermodal sector has been forecast in the Freight Market Study at the Port of Felixstowe. In order to accommodate growth on the network, the industry agreed routeing for growth is on the 'cross-country' route, via Ely, to certain terminals in the Midlands and the North.

Increased capacity on the Felixstowe Branch has been prioritised by the Strategic Freight Network Steering Group for delivery in this control period. Further enhancements are required on the corridor to support the forecast growth across the route.

4. Southampton to the West Midlands and the West Coast Main Line
The route from the Port of Southampton to terminals and markets in the West Midlands and further north is a key freight route. Its principal commodities are intermodal and automotive flows, both to and from the port. Whilst the route has seen investment in the previous and current funding (control) periods on gauge clearance, diversionary routes and train lengthening schemes, gaps have been identified which will constrain further freight growth.

5. Channel Tunnel Freight

Channel Tunnel rail freight has been identified as a key growth area by operators. Although there is path capacity for additional services to run, the market is currently constrained by the limited W12 gauge cleared routeing options on the 'classic' network and by the restriction on overnight access to the High Speed 1 (HS1) route. Services currently can travel via HS1 as far as Barking but are affected by higher track access charges, limited timing of paths, restrictive trailing loads and operational restrictions at Barking.

Gauge clearance of a variety of 'classic' routes between the Channel Tunnel and Wembley (on the WCML) would create new flows and open up growth opportunities for the Channel Tunnel freight market. An additional gap relates to the electrification capability of the network to continuously run services between the Channel Tunnel and London on all W12 routes. Enhanced capability would ensure robust core and diversionary routes for future traffic flows.

6. Cross London freight flows including Essex Thameside
Growth in cross London flows is expected, mainly due to the development of London Gateway port. Construction traffic could also increase in this area. Allied with the high volume of passenger services already running, and proposals to increase this, enhancements will be required to provide sufficient capacity for the anticipated freight growth. Due to the constraints on physical space on much of the route (e.g. very limited room for new tracks), consideration of enhancements to key junctions and signalling is required.

7. South West and Wales to the Midlands
This corridor connects Cardiff, Newport and Bristol with freight terminals in the Midlands and links to the wider Strategic Freight Network, including the WCML and Midland Main Line. Key commodities include construction, ports and domestic intermodal, steel and petroleum.

The route is considered capable of meeting the demands over the next ten years. Several capacity gaps have been identified for the longer term, to 2043. Enhancement options on the route have inter-dependencies with the Great Western Main Line corridor and the Southampton to the West Midlands and WCML flows.

8. Northern Ports and Transpennine
Freight capacity across the Pennines has been identified as a constraint to growth from Northern Ports including Liverpool, Immingham and Teesport. The combination of increasing passenger service requirements coupled with the current growth in bulk and forecast growth in intermodal commodities has resulted in a key capacity gap.

Freight growth is constrained across the Pennines due to a lack of available paths, gauge restriction for high cube containers and infrastructure restrictions in accessing the key ports of Liverpool, Immingham and Teesport. The route has been identified as a key artery to enhance freight opportunities in the North of England, as part of the Northern Powerhouse agenda.

There are known constraints to both freight capacity and gauge on each of the three Transpennine routes, via Diggle, the Hope Valley and the Calder Valley, all of which restrict network access.

9. Midland Main Line (MML)

Development of capacity on the MML is seen as a key enabler for developing new markets and accommodating growth of existing flows, principally intermodal and construction traffic. New markets would be created by new freight terminal depots and interchanges, with a number of sites currently proposed for intermodal services. New terminals could attract flows from London Gateway, Felixstowe and Southampton.

The MML is also anticipated to carry an increased amount of traffic to enable the freight market to grow across the network. Due to capacity constraints on the North London Line, the Felixstowe to the Midlands and the North corridor (referred to as F2N), and WCML, flows could be routed on the MML to maintain the required path capacity for freight flows, save for the lack of capacity and gauge clearance on the MML.

10. Great Western Main Line (GWML)

Following the electrification and W12 gauge clearance of key structures on the route in CP5, the GWML has the potential to open new markets and flows for freight operators and customers over the coming 30-year period.

The route section between Reading and Didcot is a key section for freight services due to the interaction between GWML services and services from Southampton to the West Midlands. Similarly, the section in South Wales interacts with services from Cardiff and Newport to the Midlands. Capacity gaps have been identified in both these areas; at Didcot, and between the Severn Tunnel and Cardiff.

11. Anglo-Scottish and Northern regional traffic

Linking routes from the Yorkshire terminals to Scottish Terminals via the WCML and the East Coast Main Line (ECML), the choices for funders on the Anglo Scottish route are linked to the outputs on routes including Transpennine and Northern Ports, WCML and East Midlands and Yorkshire freight flows.

Gaps have been identified over the next ten years and beyond, taking account of forecast growth in intermodal freight volumes.

Table 6.1: Summary of Capacity Gaps

Corridor	Driver of Gap						
	Capacity Constraints	Diversionary Route Capability	Operational and Timetable Constraints	Line Speed Constraints	Insufficient Gauge Clearance		Electrification of Route section
					W10	W12	
1. West Coast Main Line	■	■	■	■		■	
2. East Midlands and Yorkshire		■	■		■	■	■
3. Felixstowe to the West Midlands and the North	■		■			■	■
4. Southampton to the West Midlands and the WCML	■	■	■	■	■	■	■
5. Channel Tunnel freight		■	■		■	■	
6. Cross London freight flows	■	■	■				
7. South West & Wales to the Midlands	■	■	■				■
8. Northern Ports & Transpennine	■	■	■	■	■	■	■
9. Midland Main Line	■		■	■	■	■	
10. Great Western Main Line	■		■				■
11. Anglo-Scottish & Northern regional traffic	■	■	■		■	■	■

Items to note

While Network Rail provides infrastructure up to the boundary of ports and other freight facilities, it is for the owners of these facilities to provide rail capacity within them. It is therefore possible in the future that facilities within ports and freight terminals become a constraint on freight activities beyond the influence of Network Rail.

Rolling stock is procured by freight operators individually to meet market demand, and thus is not included in the scope of this study. It is likely that infrastructure options chosen will have some influence on the types of rolling stock required in the future.

7. Summary of gauge gaps

This section considers the potential 30-year strategy for freight gauge and identifies the gaps to the baseline position. Enhancements to the existing gauge network will be required to enable the network to facilitate the forecast growth and for rail freight operating companies to increase their modal share. An illustration of the gauge sizes referred to in this section is shown in Appendix 3.

7.1 Industry aspiration

1. W10 Network

The freight industry has highlighted the future requirement to develop further the current W10 network to increase operational flexibility and resilience for 9'6" x 2500mm sized loads, primarily required for deep sea intermodal services. The key priorities centre on creating an increased number of diversionary routes during times of core route closure. Additional diversionary routes can also create increased regular capacity through new pathing options.

Figure 7.1, shows the future W10 gauge aspiration overlaid on the existing W10 network.

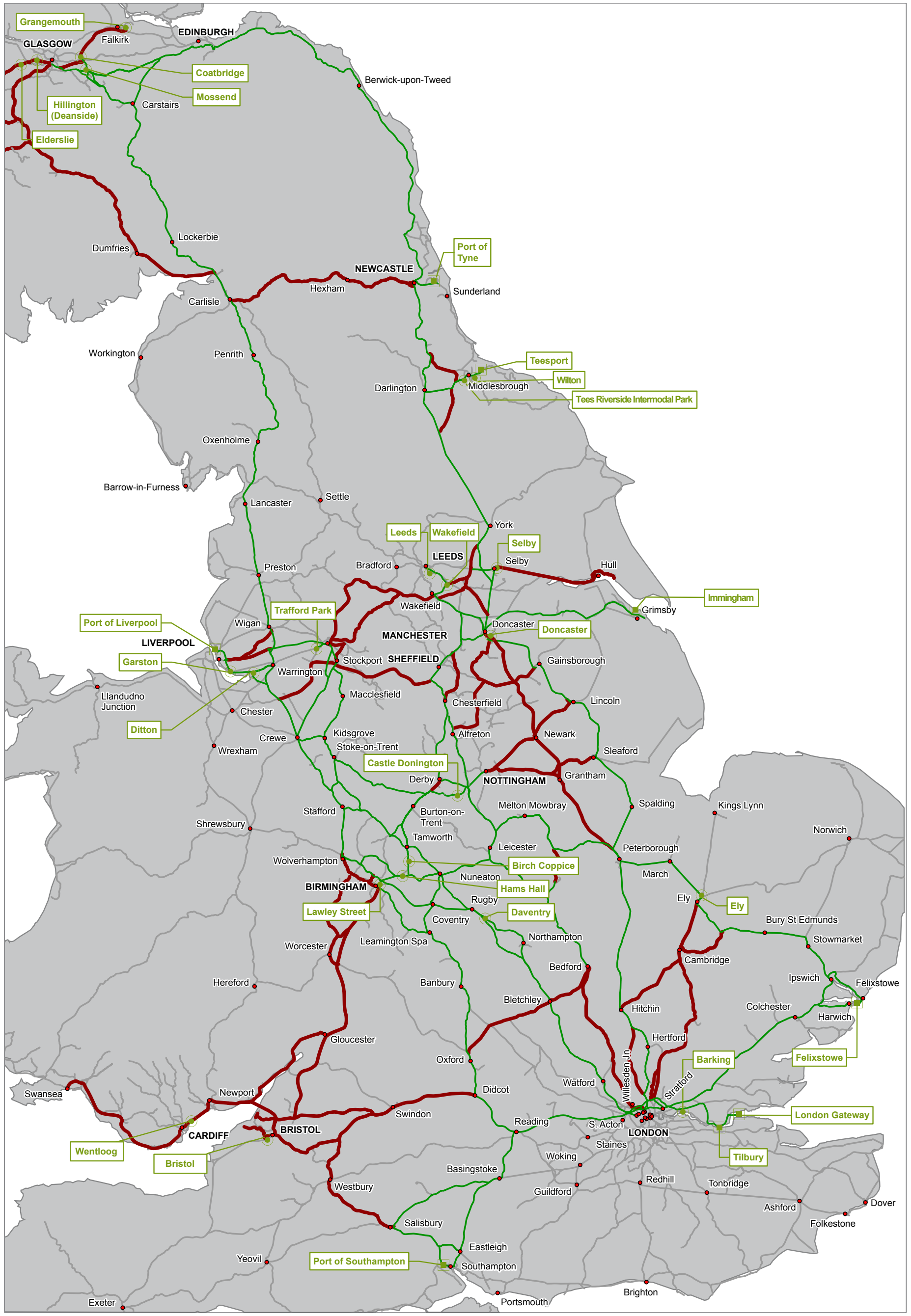
The key W10 aspirations include:

- West Anglia Main Line via Cambridge to Ely and Cheshunt to provide diversionary capability for the traffic on the Felixstowe to the West Midlands and the North route and flows from London Gateway and Tilbury, and for the southern section of the East Coast Main Line. The gauge clearance would increase the routeing flexibility and resilience for the Port of Felixstowe, London Gateway and Tilbury.

- Southampton to Didcot, via Westbury and Swindon

Additional resilience from the port of Southampton with an increment of W10 on the route via Westbury and Swindon. This would enable freight services to continue operating should the route via Basingstoke and Reading be unavailable.

Figure 7.1: W10 Gauge Network



UK Gauge Network (baseline position)

- Port of Liverpool — Key ports and terminals
- Other rail routes
- Baseline W10 loading gauge
- Future W10 gauge aspiration

2. W12 routes

In addition to continuing the implementation of the W10 network, the freight industry has prioritised the requirement to create a more extensive W12 network. Development of W12 gauge cleared routes would enable new capability, primarily for short sea intermodal services. The industry aspiration for the gauging of new routes is to, where feasible, deliver W12 capability as the standard gauge requirement. By delivering to W12 in the first instance, this removes the need to upgrade routes at a later date. Due to the limited baseline W12 network, priorities have been ranked into tier 1 and tier 2 to focus short and long-term investment.

Figure 7.2 shows the freight industry's W12 gauge clearance aspiration.

The tier 1 W12 aspiration is focused on the links from key short seaports and the Channel Tunnel to a range of freight terminals in the North East, West Midlands and the North West to create a baseline core network.

Key routes include :

- **Transpennine route between Liverpool, Manchester, Wakefield and Leeds.** Gauge clearance would act as an enabler for growth from the Port of Liverpool and Tees Dock as part of the Northern Powerhouse. The preferred Transpennine gauge cleared option is via the Diggle route.

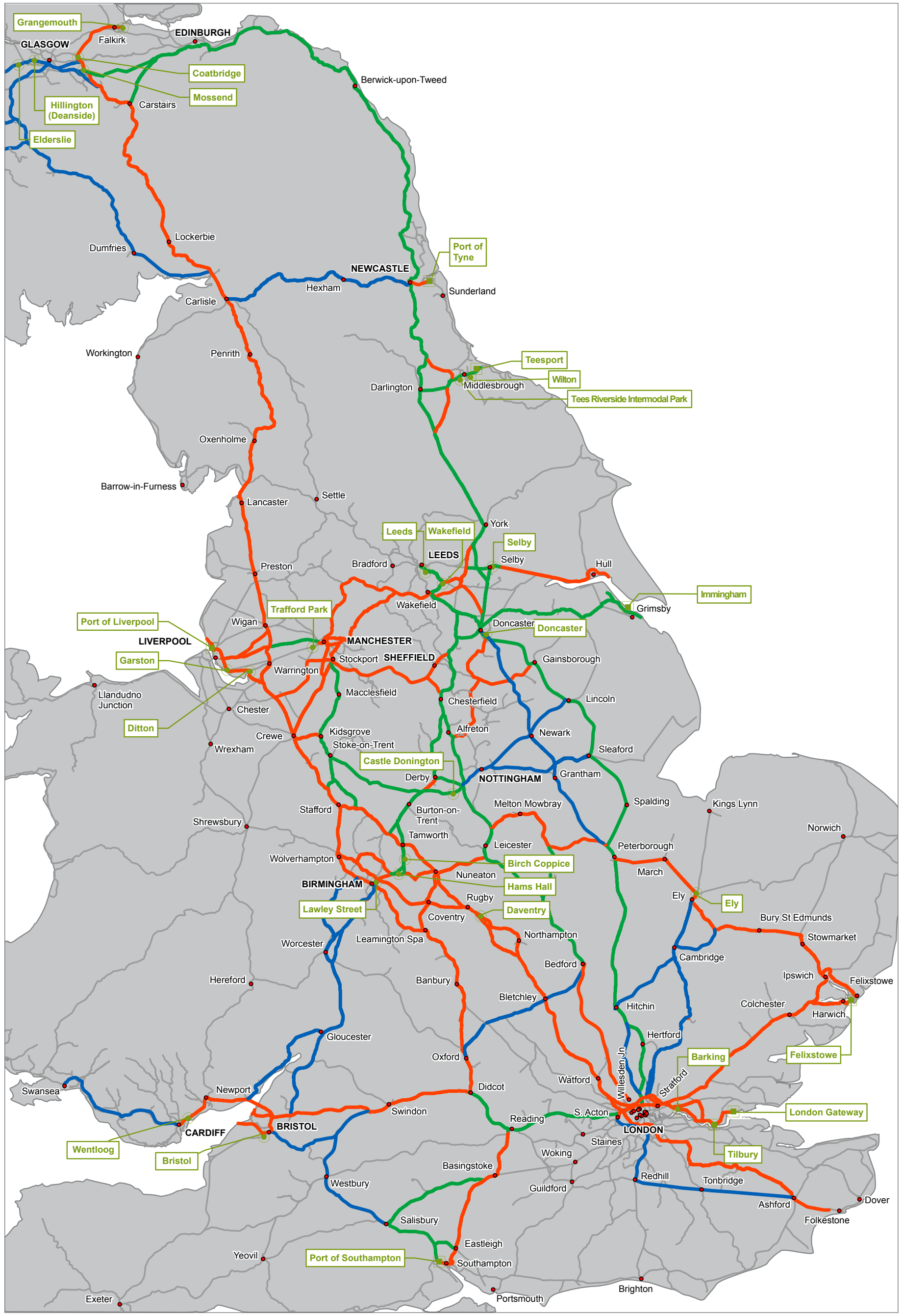
- **Channel Tunnel routes to Wembley**. Gauge clearance to W12 on this corridor would enable new flows through the Channel Tunnel from continental Europe to Wembley European Freight Operating Centre (WEFOC) on the classic network, removing the need for travel via HS1.

- **Midland Main Line, including East West Rail**, would provide additional routeing opportunities for traffic to both avoid travelling into London and also to act as a capacity enabler for existing London services. Gauge clearance would also facilitate growth opportunities for new freight terminal developments, including Radlett and the East Midlands.

The tier 1 network builds upon current W12 cleared sections to give key line of route clearance to enable the development of new markets and traffic flows. Tier 2 priorities focus upon creating diversionary routes for increased network resilience.

Due to the increased size envelope required for W12, the work required to some structures and routes may have poor business cases. Network Rail and the industry are investigating solutions to specific gauging issues on an ongoing basis, including studies on box and wagon combinations.

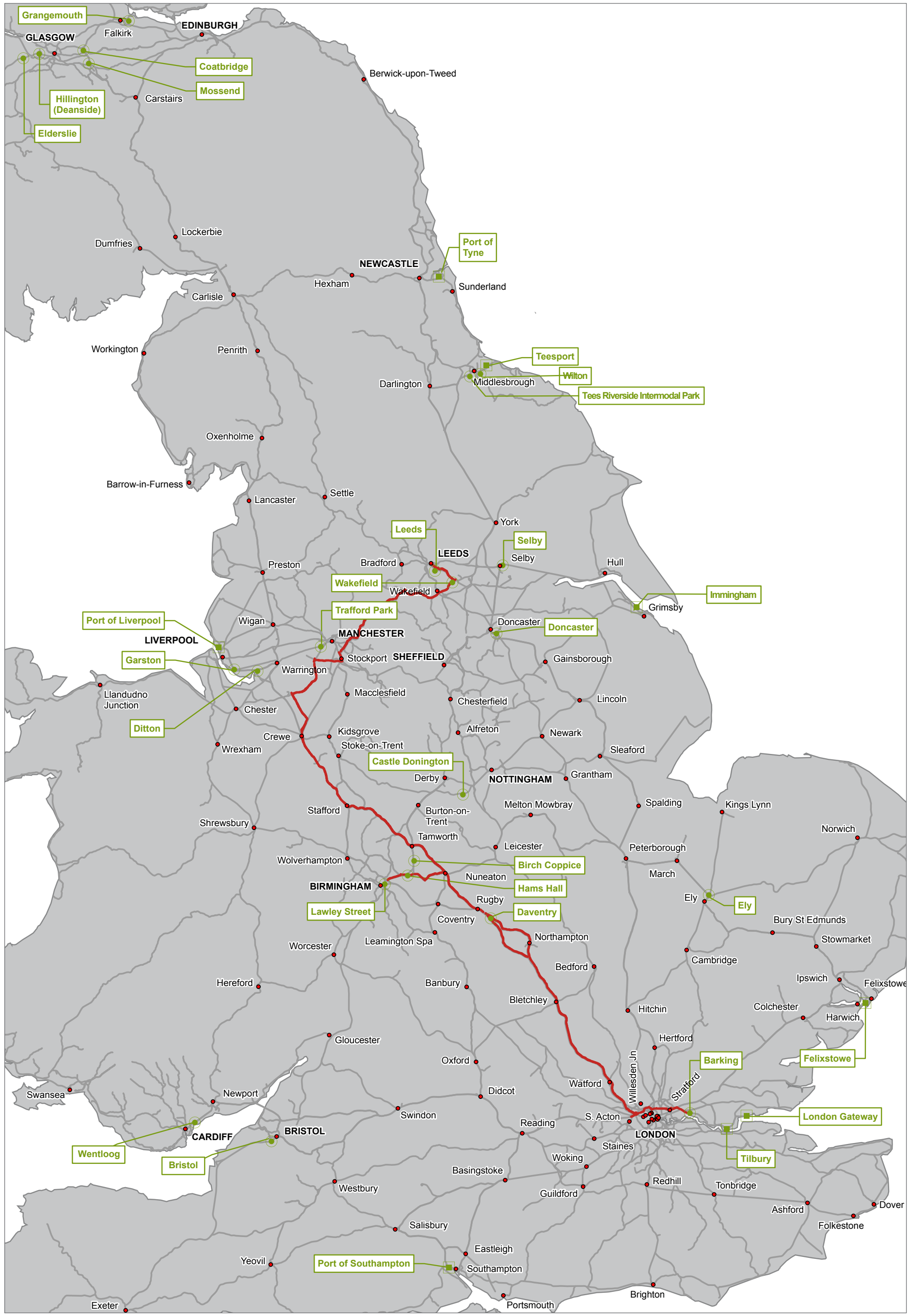
Figure 7.2: W12 Gauge Network



UK Gauge Network (baseline position)

- Port of Liverpool — Key ports and terminals
- Other rail routes
- Future W12 gauge aspiration (Tier 1)
- Future W12 gauge aspiration (Tier 2)
- Baseline W12 loading gauge

Figure 7.3: GB1 Gauge Network



UK Gauge Network (baseline position)

Port of Liverpool — Key ports and terminals

Other rail routes

GB1 loading gauge aspiration

3. GB routes

An additional aspiration of the freight industry is to enable new rail freight market flows by enhancing a selected number of routes to European gauge standards, specifically UIC GB1 gauge (sometimes referred to as GB+). Clearance to this level in both the upper and lower sectors would allow European box sizes to travel on larger continental wagons without the need for transhipment. The use of 'piggyback wagons' to carry road semi-trailers would also be facilitated.

Currently only HS1 is cleared to GB1, limiting the traffic movement to Ripple Lane and selected terminals in the Barking area. However, the industry's aspiration for GB1 is indicated in Figure 7.3. It is initially focused on primary routes between HS1 and the main freight depot locations near Birmingham, Manchester and Leeds.

The UIC GB1 European gauge standard has a significantly larger profile than current gauges being operated so it is anticipated that incremental costs of both upper and lower sector clearance, when compared to W12, would be high. A key issue is the impact of GB1 lower sector gauge and platform stepping distances. It is recognised that establishing a business case for gauge clearing to such a level is likely to be challenging, as passenger rolling stock compatibility would also have to be addressed on mixed-traffic routes.

Clearing to GB1 gauge in only the upper sector would not allow the through-running of continental gauge or piggyback wagons. However, it could enable taller European boxes, such as 3.2 metre high 'mega swaps' to be carried on W6a compliant wagons instead. The selective use of low platform wagons could further reduce the cost of such an enhancement without detriment to the height of box that could be conveyed.

Although cleared to GB1 standard, the future High Speed Two line from London to the North is not expected to provide for rail freight services.

4. Out-of-gauge loads and newly defined gauges

Variations in wagon deck heights, suspension types and box sizes mean that some wagon and box combinations do not align closely with any of the existing W gauges. This can mean that a larger gauge than might otherwise be required has to be cleared. In some cases, traffic may marginally exceed a smaller gauge whilst the infrastructure is marginally foul of a larger gauge. The combined effect of these marginal infringements can mean that acceptable clearances are present, despite the traffic being nominally out of gauge.

In these circumstances, the traffic can be authorised as an out-of-gauge load. However, such approvals must be kept under review because the maintenance and renewals regime is targeted at preserving the published gauge for a route. As a result, out-of-gauge loads should be regarded as a temporary solution.

An alternative is to define a new, additional gauge based around the out-of-gauge combination, which can then be published and maintained over a route in the normal way.

5. The incremental approach

The priority 30-year strategy, as agreed by the freight industry, is to create a core W12 network. However other gauges, including newly defined gauges, can be employed as an interim step towards the full gauge, for example by phasing works so that the most restrictive sites are addressed first. Therefore, this incremental approach should be considered as a choice for funders.

It should be noted that although this approach can be used to unlock benefits early at a reduced initial cost, phasing works in this way may be less efficient overall. This is because optimal use might not be made of possession opportunities, and because of the costs associated with an increased number of individual projects over a longer period of time.

7.2 Summary of gaps in gauge

Future gauge clearance will be required to facilitate the forecast growth in both W10 deep sea and W12 short sea and domestic intermodal markets.

The freight industry has prioritised the strategy for W10 gauge clearance to primarily enable an increased number of diversionary routes to build upon the baseline W10 network. The diversionary routes would provide resilience from the major UK ports, including Southampton and the Haven Ports.

Key W12 gauge gaps include Channel Tunnel to London (non-HS1) routes, a Transpennine route, and a long-term aspiration of West Coast Main Line clearance to create a national core network W12 spine.

Table 7.1 below provides a summary of the potential gaps to be addressed.

As the specific W12 market demand grows, the case for gauge clearance of new routes will be evaluated accordingly. Additionally, the ongoing industry standard is that when current structures are being rebuilt or renewed, for example due to electrification works, then works will be specified to W12 enhancement at that time. Network Rail is also working with the industry to develop innovative solutions to specific gauge constraints, including box and wagon combinations and design.

For routes that have been gauge cleared to a specified standard, this study notes the importance of ensuring that this published standard is maintained.

The rail freight industry has also noted the aspiration for an increase in the number of temporary gauge cleared routes in order to enable diversionary options. Acknowledging the restrictions to wagon/box combinations and possible speed limitations, additional temporary gauge cleared routes would assist network resilience especially during times of network disruption, for example, during extreme weather events.

Table 7.1 Potential gauge gaps for further consideration

Key Gauge Gaps

Gap	Required Gauge	Output
Northern Ports and Transpennine (a Transpennine route)	W12	New deep sea and short sea Transpennine capability
Midland Main Line including East West Rail	W12	Full route clearance following electrification works
West Anglia Main Line	W10	Additional routeing option linking into F2N corridor
Channel Tunnel to London Routes	W12	New route capability
West Coast Main Line	W12	New route capability for key freight corridor

8. Options for funders

8.1 Background to option development

Having established the context and baseline for the study and subsequently identified locations where a gap exists between the capacity and/or capability of the network and forecast demand, this chapter considers the options to alleviate the mismatch. This will help ensure that the rail freight sector delivers benefits to the wider economy by remaining competitive and productive over the coming decades.

This section focuses on possible interventions across each of the eleven corridors. It is important to note that the Freight Network Study identifies these options in order to provide potential choices for funders and evidence to allow further work on the feasibility of a given intervention. A detailed business case, including further evidence of the strategic, economic, commercial, financial and management case for a proposal, will be developed if a funder decides to progress a particular scheme or programme.

A programme level business case will be delivered where relevant. This will adopt a line of route approach for a corridor (e.g. Felixstowe to the West Midlands and the North) that will cover all the interventions needed to increase capacity between key origins and destinations.

The socio-economic business cases will need to be consistent with the relevant appraisal guidance, such as the DfT's WebTAG guidance in England and Wales and Transport Scotland's STAG (Scottish Transport Appraisal Guidance). The main benefits are likely to be related to the provision of additional rail capacity. If this extra capacity is expected to result in a reduction in the number of lorries on the roads, then for each lorry removed, there is a socio-economic benefit. These benefits are quantified by HGV Marginal External Costs (MECs): i.e. the benefit of removing a lorry from the roads is equivalent to the costs of an additional lorry.

For each scheme (or programme), the socio-economic business case will compare all the quantified costs and benefits in discounted terms, over the appraisal period (normally 60 years). The socio-economic case will be summarised by the Benefit Cost Ratio (BCR), the ratio of total benefits to total (net) costs to government. This will indicate to funders the value for money of the scheme. The business case will consider a number of demand scenarios, not just the Freight Market Study's central case forecasts . Finally, the business case will need to consider the strategic, commercial, financial and management cases for the scheme, not just the socio-economic (value for money) case.

8.1.1 Strategic safety

The safety of the workforce, passengers and the public are of primary importance to Network Rail and the industry as a whole. In taking forward an infrastructure intervention, detailed analysis of the system-wide implications of any changes will be carried out, in compliance with stringent safety standards including Common Safety Method (CSM) and Construction (Design and Management) Regulations 2015 (CDM).

8.1.2 Alignment with other objectives

As well as the possible options presented here, overarching continuous improvement and efficiency gains will drive the competitiveness of rail freight. The 80% increase in tonnes carried per train since 2003/04 highlights how the capability of rail to meet demand continues to grow.

Where possible, this study has also taken cognisance of the Route Study component of the industry's long-term planning process. Section 1.5 sets out how consistency was achieved for cross-boundary services. The expertise of the Network Study Working Group and others across the industry also fed into this study, in particular where no Route Study has been established to date.

The focus of recommending potential options as part of this study is on delivering value to users, operators and funders, as well as promoting modal shift and improving utilisation of capacity. Section 5.2 highlights current levels of utilisation across the network and how ensuring efficient flows of mixed traffic is the aim across the increasingly busy network. It is recognised that a number of busy cross-London routes, including the North London Line and the Gospel Oak to Barking line, are intensively used by both freight and passenger services. More efficient utilisation of freight paths, where possible, is an ongoing objective for the industry.

8.1.3 Hendy Review

As previously mentioned, some interventions originally planned to be delivered during the current funding period, Control Period 5 (CP5; April 2014 to March 2019) have been deferred to the next funding period (CP6, 2019-24) as a result of Sir Peter Hendy's Review into the deliverability of Network Rail's enhancement programme. This may affect the recommendations included as part of this study, with short-term challenges in affordability and supply-chain availability as a result of major schemes taking place later than previously anticipated. Despite this, the aim of this study is to highlight potential options for funders given the current baseline capacity and capability of the network. The industry needs to demonstrate where intervention is required across the network, to accommodate forecast demand so the substantive content of this study is not materially changed by the implications of the Hendy Review.

8.2 Capacity

This section highlights the short, medium and long-term capacity interventions that are proposed as funding choices over the next 30 year period.

Recognising the forecast growth on the network and the current financial environment, this Freight Network Study notes that it is imperative to maximise the current capacity of the network before undertaking major capital enhancements. As discussed in Section 5.1, the freight industry is addressing non-infrastructure based solutions, including working to improve utilisation rates, timetable adjustments and optimisation of operational resources. Where these methods do not sufficiently increase capacity, infrastructure interventions are required.

The maps and tables in this section show all of the capacity options considered in this study for each of the 11 corridors. The maps also show the gauge options, further details of which are provided in section 8.3.5. Short-term schemes are taken to be those prioritised for completion in approximately 10 years, including options for consideration in CP6. Medium-term schemes are those for completion within approximately 20 years, and long-term those for completion by within approximately 30 years. The short-term schemes are discussed in more detail, reflecting their more developed status, each being shown in a separate table following the maps. The medium and longer-term schemes are summarised in a single table for each line of route.

Due to the overlapping nature of many of the key freight corridors, some schemes have an effect on multiple corridors. For example, gauge clearing the South Yorkshire Joint Line would benefit corridor eight (Northern Ports and Transpennine intermodal traffic) as well as intermodal flows highlighted by corridor two (East Midlands and Yorkshire). In such instances, this is only tabulated once, and in the second corridor on which it appears, it is referenced on the map with an alphabetical letter rather than a number.

Many of the schemes identified are driven by significant forecast growth in both freight and passenger demand. Section 6.3 lists the key driver(s) for each route.

Where possible, a cost range has been indicated against options shown. It should be noted that these costs are not necessarily representative of an assessment of the scheme itself, it provides an indication of the scale of the project for comparative purposes.

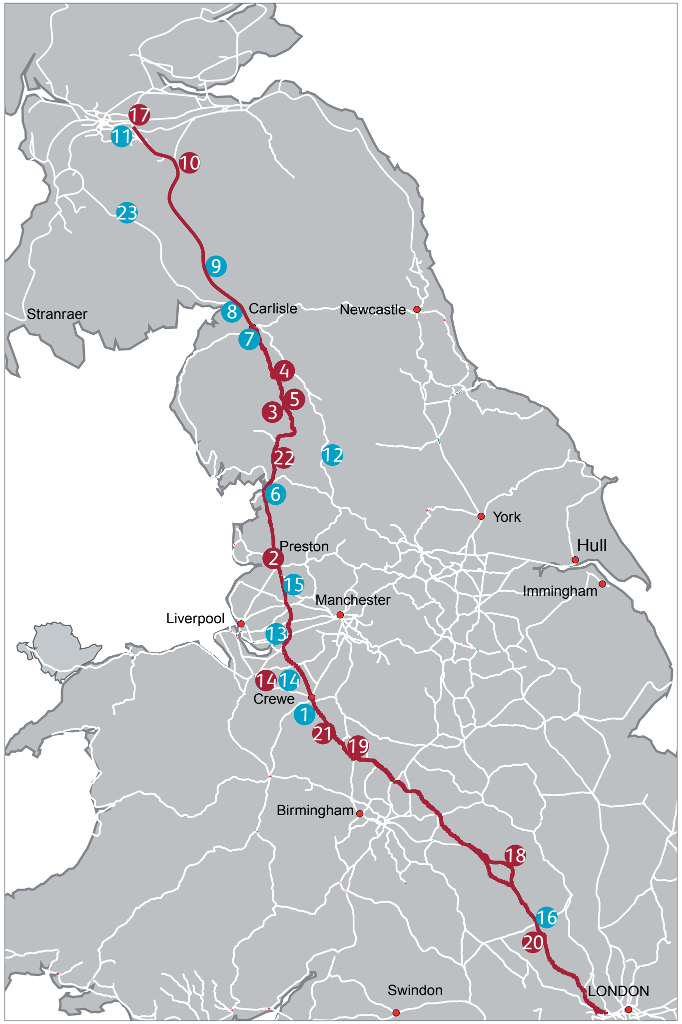
Figure 8.1 West Coast Main Line capacity and gauge options

1 Possible Crewe Yard changes
2 Preston Station area remodelling
3 Dynamic down loop Tebay to Shap Summit
4 Dynamic up loop Carlisle to Plumpton
5 Dynamic up loop Eden Valley to Shap Summit
6 4-tracking Preston to the border
7 Carlisle Station remodelling including 4-tracking of approaches
8 3 or 4 track Gretna Jn to Floriston
9 4-tracking sections from Carlisle to Carstairs
10 Carstairs remodelling
11 Grade separation Law, Holytown and Uddingston Jns
12 Settle & Carlisle upgrade to accommodate all freight traffic
13 Acton Grange to Warrington capacity
14 Winsford to Weaver Jn interventions (2026 and 2043)
15 Wigan to Preston interventions
16 Scheme to accommodate East West Rail traffic onto the WCML
17 Gauge clearance to W12 of WCML to Grangemouth
18 Northampton Loop enhancements
19 Doubling of Stafford South Jn
20 Gauge clearance to W12 of WCML from Wembley to the Midlands
21 Gauge clearance to W12 of WCML from the Midlands to the North West
22 Gauge clearance to W12 of WCML from Wigan to Coatbridge
23 Gauge clearance to W12 of the Glasgow South Western route

● Short-term capacity and gauge options
● Longer-term capacity and gauge options

Corridor 1. West Coast Main Line (WCML), including impact of HS2

The most constrained section of this route is the section north of Preston into Scotland. These constraints are driven by the mainly two-tracked nature of the route, with loops to allow slower trains to be passed. This restricts the number of freight trains that can be pathed among higher speed passenger services, an effect that is amplified by the topography of the route, with freight trains taking longer to accelerate on rising gradients. Key interventions on northern sections of the route will be required in order to maintain and grow freight on this key artery. These could include long 'dynamic' loops, which allow freight trains to be passed without stopping. Capability driven schemes to increase the speed of loop entry and exit will also help to raise capacity. Figure 8.1 displays the recommended potential options to achieve the short and longer-term capacity requirements.



Key short-term gaps include capacity enhancements at locations including north of Preston and between Carstairs and Grangemouth.

The expected increase in passenger services following implementation of HS2 services re-joining the WCML will increase further the capacity constraint between Preston and Carlisle. This is in addition to freight growth and new franchises (e.g. additional Transpennine Express Anglo-Scottish services). Although new infrastructure interventions have been identified, the longer-term enhancement of this route should be developed in conjunction with identifying options for England – Scotland services with shorter journey times. It is not proposed to continue development in isolation of the dynamic loops between Preston and Carlisle (identified by the WCML North Strategic Rail Study[1]). The strategy for further development of infrastructure interventions should be agreed with DfT / HS2 Ltd, to enable development of a long-term solution to capacity and Anglo-Scottish connectivity/journey time needs.

1 WCML North Strategic Rail Study will inform the WCML Route Study

Short term capacity options for Corridor 1

Table 8.1: Assessment of Option 2 – Corridor 1
Summary of intervention Preston station area capacity enhancement and remodelling
Output Assessment Create a high-capacity passenger interchange at Preston enabling improved connectivity and capacity between long distance, interurban and regional services. Provide additional capacity to accommodate freight growth
Potential cost range: £375m-£875m

Table 8.2: Assessment of Option 3 – Corridor 1
Summary of intervention Dynamic down loop Tebay to Shap Summit in Cumbria (a dynamic loop is long enough to allow overtaking without either train stopping)
Output Assessment Provides network capacity for future growth and connectivity requirements, enabling one additional long-distance passenger and one freight path to operate per hour (accommodates the growth of classic services and the introduction of HS2 classic compatible services for 2026).
Potential cost range: £250m-£500m

Table 8.3: Assessment of Option 4 – Corridor 1
Summary of intervention Dynamic up loop between Carlisle and Plumpton (near Penrith)
Output Assessment Provides network capacity for future growth and connectivity requirements, enabling one additional long-distance passenger and one freight path to operate per hour (accommodates the growth of classic services and the introduction of HS2 classic compatible services for 2026).
Potential cost range: £250m-£500m

Table 8.4: Assessment of Option 5 – Corridor 1
Summary of intervention Dynamic up loop between the Eden Valley (near Penrith) and Shap Summit
Output Assessment Provides network capacity for future growth and connectivity requirements, enabling one additional long-distance passenger and one freight path to operate per hour (accommodates the growth of classic services and the introduction of HS2 classic compatible services for 2026).
Potential cost range: £375m-£875m

Table 8.5: Assessment of Option 10 – Corridor 1
Summary of intervention Remodelling of Carstairs Junction, in order to improve freight regulation. This will include introduction of bi-directional signalling and rationalisation of existing junctions and is expected to be undertaken in conjunction with planned track renewals in CP6. This will accommodate 4 Class 4 and 1 Class 6 freight train paths per hour.
Output Assessment Provides increased overall capacity, increased freight loop standage and more efficient access and egress for freight facilities, and higher speeds through the junctions.
Potential cost range:£100m-£250m

Table 8.6: Assessment of Option 18 – Corridor 1
Summary of intervention Reduction of Headways on the Northampton loop Remodelling of Northampton station to allow higher linespeed
Output Assessment Reduction of Headways on the Northampton loop: Designed to accommodate an additional passenger and freight traffic including 1 freight tph Remodelling of Northampton station: provide network capacity by allowing freight services to pass Northampton station at a higher speed and reduce the speed differential between freight and passenger services.
Potential cost range: Reduction of Headways on the Northampton loop : £75m-£175m Remodelling of Northampton station to allow higher linespeed: £175m-375m

Table 8.7: Assessment of Option 19 – Corridor 1
Summary of intervention Doubling of Stafford South Junction
Output Assessment Doubling of Stafford south junction to reduce the conflict between services joining from the West Midlands and to accommodate one additional freight train path per hour on the WCML
Potential cost range: £15m-£35m

Table 8.8: Medium and long term capacity options for Corridor 1 (long term unless otherwise stated)	
Option Number	Details
1	Possible impacts on freight yards in the Crewe area due to works to enhance capacity for passenger and freight services. This takes an opportunity for major improvements in conjunction with HS2 Phase 2a and replacement of life expired assets.
6	Four-tracking north of Preston to the Border or investigation into the feasibility of a new two-track railway. Strategy for further development of infrastructure interventions to be undertaken in conjunction with and agreed with DfT / HS2 Ltd, to enable the development of a long term solution to capacity and Anglo-Scottish connectivity / journey time needs.
7	Carlisle station remodelling, including four-tracking both approaches, new platforms and segregating passenger and freight flows through the station.
8	Three or four-tracking from Gretna Junction to Floriston (Cumbria).
9	Four-tracking sections from Carlisle to Carstairs.
11	Grade separate of Law, Holytown and Uddingston Junctions southeast of Glasgow.
12	Settle and Carlisle upgrade to accommodate intermodal freight traffic.
13	Acton Grange to Warrington capacity - enable long-term growth for interurban connectivity at Warrington and provide additional capacity to accommodate freight growth.
14	Winsford to Weaver Junction (near Runcorn) interventions. **Option 1:** four track between Winsford and Weaver excluding Weaver, to deliver an extra 1tph freight and 1tph passenger paths (off-peak). Medium/ long term. **Option 2:** four track between Winsford and Weaver including Weaver, to deliver and extra 2tph freight and 3tph passenger paths (off-peak). Medium/ long term. **Option 3:** Electrification of diversionary route via Middlewich (Cheshire) and potential further enhancements.
15	Interventions between Wigan and Preston, four-tracking from Springs Branch Junction to Euxton Junction, additional terminating platform capacity at Wigan, grade separation of Euxton Junction, six-tracking from Farrington Curve Junction to Preston, additional platform capacity at Preston, realign Preston throat so that flows split between Blackpools, freight and long distance. The intervention supports a number of additional passenger services running in the area as well as 3 additional freight services.
16	Scheme to accommodate East West Rail traffic onto the WCML. Grade separation at Denbigh Hall South Junction, near Bletchley, and additional platform capacity at Milton Keynes Central

Although not forming part of the core WCML corridor, this study notes that there are several external projects in development in West Cumbria that are scheduled to increase the volume of freight traffic on the Cumbrian Coast Line, some of which will also impact traffic volumes on the WCML. The key developments are:

- NuGen – A new nuclear power station being constructed adjacent to the current Sellafield site;
- National Grid – new infrastructure being installed along the Cumbrian coast;
- West Cumbria Mining Ltd. – A new off-shore coking coal mine in the vicinity to St Bees; and
- Low Level Waste Repository – Expansion of the current operations at Drigg.

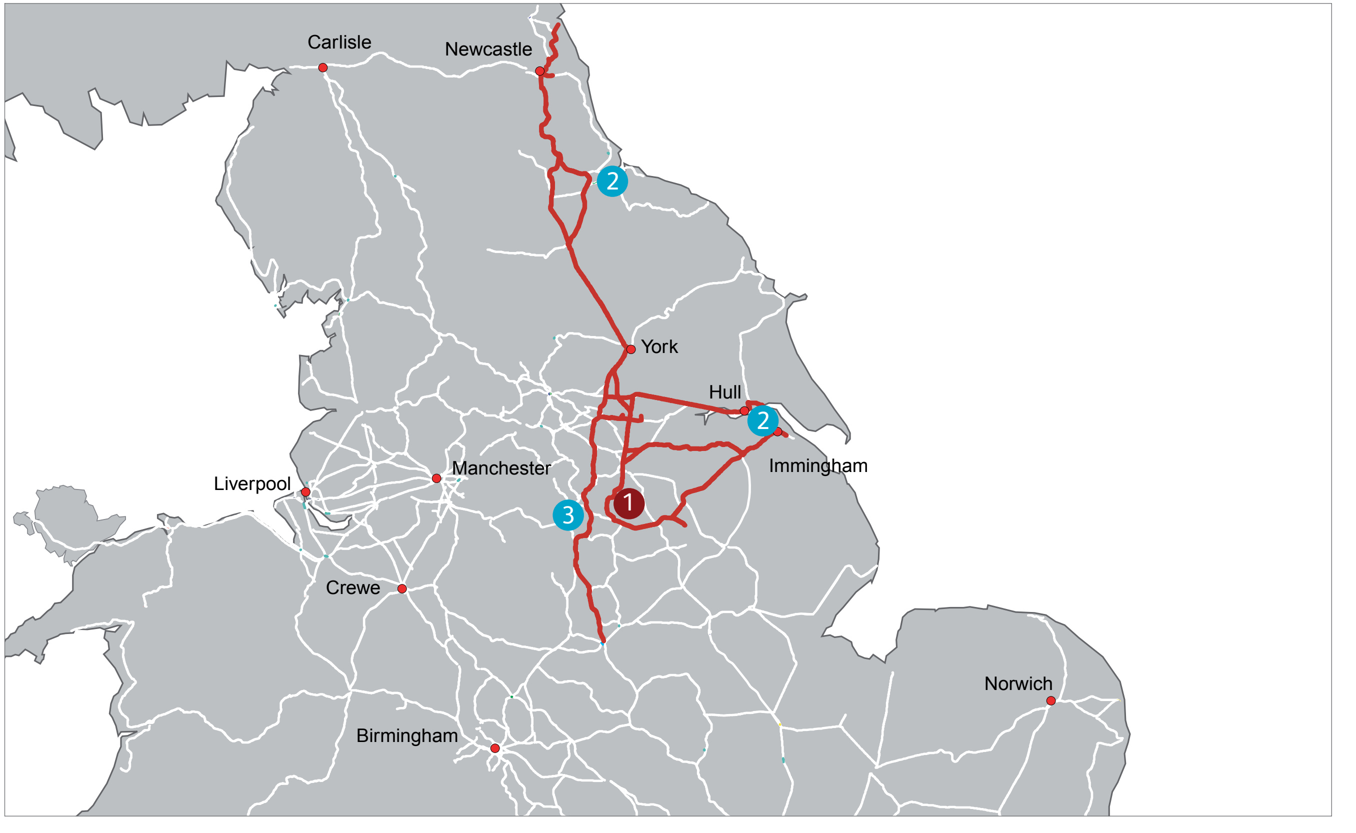
The associated increase in freight traffic on the Cumbrian Coast Line may necessitate interventions to support the construction and operational phases of the developments. As such, Network Rail is currently working with the respective stakeholders to understand the potential interventions required. The Cumbrian Coast Line will be further considered in the forthcoming North of England Route Study.

Corridor 2. East Midlands and Yorkshire

The key intervention in enabling other markets to replace the coal traffic is gauge clearing sections of the route. Figure 8.2 displays the required interventions for short and longer-terms.

Figure 8.2: East Midlands and Yorkshire capacity and gauge options

1. Gauge clearance to W12 of South Yorkshire Joint Line
2. Diversionary access for Immingham and Teesport
3. Electrification of Yorkshire freight routes



- Short-term capacity and gauge options
- Longer-term capacity and gauge options

Short-term capacity option for Corridor 2

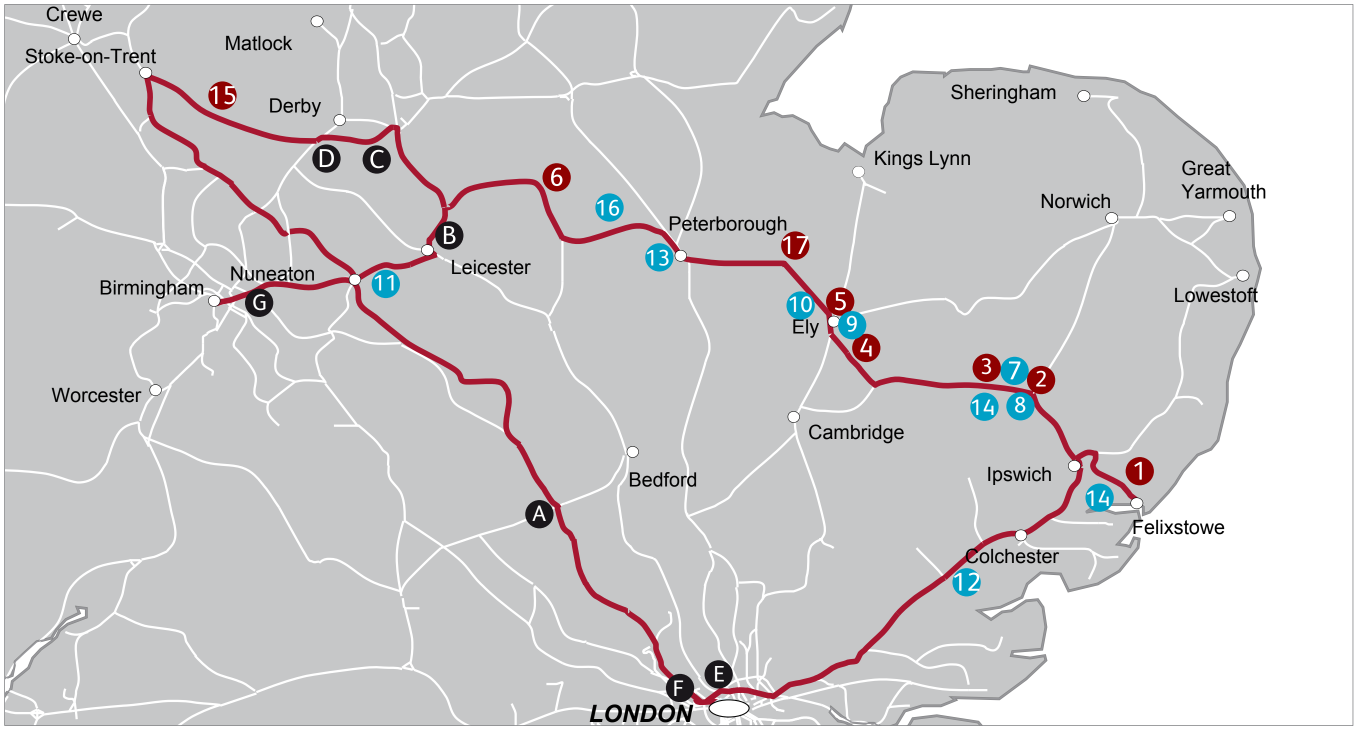
Table 8.9: Medium and long term capacity options for Corridor 2 (long term unless otherwise stated)	
Option Number	**Details**
2	Diversionary access for Immingham and Teesport.
3	Electrification of Yorkshire freight routes: - Tapton Junction to Masborough and Nunnery Main Line Junction, via Beighton Junction - Beighton Junction to Woodburn Junction - Hare Park Junction to Leeds Stourton terminal reception line - Stourton terminal to Whitehall Junction.

Figure 8.3: Felixstowe to the West Midlands and the North capacity and gauge options

- 1 Further doubling of Felixstowe Branch Line
- 2 Haughley Junction loop facility
- 3 Bury St Edmunds headway reductions
- 4 Partial or full doubling of Soham to Ely
- 5 Ely infrastructure works
- 6 Signalling enhancements Syston East Junction – Peterborough area
- 7 Haughley Jn 4 tracking
- 8 Haughley Jn grade separation
- 9 Grade separation and additional tracking around Ely
- 10 New Ely avoiding line
- 11 Track and signalling enhancements Leicester to Nuneaton
- 12 Passing loop between Colchester and Witham
- 13 4-tracking Werrington Jn to Peterborough
- 14 F2N Phase 3: to accommodate long term growth
- 15 Gauge clearance to W12 of Syston to Stoke
- 16 Electrification of the route via Ely
- 17 Gauge clearance to W12 of the route via Ely

- A Scheme to accommodate East West Rail traffic on to WCML
- B Leicester Area Capacity
- C New line linking Stenson Jn to MML
- D Stenson Jn to Sheet Stores Jn Linespeed Improvement
- E Modification of signalling block at Hampstead Heath Tunnel
- F Freight regulation loop at Kensal Rise
- G Water Orton area interventions

- Short-term capacity and gauge options
- Longer-term capacity and gauge options
- Option proposed on other corridor



Corridor 3. Felixstowe to the West Midlands and the North

The Felixstowe to the West Midlands and the North corridor (cross-country route, via Ely) is projected to be the primary route for intermodal traffic from the Port of Felixstowe travelling to the Midlands, North of England, and Scotland, and one of the key rail freight arteries in the country. Rail freight volumes from the Port of Felixstowe are forecast to increase and growth on the cross-country route is required to facilitate this.

Figure 8.3 displays the required interventions for the short and longer terms.

One of the most significant capacity constraints on the cross-country route is the Ely area. Projects required include Ely North Junction, Ely level crossings, Ely to Soham doubling and Ely area weak bridges.

Due to land restrictions and ground conditions, the projects have a high degree of complexity, specifically the Ely area level crossings works.

Additional schemes which may be required on the route include Haughley Junction, Syston to Peterborough resignalling, Leicester area capacity, further doubling of the Felixstowe branch including level crossings and infrastructure capability, and route-wide enhancements.

Short term capacity options for Corridor 3

Table 8.10: Assessment of Option 1 – Corridor 3
Summary of intervention Further doubling of the Felixstowe Branch Line (this is in addition to the CP5 scheme, which is included in the baseline).
Output Assessment To provide 60 ftppd in each direction to/from Felixstowe (in conjunction with other options). Timescales to be confirmed based upon market requirements.
Potential cost range: £75m-£175m

Table 8.11: Assessment of Option 2 – Corridor 3
Summary of intervention A loop facility at Haughley Junction (near Stowmarket), including doubling of the junction
Output Assessment To provide 60 ftppd in each direction to/from Felixstowe (in conjunction with other options). Timescales to be confirmed based upon market requirements.
Potential cost range: £35m-£75m

Table 8.12: Assessment of Option 3 – Corridor 3
Summary of intervention Headway reductions at Bury St Edmunds through improvements to signalling
Output Assessment To provide 60 ftppd in each direction to/from Felixstowe (in conjunction with other options). Timescales to be confirmed based upon market requirements.
Potential cost range: £50m-£70m

Table 8.13: Assessment of Option 4 – Corridor 3
Summary of intervention Doubling between Ely and Soham
Output Assessment To provide 60 ftppd in each direction to/from Felixstowe (in conjunction with other options). Timescales to be confirmed based upon market requirements. Note: Committed in CP6 and therefore part of baseline.
Potential cost range: £120m-£150m

Table 8.14: Assessment of Option 5 – Corridor 3
Summary of intervention Infrastructure works at Ely such as level crossings enhancements and additional tracking
Output Assessment To provide 60 ftppd in each direction to/from Felixstowe (in conjunction with other options). Timescales to be confirmed based upon market requirements.
Potential cost range: £100m-£250m

Table 8.15: Assessment of Option 6 – Corridor 3
Summary of intervention Signalling enhancements in the Syston East Junction – Peterborough area
Output Assessment To provide 60 ftppd in each direction to/from Felixstowe (in conjunction with other options). Timescales to be confirmed based upon market requirements.
Potential cost range: £50m-£60m

Table 8.16 Medium and long term capacity options for Corridor 3 (long term unless otherwise stated)

Option Number	Details
7&8	Either: some four-tracking between Haughley Junction and Ipswich. Or: Grade separation at Haughley Junction.
9	Grade separation at Ely North and Dock Junctions as well as additional track around Ely.
10	A new avoiding line at Ely.
11	Track and signalling enhancements between Leicester and Nuneaton.
12	A passing loop between Colchester and Witham.
13	Four-tracking Peterborough to Werrington Junction, north of Peterborough.
14	Further route-wide capacity and capability programme to enable long-term growth.
16	Electrification of the the entire route, via Ely. Medium term.

Corridor 4. Southampton to the West Midlands and the West Coast Main Line

Building on the work in CP4 and CP5, further interventions have been identified. Short-term enhancements are required to resolve conflicts in the Didcot and Oxford area and to electrify the diversionary route via Andover. Longer-term enhancements include grade separation at Basingstoke, additional looping locations, track remodelling of diversionary route via Andover.

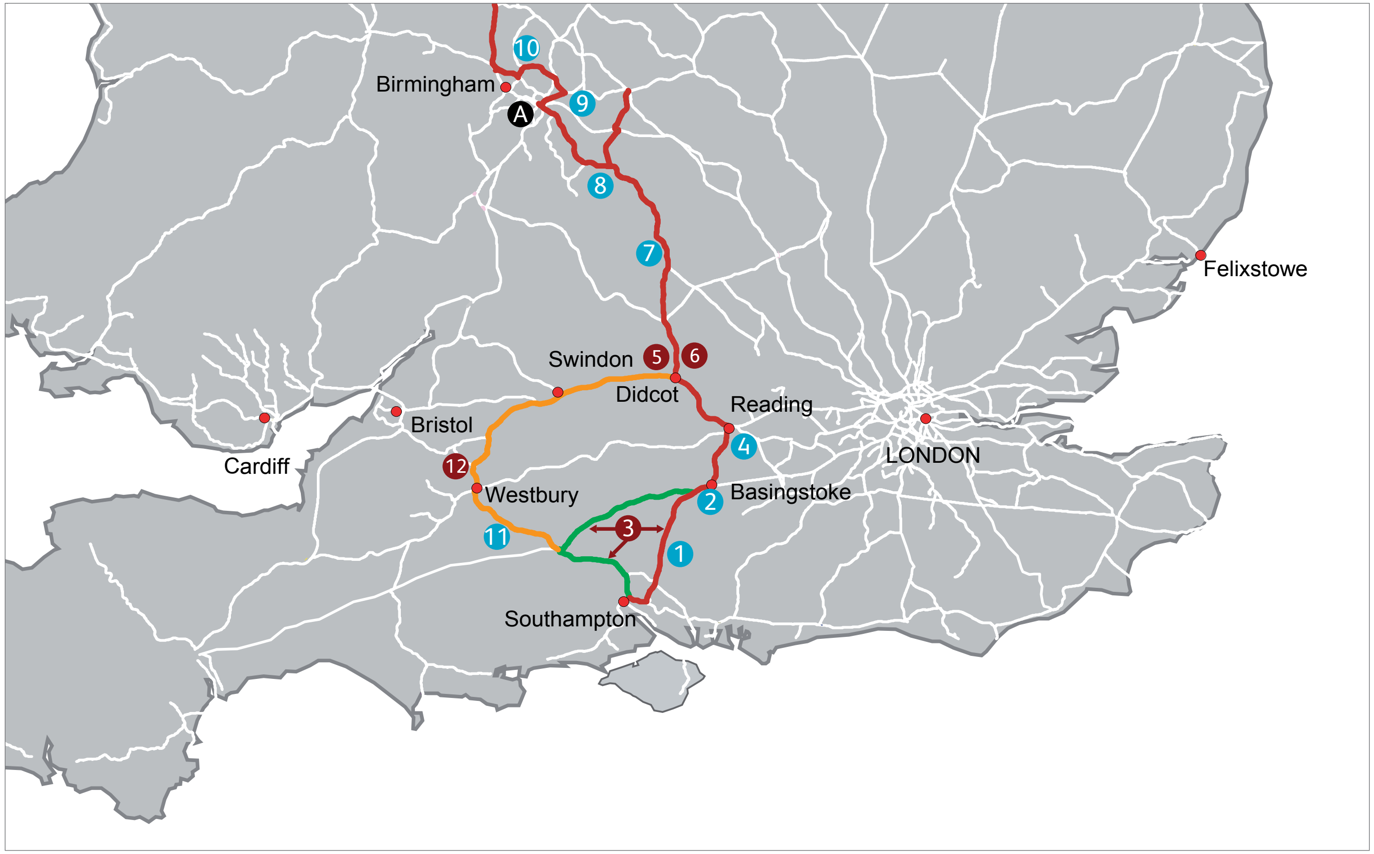
Figure 8.4 displays the required capacity interventions for short and longer-terms.

Figure 8.4: Southampton to the West Midlands and WCML capacity and gauge options

1 Passing loop between Eastleigh and Basingstoke
2 Grade separation at Basingstoke
3 Assuming OLE electrification of Southampton to Basingstoke, provision of electrified diversionary route via Andover
4 Capacity enhancements between Southcote Jn and Oxford Road Jn
5 Grade Separation at Didcot East and Oxford North Jns and capacity improvements at Oxford Station
6 Grade separation at Didcot East Jn, capacity improvements Didcot-Oxford and Oxford Station
7 Banbury loops
8 Leamington Spa station remodelling
9 Water Orton area interventions
10 Sutton Park Line electrification
11 Gauge clearance to W10 of diversionary route via Westbury and Melksham
12 Gauge clearance to W8 of Bradford Jn to Bathampton Jn
A Electrification of key freight terminals in the West Midlands

Short-term capacity and gauge options
Longer-term capacity and gauge options
Option proposed on other corridor

Core route
Andover Diversion
Westbury and Melksham Diversion



Short term capacity options for Corridor 4

Table 8.17: Assessment of Option 3 – Corridor 4
Summary of intervention Electrification of the diversionary route from Southampton Ports and Basingstoke via Andover
Output Assessment Will allow for conversion of some freight journeys from diesel to electric, with associated performance benefits. (note: depends on overhead electrification or other electrification capability solution on the route via Winchester.
Potential cost range: £300m-£500m

Either option 5 **or** option 6:

Table 8.18: Assessment of Option 5 – Corridor 4
Summary of intervention **Either:** Grade separation at Didcot East Junction and Oxford area and capacity improvements at Oxford Station
Output Assessment Provides overall capacity increase required to accommodate expected passenger and freight demand, enabling up to 5ftpph.
Potential cost range:£100m-£200m (Grade separation at Didcot East and Oxford area only)

Table 8.19: Assessment of Option 6 – Corridor 4
Summary of intervention **Or:** Grade separation at Didcot East Junction, four-tracking between Didcot and Oxford and at Oxford Station
Output Assessment Will increase capacity by allowing for segregation and of higher speed and lower speed services, enabling up to 5ftpph.
Potential cost range: £225m-£475m (Grade separation at Didcot East Junction and four-tracking only)

Table 8.20: Medium and long term capacity options for Corridor 4 (long term unless otherwise stated)

Option Number	Details
1	Passing loops between Eastleigh and Basingstoke. Medium term
2	Basingstoke grade separation. Medium term
4	Capacity enhancements between Southcote Junction and Oxford Road Junction (south of Reading), including grade separation at Southcote Junction.
7	Passing loops at Banbury.
8	Enhanced signalling and crossovers at Leamington Spa station to enable greater use of bay platforms for passenger services.
9	Additional capacity at Water Orton including elements of four tracking and grade separation.
10	Electrification of the Sutton Park Line, near Birmingham.

Corridor 5. Channel Tunnel freight

The key interventions for this corridor are to enhance the capability of the classic routes (i.e. the non-HS1 routes). Figure 8.5 displays the required interventions:

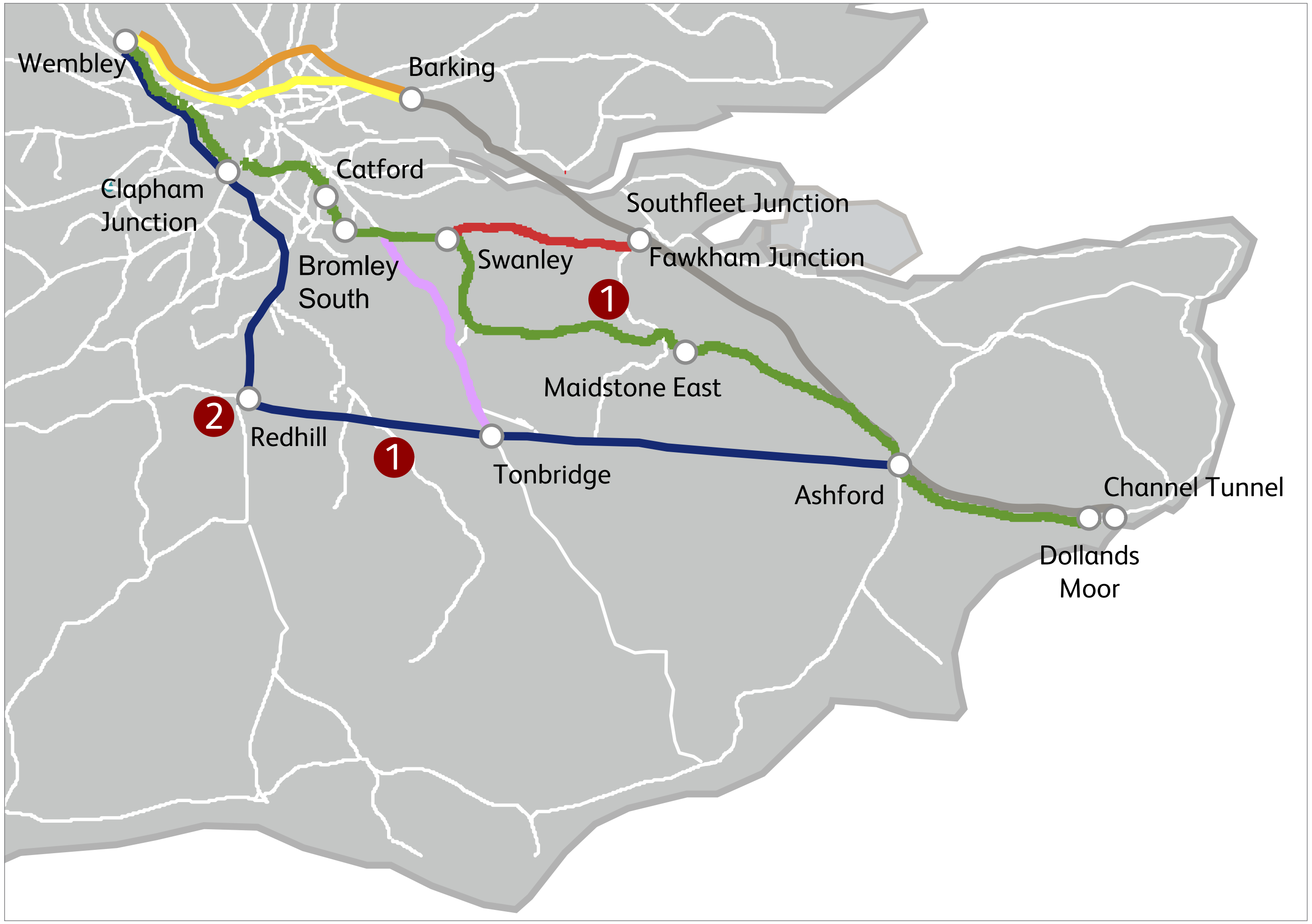
Figure 8.5. Channel Tunnel freight capacity and gauge options

1 Gauge clearance to W12 between Channel Tunnel and Wembley via Maidstone and/ or Tonbridge

2 Address Redhill track circuit issue to enable electric traction capability

Channel Tunnel

- Route 1: Channel Tunnel core route via Maidstone East
- Route 2: Channel Tunnel diversionary route via Tonbridge
- Route 3: Barking to Wembley HS1 via NLL
- Route 4: Barking to Wembley Non-HS1 via GOB
- Route 5: Fawkham Jn to Swanley
- Route 6: Tonbridge to Bickley
- Route 7: HS1
- Short-term capacity and gauge options



Short term capacity options for Corridor 5

Table 8.21: Assessment of Option 2 – Corridor 5
Summary of intervention Address incompatibility issue between existing Redhill track circuit system and Class 92 locomotives
Output Assessment Will enable the use of electric traction on route from Channel Tunnel to London via Redhill.
Potential cost range: £15m - £30m

The Kent Route Study was published in March 2017. A potential choice for funders that is being considered is to add a third track between Peckham Rye and Nunhead. If progressed, this could allow for freight regulation and potentially provide additional capacity for Channel Tunnel freight traffic.

Figure 8.6: Cross London freight flows capacity and gauge options

1. Enhancements to signalling on the Gospel Oak to Barking line
2. Freight loop at Gospel Oak on the Gospel Oak to Barking line
3. Modification of signalling block at Hampstead Heath Tunnel
4. Freight regulation loop at Kensal Rise
5. Forest Gate grade separation
6. Possible Pitsea to Ingatestone rail link
7. Cross London freight capacity
8. Infill electrification between Junction Road Jn and Carlton Road Jn and to London Gateway port
9. Gauge clearance to W12 of West Anglia Main Line

Felixstowe
- Main route
- Alternative route

Channel Tunnel
- Main route
- Alternative route

London Gateway
- Main route
- Alternative route

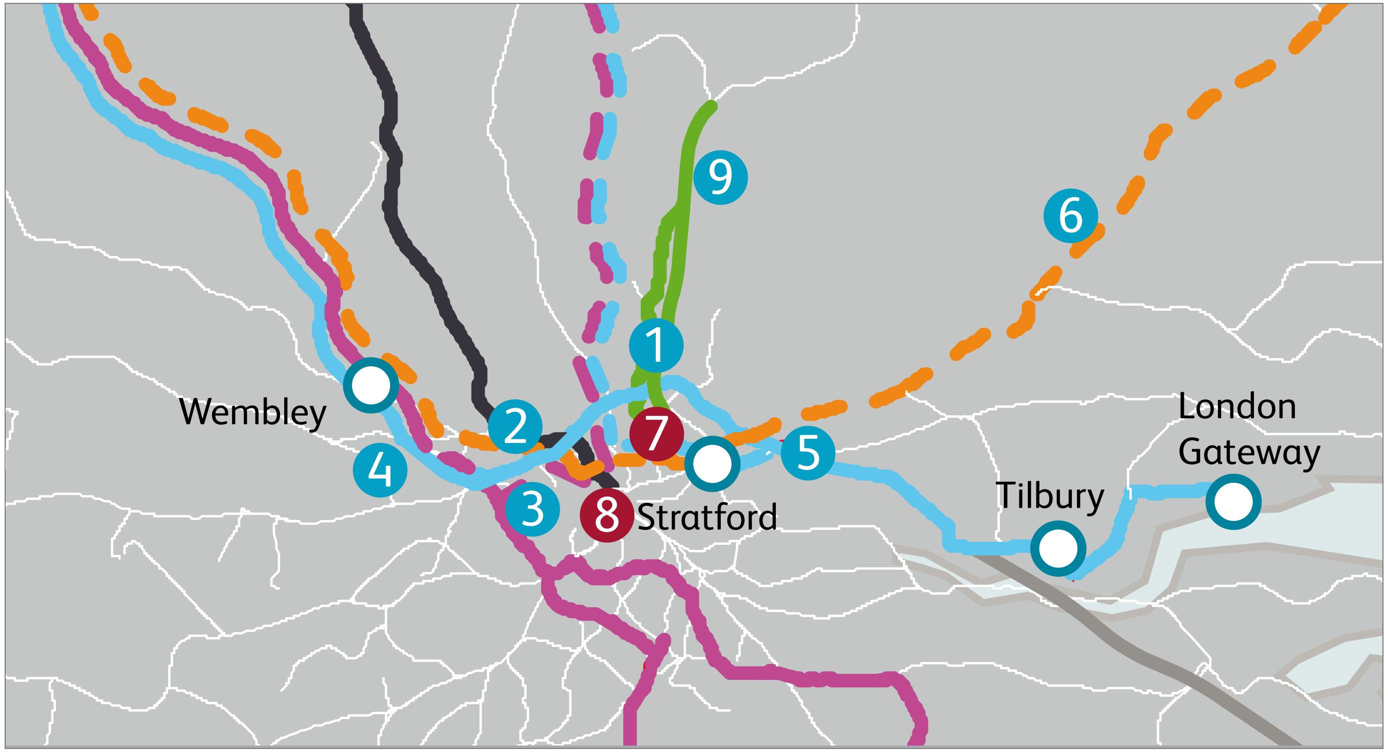
Midland Main Line
- Main route

West Anglia Main Line
- Potential diversionary route for other routeings

- Short-term capacity and gauge options
- Longer-term capacity and gauge options

Corridor 6. Cross London freight flows including Essex Thameside

Figure 8.6 details interventions required on the Cross London and Essex Thameside corridor to enable growth in passenger and freight volumes.



Short term capacity options for Corridor 6

Table 8.22: Assessment of Option 7 – Corridor 6
Summary of intervention Cross London Freight capacity has been identified as a key short-term requirement to enable the growth of freight on cross London routes, such as on the Gospel Oak to Barking line and the North London line. The output is to be determined and will be developed through CP5.
Output Assessment Scope to be determined. Output to enable increased capacity for freight services on cross London flows
Potential cost range: No cost information available

Table 8.23: Assessment of Option 8 – Corridor 6
Summary of intervention Infill electrification of the Thames Haven branch line and Junction Road Junction to Carlton Road Junction to deliver a new electric freight flow following completion of the Gospel Oak to Barking electrification scheme. The scheme would enable Thames Gateway traffic to operate by electric traction from the port via the Gospel Oak to Barking line to Carlton Road Junction and the Midland Main Line.
Output Assessment Will allow use of electric traction
Potential cost range: £40m-£50m

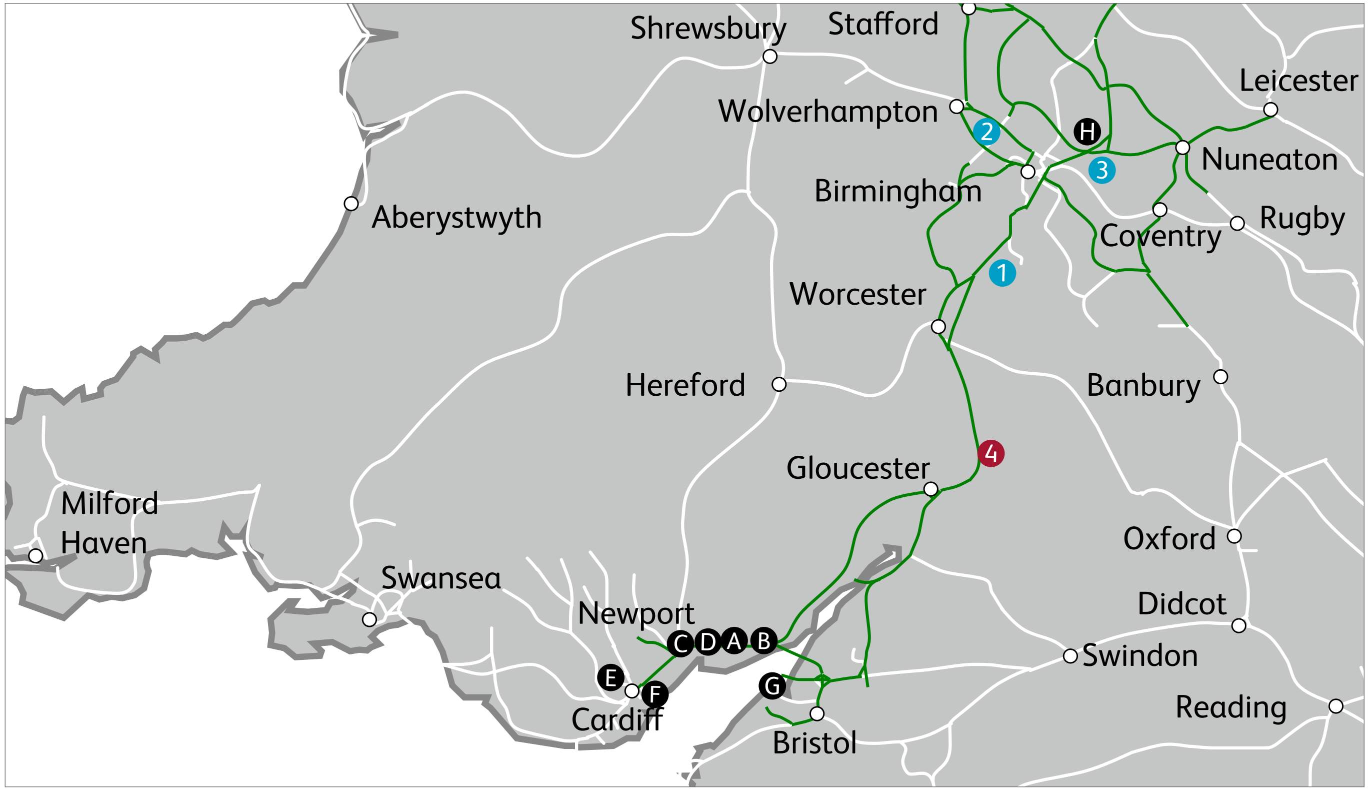
Table 8.24 Medium and long term capacity options for Corridor 6 (long term unless otherwise stated)

Option Number	Details
1	Enhanced signalling headway on the Gospel Oak to Barking line to enable 4tph freight alongside 6tph passenger and possible new platform at Gospel Oak.
2	A westbound freight loop between Gospel Oak Junction and Upper Holloway on the Gospel Oak to Barking line.
3	Modification of the signalling block at Hampstead Heath Tunnel, to enable 4tph freight alongside 12tph passenger.
4	A freight regulation loop at Kensal Rise, to enable 4tph freight alongside 12tph passenger.
5	Grade separation at Forest Gate.
6	Investigate the feasibility of a new rail link between Pitsea and Ingatestone to facilitate routeing of Thames Gateway traffic via the Felixstowe to Nuneaton corridor.

Corridor 7. South West & Wales to the Midlands

Figure 8.7 displays the required interventions.

Figure 8.7: South West & Wales to the Midlands capacity and gauge options



1. Bromsgrove Corridor interventions
2. Re-opening of Stourbridge - Walsall/Lichfield Line
3. Electrification of key freight terminals in the West Midlands
4. Gauge clearance to W10 of Bristol to Birmingham

A. Remodeling of Bishton flyover (with flat junction) and west end of Severn Tunnel Jn
B. Remodeling of Bishton flyover (with replacement flyover) and east end of Severn Tunnel Jn
C. Grade separation at Maindee West Jn
D. Headway improvement between Bishton and Maindee Jn
E. Headway improvements on main lines between Ebbw Jn and Cardiff Central
F. Headway improvements on main and relief lines between Ebbw Jn and Cardiff Central
G. Electrification of Avonmouth Branch
H. Water Orton area interventions

- Short-term capacity and gauge options
- Longer-term capacity and gauge options
- Option proposed on other corridor

Table 8.25 Medium and long term capacity options for Corridor 7 (long term unless otherwise stated)

Option Number	Details
1	To accommodate the train service identified in the West Midlands and Chilterns Route Study for 2043, grade separation would be required in the Barnt Green and Kings Norton area. High level analysis suggests that this option could support 2 freight trains per hour, up to 8tph long distance passenger and 6tph on the Cross City commuter corridor.
2	Reopening the Stourbridge to Walsall/ Lichfield line.
3	Electrification of key freight terminals, including Lawley Street (in Birmingham), Bescot (near Walsall) and Hams Hall (at Water Orton). Medium term.

Corridor 8. Northern Ports & Transpennine

Although the Transpennine corridor does not currently carry a high volume of freight traffic, it is considered by the rail freight industry to be a potential area for growth and an opportunity to achieve modal shift from road to rail. The ports of the north west and north east have aspirations to increase their market share of containerised imports, and Transport for the North have a wider aspiration to convey greater volumes of freight by rail.

Short-term interventions to support these aspirations include the delivery of enhancements to increase capacity and capability across the Pennines as early as possible in CP6. Additionally, gauge clearance of a Transpennine route should be provided as part of the forthcoming Transpennine Route Upgrade (a CP5 baseline scheme), and during the possessions for this programme, freight paths should be provided on alternative routings to enable the FOCs to provide a continued service to their customers.

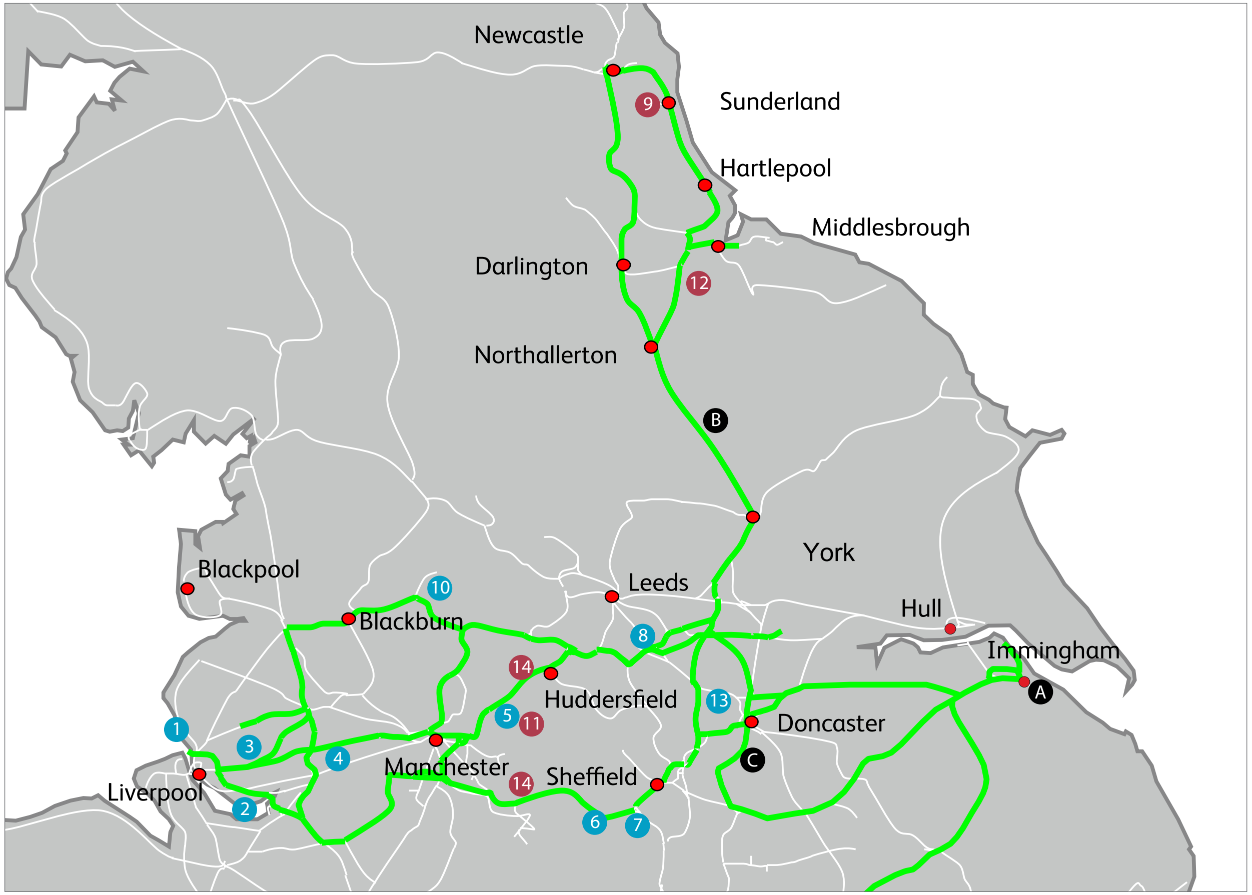
Enhancements identified for the longer-term are capacity driven interventions to enable increased freight capacity across the Transpennine routes.

Figure 8.8 displays the required interventions for short and longer-terms.

Figure 8.8: Northern Ports & Transpennine capacity and gauge options

1 Bootle Branch enhancements
2 South Liverpool Terminals to WCML
3 Port of Liverpool to WCML
4 Chat Moss: night time access
5 Enhancements to increase Transpennine freight capacity
6 Hope Valley: loop at Edale
7 Hope Valley: loop at Grindleford
8 Electrification of Yorkshire freight routes
9 Level crossing enhancements at East Boldon and Tile Shed
10 Potential Calder Valley Line enhancements
11 Short term Transpennine Freight Capacity
12 Level crossing enhancements Teesport - Northallerton
13 Further gauge clearance to Yorkshire Terminals
14 Gauge clearance to W12 of a Transpennine route
A Diversionary access for Immingham and Teesport
B Capacity interventions on ECML between York & Newcastle
C Gauge clearance to W12 of South Yorkshire Joint Line

Short-term capacity and gauge options
Longer-term capacity and gauge options
Option proposed on other corridor



Short term capacity options for Corridor 8

Table 8.26: Assessment of Option 9 – Corridor 8
Summary of intervention Level crossing enhancements on Tyne Dock branch for increased freight traffic at East Boldon and Tile Shed
Output Assessment Allows increased freight services while keeping within Network Rail level crossing safety standards. Note: LNE Route is currently considering whether this scheme will be required.
Potential cost range: £4m

Table 8.27: Assessment of Option 11 – Corridor 8
Summary of intervention Given the changing nature of upgrades on the Transpennine routes and Transport for the North's on-going freight initiatives (see Section 2.1), increasing freight capacity and capability has been identified as a key short term requirement to enable the growth of freight on the Transpennine routes.
Output Assessment Output to enable increased capacity for Transpennine freight services. The output is to be determined and will be developed in conjunction with the North of England Route Study and future Cross Boundary Analysis. Scope to include consideration of W10/W12 gauge clearance.
Potential cost range: No cost information available

Table 8.28: Assessment of Option 12 – Corridor 8
Summary of intervention Level crossing enhancements between Teesport and Northallerton for increased intermodal traffic.
Output Assessment To enable increased freight services alongside level crossing safety compliance.
Potential cost range: No cost information available

Table 8.29: Medium and long term capacity options for Corridor 8 (long term unless otherwise stated)	
Option Number	Details
1	Line speed improvements from 20mph up to 40mph on the Bootle branch. Medium term.
2	Enabling works to support the aspiration to reach 3tph from South Liverpool Terminals to the WCML.
3	Enabling works to support the aspiration to reach 3tph from Port of Liverpool to the WCML.
4	Rearranging maintenance schedules to allow night-time access to the Chat Moss corridor.
5	Increasing Transpennine freight capacity via Diggle for Liverpool and Humber ports, including gauge clearance.
6	A loop at Edale in the Hope Valley.
7	A loop at Grindleford in the Hope Valley.
8	Electrification of Yorkshire freight routes: - Tapton Junction to Masborough and Nunnery Main Line Junction, via Beighton Junction - Beighton Junction to Woodburn Junction - Hare Park Junction to Leeds Stourton terminal Reception line - Stourton terminal to Whitehall Junction.
10	Improved capacity and line speeds on the Calder Valley line.

Corridor 9. Midland Main Line
Figure 8.9 displays the required interventions for short and longer-terms.

Figure 8.9: Midland Main Line capacity and gauge options

1. South of Bedford enhancements: grade separation at Harpenden and Leagrave Jns
2. Bedford area enhancements incl. new platform and a new turnback
3. 4-tracking Kettering North Jn to Kilby Bridge Jn
4. Leicester Area Capacity
5. New line linking Stenson Jn to the MML
6. Stenson Jn to Sheet Stores Jn linespeed improvements
7. Additional turnback facility at Derby station
8. Further Peak Forest capacity
9. Additional access to Mountsorrel Aggregates Terminal
10. Dore to Sheffield capacity enhancements
11. Reopening of Matlock - Buxton line
12. Gauge clearance to W10 between London and Bedford (including cross London route infill)
13. Gauge clearance to W12 between London and Bedford (including Gospel Oak to Barking)

- Short-term capacity and gauge options
- Longer-term capacity and gauge options

Short-term capacity option for Corridor 9

Table 8.30: Assessment of Option 4 – Corridor 9
Summary of intervention Leicester area capacity, including new platforms at Leicester station, two additional tracks between Wigston North Junction and Syston East Junction, and grade separation at Wigston North Junction.
Output Assessment Required to provide both passenger and freight capacity by 2023 (4ftpph) and 2043 (7ftpph). Reduces crossing moves and improves freight regulation. Note: Partially committed in CP6, and these elements assumed as part of baseline. Probable that full completion will not occur until CP7.
Potential cost range: £600m-£1billion

Table 8.31: Medium and long term capacity options for Corridor 9 (long term unless otherwise stated)

Option Number	Details
1	Capacity enhancements in the area south of Bedford area including grade separation at Harpenden and Leagrave Junctions.
2	Enhancements in the Bedford area including a new platform and new turnback south of the station. Medium term.
3	Kettering – Wigston North Junction enhancements: 4-tracking Kettering North Junction to Kilby Bridge Junction.
5	A new line linking Stenson Junction to the MML at Trent Junctions, north of East Midlands Parkway station.
6	Increased line speed between Stenson Junction (near Derby) and Sheet Stores Junction (near Derby).
7	Additional turnback facility at Derby station.
8	Further capacity at Peak Forest, including remodelling of layout by Dowlow and Hindlow Quarries and extension of Buxton Up Relief Sidings. To facilitate trailing weight increase from 1,750 tonnes – 2,600 tonnes at Dowlow and Hindow quarries. Medium term.
9	Improve access to aggregates terminals including Mountsorrel.
10	Improvements to capacity between Dore to Sheffield, including reinstating four tracks and loss of sidings in Sheffield station, and doubling at Dore. Medium term.
11	Reopening of Matlock-Buxton rail link.

Corridor 10. Great Western Main Line

Requirements for capacity enhancements have been identified for the short-term at Didcot.

Additionally, a number of interventions have been identified for funders for the longer-term between the Severn Tunnel and Cardiff to improve freight capacity, and improve capability on the Avonmouth Branch.

Figure 8.10 displays the required interventions for short and longer-terms.

Figure 8.10: Great Western Main Line capacity and gauge options

1. Remodelling of Bishton Flyover (with flat junction) and west end of Severn Tunnel Jn
2. Remodelling of Bishton Flyover (with replacement flyover) and east end of Severn Tunnel Jn
3. Grade separation at Maindee West Jn
4. Headway improvements between Bishton and Maindee Jn
5. Headway improvement on main lines between Ebbw Jn and Cardiff Central
6. Headway improvement on main and relief lines between Ebbw jn and Cardiff Central
7. Electrification of Avonmouth Branch
8. Gauge clearance infill to W12 between London, Bristol and Cardiff
9. Gauge clearance to W12 from Severn Tunnel Jn to Cardiff

A. Grade Separation at Didcot East and Oxford North Jns and capacity improvements at Oxford Station

B. Grade separation at Didcot East Jn, capacity improvements Didcot-Oxford and Oxford Station

- Short-term capacity and gauge options
- Longer-term capacity and gauge options
- Option proposed on other corridor

Table 8.32: Medium and long term capacity options for Corridor 10 (long term unless otherwise stated)

Scheme Number	Details
1&2	Either: Remodelling of Bishton Flyover (with a flat junction) and the west end of Severn Tunnel Junction. Or: Remodelling of Bishton Flyover (with a replacement flyover) and east end of Severn Tunnel Junction.
3	Grade separation at Maindee West Junction (near Newport).
4	Headway improvements between Bishton and Maindee Junction (near Newport).
5&6	Either: Headway improvement on the main lines between Ebbw Junction and Cardiff Central. Or: Headway improvement on the main and relief lines between Ebbw Junction and Cardiff Central.
7	Electrification of the Avonmouth branch near Bristol. Medium term.

Corridor 11. Anglo-Scottish & Northern regional traffic

Possible options for funders have been identified to meet the outputs for short and longer-term, in view of forecast growth in the domestic and ports intermodal markets. Figure 8.11 displays the required interventions for short and longer-terms.

Figure 8.11: Anglo-Scottish & Northern capacity and gauge options

- 1 Grantshouse dynamic loops and 4-tracking Prestonpans to Drem
- 2 Edinburgh suburban line capacity improvements
- 3 Enhancements to loops north of Newcastle
- 4 Capacity interventions on ECML between York & Newcastle
- 5 4-tracking in Hare Park Jn area
- 6 Freight loop at Camperdown
- 7 Looping strategy between Dundee and Aberdeen

- A Carlisle Station remodelling: incl. 4-tracking both approaches
- B 3 or 4-track Gretna Jn to Floriston
- C 4-tracking sections from Carlisle to Carstairs
- D Carstairs remodelling
- E South Yorkshire Joint Line gauge clearance
- F Electrification of Yorkshire freight routes

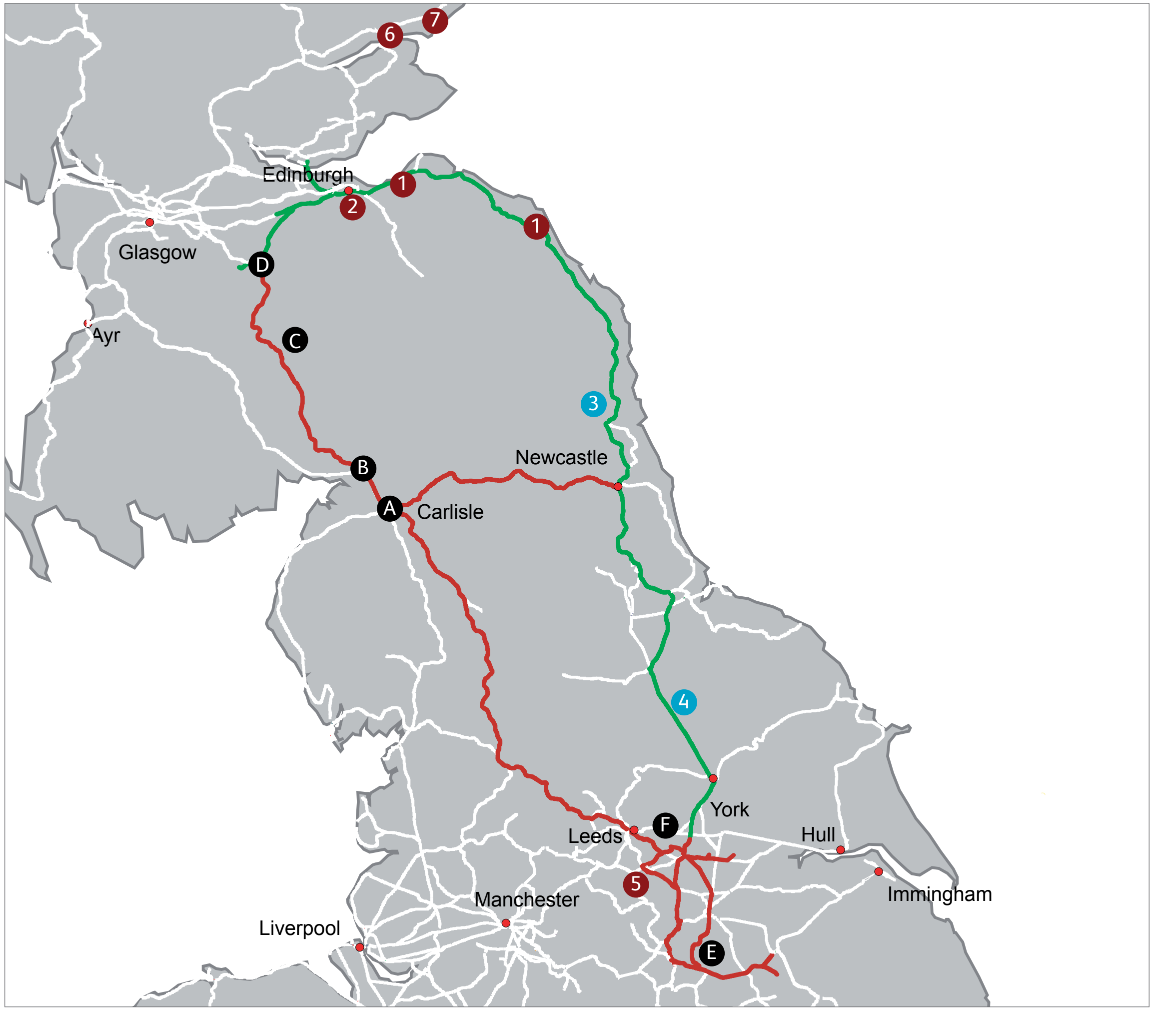
Core route

All other routes

Short-term capacity and gauge options

Longer-term capacity and gauge options

Option proposed on other corridor



Short term options for Corridor 11

Table 8.33: Assessment of Option 1 – Corridor 11
Summary of intervention Dynamic loops on ECML at Grantshouse (near Berwick-upon-Tweed) and four-tracking ECML Prestonpans to Drem (east of Edinburgh)
Output Assessment Accommodates expected freight demand for CP6, of 1ftpph (Class 4 or Class 6).
Potential cost range: Greater than £250m

Table 8.34: Assessment of Option 2 – Corridor 11
Summary of intervention Edinburgh Suburban Line capacity improvements, including: remodelling of Portobello, Slateford and Niddrie West single lead junctions, upgrade of the signalling capacity, enhancement of the Millerhill through route capabilities (from Monktonhall Junction) in addition to electrification.
Output Assessment Full project will provide (from freight perspective): W12 gauge cleared electrified route between the East Coast Main Line and West Coast Main Line that provides sufficient capacity for electric freight (avoiding Edinburgh Waverley), and a diversionary route for all operators (local, long distance and freight). Capacity for 1ftpph (Class 4 or Class 6). Other passenger benefits.
Potential cost range: £150m-£300m

Table 8.35: Assessment of Option 5 – Corridor 11
Summary of intervention 4-tracking existing 2-track railway in the Hare Park Junction area, south of Leeds
Output Assessment Accommodate passenger volumes, as required under franchise commitments for CP6, and forecast freight traffic. Note: Because of the scale of the interventions proposed, it is possible that this scheme would offer poor value for money.
Potential cost range: N/A

There are a number of key enhancements proposed in the Scotland Route Study north of the Central Belt (i.e. beyond the extremity of this corridor) to accommodate freight growth. Two principal schemes are:

Table 8.36: Assessment of Option 6 – Corridor 11
Summary of intervention Freight loop at Camperdown (North of Dundee).
Output Assessment Create an Up Freight loop to remove existing crossovers and extend bi-directional working between new loop and Dock Street Tunnel. Provides capacity for 1ftpph, and potential timetable benefits for passenger services.
Potential cost range: £45m-£111m

Table 8.37: Assessment of Option 7 – Corridor 11
Summary of intervention Looping strategy for freight between Dundee and Aberdeen.
Output Assessment Looping strategy for freight paths to increase freight capacity, pathing optimisation and potential timetable benefits for passenger and freight services. Provides capacity for 1ftpph. Key freight trains include engineering haulage traffic between Dundee and Aberdeen.
Potential cost range: £56m-£140m

Table 8.38: Medium and long term capacity options for Corridor 11 (long term unless otherwise stated)

Option Number	Details
3	Enhancements (length and speed) to existing loops north of Newcastle.
4	Interventions on the ECML between York and Newcastle to manage the speed mix and accommodate freight and passenger traffic. Options include realigning tracks north of York, remodelling Northallerton station, and potential new alignments to provide diversionary route to ECML. Medium term.

Ongoing Capacity Considerations

Short-term options should be considered as a priority over the next decade, with medium term options likely to require investigation over 20 years and long term options relating to 2043.

In November 2016 the Department for Transport (DfT) announced where its preferred route for the second phase of High Speed Two (HS2) will join the classic network. However, the West Coast Route Study has not yet been published. As such, interventions on Corridor 1 should be considered as indicative. This includes Option 6, four tracking the WCML north of Preston, which remains a long-term option for funders, and will be developed in conjunction with the DfT/ HS2 Ltd. The viability of alternatives, including additional loops or a full upgrade of the Settle-Carlisle line, should also be considered.

Although the East Coast Route Study has not yet been established, Corridors 2, 8 and 11 all face the challenge of capacity constraints between Northallerton and Newcastle. While the need for intervention is clear, the full extent of the gap between capacity and demand will not be understood until a final train service specification for the ECML north of York exists. At present, the exact quantum of services extending from HS2 on to the classic network is not known.

Across all corridors, the key capacity challenge is to ensure that full benefits are realised for a line of route. Failing to unlock capacity along the entire route means that the benefit of individual projects completed is not realised. For example, a lack of intervention at Forest Gate in East London would have a resultant impact on freight volumes for the entire ECML. Given the cross-boundary nature of impacted freight flows, this study is the primary vehicle in providing a holistic understanding of the need for line of route interventions.

8.3 Capability

In addition to capacity schemes, this study has assessed the capability requirements for the individual line of routes for the future 30 year time period.

The demands placed on the capability of the network are more varied for freight services compared to passenger. Capability enhancements can create new commodity flows, additional routeing options, economies of scale and increased capacity for freight operators. The main areas of significance to the freight industry are detailed below:

8.3.1 Speed (average and maximum)

Sections with low line speed impacts on freight more than on passenger services. Typically, freight trains are heavier than passenger services and accelerate less rapidly. This problem is compounded further when a section of low line speed is followed by an upward gradient. For this reason, restrictive line speeds are of significant detriment to end-to-end journey times for freight services.

In many instances, RA10 operating permissions entail multiple line of route structure related speed restrictions. These speed restrictions serve to depress service quality, lead to extended sectional running times and cause operators to incur additional brake wear and fuel usage as a result of the acceleration and deceleration. It is, therefore, a priority of the freight industry that enhancements to remove speed restrictions are taked forward, thereby facilitating increased average speed.

It must be noted, however, that increasing the maximum line speed for freight services may not always lead to notable benefits where the average speed of a service is still constrained by slow sections elsewhere. For this reason, short-term capability options are focused on increasing the average speed and therefore end-to-end journey times. Possible options based around removing sections of slow line speed have been developed with input from the Working Group as well as Route Freight Managers within Network Rail.

It is recognised that existing constraints may limit some of these aspirations. For example, running 90mph services on the WCML may lead to increased wear on wagons, air turbulence at stations, increased emissions, and the geographical nature and topography of the line north of Preston could present additional challenges. In addition, Section 5.5 notes that capability analysis has established that, in the shorter term, switching from diesel to electric traction would provide greater benefits than increasing the line speed to 90mph. Despite this, in the longer term, increasing the maximum line speed remains an aspiration once other benefits have been realised.

This strategy will ensure consistency of line speed by removal of slower sections before beginning to take advantage through the deployment of more powerful locomotives in the future.

This study notes an additional requirement to update and optimise the freight train braking capability standards, to ensure they reflect current rolling stock capability. Following a study by the Rail Safety and Standards Board[2] into braking capability, further analysis is required to revise and implement braking standards to enable the removal of nationwide speed restrictions.

8.3.2 Train lengthening

Enhancements to train length enable operators to carry greater loads per path thereby acting to increase freight capacity on the network. Section 4.2.2 highlighted corridors where length limits do not allow 775m trains to run by default, and increasing maximum train lengths remains a key aspiration for the freight industry. Key routes identified for 775m capability include Felixstowe to the West Midlands and the North, Anglo Scottish and the WCML.

775m train length capability (including locomotive) is the short-term baseline for key intermodal corridors. Rail freight users have expressed the need to develop capability for longer trains, for example, 1,500m intermodal services, in the long term. Additionally, automotive rail flows should progress to 1,500m length services due to the lightweight nature of the commodity. However, this is dependent on suitable locations on the network with the capability to handle, assemble and manage services of this length.

For construction traffic, the commodity itself is heavy and it is the weight of the material carried, rather than the length of the train, which is the limiting factor. However, the industry is targeting a baseline of 2,000 tonne – 2,600 tonne trailing weight for construction flows, which equates to approximately 450m trailing length. A long term aspiration exists for trains of 600m and 3,000 tonnes.

These aspirations encourage rail to take advantage of economies of scale, increase productivity and become increasingly competitive relative to road. Early studies have begun to investigate the possibility of using nodal yards to assemble the longest trains, taking the onus to provide extended facilities away from just the ports. Innovations such as this are vital if the aspiration of running longer trains is to become viable.

Realising the benefits of infrastructure enhancements across the network does in part rely on investment in the ports and rail freight terminals. By providing future aspirational capabilities, investing in rail freight will become an increasingly attractive proposition to the wider industry, including both terminals and customers. This in turn will increase the market share and competitiveness of rail freight.

8.3.3 Electrification

Electrification of freight services acts to reduce freight journey times, increase capacity, timetable performance, capacity utilisation and the environmental credentials of freight services.

It is expected that the approach to future route electrification and upgrades will be set out in due course and will include advice of freight specific electrification schemes.

8.3.4 Nodal yards

As introduced in Section 5.4.2, the concept of nodal yards is as locations to act as regulation points to enable quality freight paths whilst facilitating key ancillary services including wagon maintenance, locomotive fuelling and driver/staff change over.

Building on the operational model established in CP4 with Ipswich and Wembley nodal yards and Ripple Lane proposed for CP5, there is a need to develop suitable proposals for the next wave of nodal yard facilities. These must be strategically located at corridor intersections enabling regulation, relief, run round and recess of freight traffic with high average speed paths between key locations.

Future locations for nodal yards include:

- Eastleigh; serving Southampton Port automotive and intermodal traffics; 1,500m standage capability to match splitting/joining of future super length autos services;
- Bescot; with multiple route connectivity and short haul accessibility to both the current and future array of West Midlands terminals.
- Crewe and Mossend; – 1,500m standage for automotive trains

2 RSSB T999 study, Review of the braking tables in RGS GK/RT0075 Lineside Signal Spacing and Speed Signage

and potential post HS2 super length train operation over WCML North.

- Peterborough; sited at the intersection of the ECML and the Felixstowe to Midlands / North West corridors, a remodelling of the existing legacy layout with capacity to accommodate multiple 775m services; ideally coinciding with and capitalising on resignalling schemes in the area.

8.3.5 Gauge

As discussed in Chapter 7, the development of the intermodal market is dependent on the gauge capability of the network. To enable new flows, W10 and W12 standard clearances of key corridors are required, along with diversionary route capability. Additionally, gauge clearance of new (diversionary) routes can create extra network capacity by providing additional routeing options.

In addition to identifying key gauge routes, the freight industry is actively investigating alternative options to enable larger box types through the innovative use of box and wagon combinations.

Section 7.1.2 details the future network gauge aspiration for W10 and W12 clearances.

Corridor Assessment

The following tables detail the capability options, by corridor, in the short and longer term. They include gauge, length and speed options. Further details of scheme options (including subschemes where relevant) are provided in Appendices 5 and 6.

Table 8.39: Capability options for Corridor 1: West Coast Main Line			
Category	**Option number**	**Options and aspirations**	**Timing**
Gauge	17	Gauge clearance to W12 between WCML (Coatbridge) and Grangemouth. Potential cost range: less than £50m.	Short term
	20	Gauge clearance to W12 between Wembley and Midlands terminals	Short term
	21	Gauge clearance to W12 between Midlands terminals and Wigan / Trafford Park	Short term
	22	Gauge clearance to W12 between Wigan and Coatbridge	Short term
Length	24	West Coast West Midlands to North West train lengthening to 775m	Short term
	25	West Coast North West to Scotland train lengthening to 775m	Short term
Speed		Aspiration: to remove sections of low line speed, to enable freight to achieve greater average speed	Short term
	26	Northampton Station speed improvements	Short term
	27	West Coast West Midlands to North West speed improvements (including at Crewe and Warrington)	Short term
	28	West Coast South loop entry and exit speed improvements (including at Wembley Yard)	Short term
	29	West Coast North loop entry and exit speed improvements (including at Eden Valley and Tebay)	Short term
	30	West Coast South speed improvements (for Heavy Axle Weight traffic) (including at bridge near Wolverton)	Short term
Gauge	23	Gauge clearance to W12 of the Glasgow South Western route	Long term
Speed		Aspiration: to increase maximum freight speed from 75mph to 90mph to help reduce total journey time. This could necessitate the use of electric traction. To maximise benefit from increased velocity, freight to run on fast lines when possible (i.e. off peak, night-time).	Long term

Table 8.40: Capability options for Corridor 2: East Midlands and Yorkshire freight flows

Category	Option number	Options and aspirations	Timing
Gauge	1	Gauge clearance to W12 of South Yorkshire Joint Line between Doncaster and Gainsborough via Worksop, to enable W12 traffic to access Rossington intermodal terminal. Potential cost range: £15m to £35m.	Short term
Speed		Aspiration: to remove sections of low line speed, to enable freight to achieve greater average speed	Short term
	4	East Coast North speed improvements (including on the ECML in the Thirsk area and between King Edward Bridge Jn and Sunderland)	Short term
	5	East Midlands & Yorkshire speed improvements (for Heavy Axle Weight traffic) (including on South Yorkshire Joint Line)	Short term
Gauge		Aspiration: to enhance gauge clearance for York and Newcastle stations, providing W12 clearance for additional track through central York and central Newcastle approaches	Long term
Speed		Aspiration: to increase average speed in conjunction with loops, in line with East Coast Connectivity. This could have substantial benefits to terms of capacity and resilience.	Long term

Table 8.41: Capability options for Corridor 3: Felixstowe to the West Midlands and North

Category	Option number	Options and aspirations	Timing
Gauge	15	Gauge clearance to W12 between Syston and Stoke. This scheme is committed in CP6 and is therefore included in baseline. Potential cost range: £20m to £30m.	Short term
	17	Gauge clearance to W12 of cross country route via Ely (subject to emerging market demands)	Short term
Length	18	West Midlands train lengthening to 775m (including Nuneaton to Lawley Street)	Short term
Speed		Aspiration: removal of sections of low line speed to enable freight to achieve greater average speed	Short term
	19	Anglia speed (including in Ely area)	Short term
		Aspiration: to run electric traction on both routes	Medium term
		Aspiration: to increase maximum freight speed from 75mph to 90mph to help reduce total journey time. This could necessitate the use of electric traction	Long term

Table 8.42: Capability options for Corridor 4: Southampton to West Midlands & WCML

Category	Option number	Options and aspirations	Timing
Gauge	11	Gauge clearance to W10 of diversionary route via and Westbury and Melksham	Short term
	12	Gauge clearance to W8 between Bathampton Jn and Bradford Jn (Dundas Aquaduct)	Short term
Length		Aspiration: investigations to be undertaken to support aspiration to run trains longer than 775m	Short term

Table 8.43: Capability options for Corridor 5: Channel Tunnel freight			
Category	**Option number**	**Options and aspirations**	**Timing**
Gauge	1	Gauge clearance to W12 between the Channel Tunnel and Wembley via Maidstone and/or Tonbridge	Short term

Table 8.44: Capability options for Corridor 6: Cross London flows including Essex Thameside			
Category	**Option number**	**Options and aspirations**	**Timing**
Length	10	London Gateway train lengthening to 775m (London Gateway to Ripple Lane)	Short term
Speed		Aspiration: to remove sections of low line speed, to enable freight to achieve greater average speed	Short term
	11	Cross London speed improvements (between Kentish Town and Camden Road)	Short term
	12	Cross London speed improvements (for Heavy Axle Weight traffic) (including at Kentish Town Viaduct)	Short term
Gauge	9	W12 gauge clearance of the West Anglia Main Line	Long term
Speed		Aspiration: to run electric traction on all freight routes	Long term

Table 8.45: Capability options for Corridor 7: South West and Wales to the Midlands			
Category	**Option number**	**Options and aspirations**	**Timing**
Gauge	10	Gauge clearance to W10 between Bristol and Birmingham	Short term
Speed		Aspiration: Remove sections of low line speed to enable freight to achieve greater average speed	Short term
	11	Western speed improvements (including Cheltenham, Worcester and Westerleigh Junction, near Bristol)	Short term
	12	West Midlands speed improvements (for Heavy Axle Weight traffic) (including bridge near Kenilworth and at Duddeston)	Short term
Length		Aspiration: use of electric traction could potentially enable longer trains to run	Long term
Speed		Aspiration: to run electric traction on the entire route, to enable heavier trains to operate and free up capacity on the route	Long term

Table 8.46: Capability options for Corridor 8: Northern Ports and Transpennine			
Category	**Option number**	**Options and aspirations**	**Timing**
Gauge	14	Gauge clearance to W12 of a Transpennine route	Short term
Speed		Aspiration: Remove sections of low line speed to enable freight to achieve greater average speeds	Short term
	15	Immingham speed improvements (at locations between Doncaster and Immingham)	Short term
	16	Transpennine speed improvements (for Heavy Axle Weight traffic) (including at bridge near Stalybridge)	Short term
	17	North West speed improvements (for Heavy Axle Weight traffic) (including at bridge near Stockport)	Short term
	18	North East and Humber speed improvements (for Heavy Axle Weight traffic) (including at bridge near Scunthorpe)	Short term
	19	East Lancashire speed improvements (Heavy Axle Weight only) (including at Lydgate Viaduct near Burnley)	Short term
	20	Liverpool speed improvements (Bootle branch)	Short term
Gauge	13	Gauge clearance to W12 of further routes for Yorkshire terminals including: Gascoigne Wood Jn to Sherburn Jn to Colton Jn Altofts Jn to Whitwood Jn to Sherburn Jn Methley Jn to Whitwood Jn	Medium term
		Aspiration: enhanced gauge clearance for York and Newcastle stations	Long term

Table 8.47: Capability options for Corridor 9: Midland Main Line			
Category	**Option number**	**Options and aspirations**	**Timing**
Gauge	12	Gauge clearance to W10 between London and Bedford (including cross London routes infill)	Short term
	13	Gauge clearance to W12 between London and Bedford (including Gospel Oak to Barking line)	Short term
Speed	14	MML South speed improvements (for Heavy Axle Weight traffic) (including at Sharnbrook Viaduct near Bedford)	Short term
	15	Corby speed improvements (for Heavy Axle Weight traffic) (including at Harringworth Viaduct)	Short term
	16	Sheffield speed improvements (for Heavy Axle Weight traffic) (including at Attercliffe Viaduct)	Short term
	17	MML South speed improvements (from less than 60mph) (including Bedford to Harrowden Jn)	Short term
	18	MML South speed (from 60mph or above) (including St Albans area)	Short term
	19	MML North speed improvements (from less than 60mph) (including Leicester area)	Short term
	20	MML North speed improvements (from 60mph or above) (including Sileby to Loughborough)	Short term
Length		Aspiration: to increase length of construction trains, but improvements to traction issues will also need to be investigated	Long term

Table 8.48: Capability options for Corridor 10: Great Western Main Line

Category	Option number	Options and aspirations	Timing
Gauge	8	Gauge clearance infill to W12 between London, Bristol and Cardiff (including Chipping Sodbury Tunnel and Newport Old Tunnel)	Short term
	9	Gauge clearance to W12 from Cardiff to Severn Tunnel Jn	Short term
Speed		Aspiration: to remove sections of low line speed, to enable freight to achieve greater average speed	Short term
	10	Acton speed improvements (at Acton junctions)	Short term
Speed		Aspiration: to increase in freight average speed from 45mph to 60mph, either through enhancing or replacing existing wagons and, ultimately 75mph to yield significant capacity benefits. The potential options for this include: i) Enhancements to/new wagons ii) Electric traction (and therefore electrification) to achieve 75mph	Long term
Length		Aspiration: to increase length of construction trains, but improvements to traction issues will also be required to be investigated	Long term

Table 8.49: Capability options for Corridor 11: Anglo Scottish and Northern Regional Traffic

Category	Option number	Options and aspirations	Timing
Gauge		Aspiration: W12 strategic infill of sections connecting to East Coast Main Line	Short term
Speed		Aspiration: Remove sections of low line speed to enable freight to achieve greater average speed	Short term
	9	East Coast North speed improvements (for Heavy Axle Weight traffic) (including through Morpeth Station)	Short term
Speed		Aspiration: to increase in freight average speed from 60mph to 75mph on ECML to help reduce end to end journey time. A further aspiration is to increase average speed in conjunction with loops, in line with East Coast Connectivity. This could have substantial benefits to terms of capacity and resilience.	Long term

9. Strategy for funders

9.1 Introduction

The Freight Network Study has looked at the current rail freight industry, recent changes to the market and has assessed the further investment needed to meet expected future growth. A number of potential options have been proposed for the development of the capability and capacity of the rail network.

This chapter seeks to outline the key strategic capacity and capability issues of concern to freight operators. Development of options as part of this study has looked at stakeholder aspirations, particularly those of operators for the development of capability to enable them to expand their markets. In developing these options, a recommendation of the timescale in which schemes are likely to be required is provided. The schemes identified as being 'short term' (over the next ten years) have been recommended based on the strategic case, and support from stakeholders.

This study identifies a potential strategy for accommodating freight growth effectively and efficiently given existing commitments to passenger operators. Individual Route Studies both inform, and are informed by, this study. Route based capacity options that support rail freight are brought together in this study. In addition, this study recommends capability options that can enhance the efficiency of rail freight, benefitting the entire rail network.

The resulting strategy sets out the key components for meeting the capacity challenge in both the short and long-term within the 30 years of the Long Term Planning Process (LTPP) period. It comprises the following elements:

- Potential strategy for future rail freight capacity
- Potential strategy for future capability of rail freight
- Next steps.

9.2 Strategy for future rail freight capacity

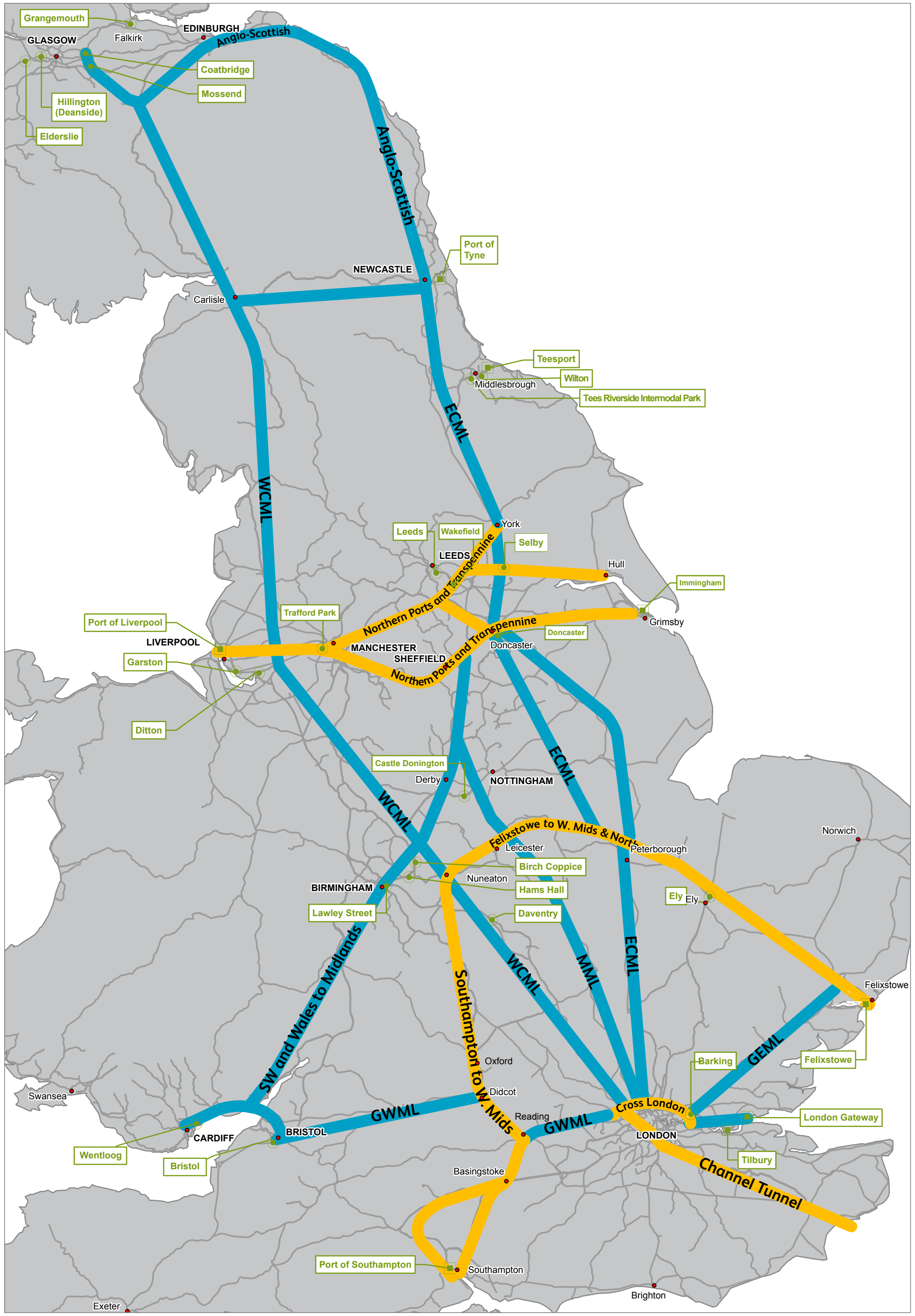
9.2.1 The core principle

This study recommends potential short-term options for the development of the core arterial freight network, building upon the schemes delivered in previous Control Periods. The strategy focuses on developing capacity and capability, primarily for intermodal commodities from the major ports and the Channel Tunnel to key terminal locations. The industry recognises the link between capacity from Felixstowe and Southampton ports as being a key driver for growth in the Midlands and the North of England. The strategy creates a nationally cohesive freight network with complete 'line of route' enhancements. This is illustrated in Figure 9.1, which shows the core freight network and the priorities for short-term interventions within it.

Recognising that the full range of options classified as short term may not be affordable over the next ten years, an exercise was undertaken to rank short term interventions as high, medium or other priority. Criteria to score each individual scheme were developed, enabling all short term capacity and capability schemes to be ranked as being high, medium or other priority, based on their individual scores. For the short term options proposed, this exercise enables the highest priorities for funders to be identified. The process employed, and the prioritisation assigned to each individual scheme, has been approved by the Network Study Working Group. The short-term priorities for investment, for capacity, gauge, and capability (excluding gauge) are shown in Tables 9.1, 9.2 and 9.3 below.

Further information on the scores for each scheme is provided in Appendix 5. Further information on the process employed is in Appendix 6. The prioritisation exercise is intended to give an indication of the relative level of priority which should be attached to each short-term scheme. The exercise does not replace the need for a business case for individual schemes and/or programmes. The further development and implementation of individual schemes/programmes will be subject to a satisfactory business case, as required by funders.

Figure 9.1: Core freight network corridors and priorities for short term intervention



Core freight network

Priority corridors for short-term enhancement to enable new flows

Port of Liverpool Key ports and terminals

Table 9.1: Short term capacity options for funders

Category	Priority and corridor	Scheme
Highest priority	1. Felixstowe to West Midlands & the North[8]	• Loop facility at Haughley Junction, including doubling of the junction • Headway reductions at Bury St Edmunds • Full doubling between Soham and Ely • Infrastructure works at Ely • Signalling enhancements Syston east Junction to Peterborough • Leicester area capacity
	2. Cross-London inc. Essex Thameside	• Cross London freight capacity
	3. West Coast Main Line	• Doubling of Stafford South Junction • Preston station area capacity enhancement and remodelling
	4. Southampton to West Midlands & West Coast Main Line	• Didcot East Junction to Oxford north Junction: Grade separation at Didcot East Junction and – Either: grade separation at Oxford North Junction and improvements at Oxford station – tracking Didcot to Oxford
Medium priority	1. Felixstowe to West Midlands & the North	• Further doubling of the Felixstowe branch
	2. West Coast Main Line	• Dynamic down loop Tebay to Shap Summit in Cumbria • Dynamic up loop between Carlisle and Plumpton (near Penrith) • Dynamic up loop between the Eden Valley (near Penrith) and Shap Summit • Remodelling of Carstairs, in order to improve freight regulation • Reduction of headways on Northampton loop and remodelling of Northampton station to allow higher line speeds
	3. Northern Ports & Transpennine	• Transpennine freight capacity
	4. Cross-London inc. Essex Thameside	• Infill electrification Junction Rd Junction to Carlton Rd Junction and to London Gateway port
	5. Anglo-Scottish & Northern	• Dynamic loops on ECML at Grantshouse (near Berwick-upon-Tweed)
Other options	1. Anglo-Scottish & Northern	• 4 tracking existing 2 track railway in the Hare Park Junction area, south of Leeds • Edinburgh Suburban Line capacity improvements • Freight loop at Camperdown (north of Dundee) • Looping strategy for freight between Dundee and Aberdeen
	2. Channel Tunnel	• Electric traction capability for all Channel Tunnel routes, addressing the Redhill track circuit
	3. Northern Ports & Transpennine	• Level crossing enhancements: Teesport to Northallerton • Level crossing enhancements at East Boldon and Tile Shed for increased Tyne Dock traffic
	4. Southampton to West Midlands & West Coast Main Line	• Electrification of the diversionary route via Andover and potentially Eastleigh to Romsey

Table 9.2: Short term gauge options for funders		
Category	**Priority and corridor**	**Scheme**
Highest priority	1. Channel Tunnel	• W12 gauge clearance between the Channel Tunnel and Wembley via Maidstone and/or Tonbridge
	2. West Coast Main Line (WCML)	• WCML W12: Midlands Terminals to Wigan / Trafford Park • WCML W12: Wembley to Midlands terminals
	3. Northern Ports and Transpennine	• W12 Transpennine clearance
	4. East Midlands & Yorkshire	• W12 South Yorkshire Joint Line
Medium priority	1. West Coast Main Line	• WCML W12: Wigan to Coatbridge • W12 WCML to Grangemouth
	2. Felixstowe to West Midlands & the North	• Line of route gauge upgrade to W12, on the cross country route via Ely (subject to emerging market demands)
	3. Southampton to West Midlands & West Coast Main Line	• Bathampton Junction to Bradford Junction W8/W10 (Dundas Aqueduct) • W10 Diversionary Route via Westbury and Melksham
	4. Midland Mainline	• W12 London (Gospel Oak to Barking) to Bedford
Other options	1. Great Western Mainline	• W12 infill between London, Bristol and Cardiff
	2. Midland Mainline	• Infill W10 between London and Bedford
	3. South West & Wales to the Midlands	• Bristol to West Midlands W10

Note: Schemes listed for W10 enhancement will be also considered for W12.

Table 9.3: Short term capability (excluding gauge) options for funders

Category	Priority and corridor	Scheme name
Highest priority	1. Cross-London inc. Essex Thameside	Cross London Heavy Axle Weights (HAW)
	2. West Coast Main Line	West Coast North loop entry and exit speed
	3. Felixstowe to West Midlands & the North	Anglia speed
	4. West Coast Main Line	Northampton station speed
	5. West Coast Main Line	West Coast West Midlands to North West speed
	6. Cross-London inc. Essex Thameside	London Gateway 775m train length
	7. Cross-London inc. Essex Thameside	Cross London speed
	8. Midland Main Line	MML North speed (from less than 60mph)
	9. Midland Main Line	MML South speed (from less than 60mph)
	10. West Coast Main Line	West Coast South loop entry and exit speed
Medium priority	1. Midland Main Line	Corby HAW
	2. Great Western Main Line	Acton speed
	3. Midland Main Line	MML South HAW
	4. Felixstowe to West Midlands & the North	Anglia HAW
	5. South West & Wales to the Midlands	West Midlands HAW
	6. Northern Ports & Transpennine	Transpennine HAW
	7. West Coast Main Line	West Coast HAW South
	8. West Coast Main Line	West Coast 775m train length North West to Scotland
	9. West Coast Main Line	West Coast 775m train length West Midlands to North West
	10. Anglo-Scottish & Northern	East Coast North HAW
	11. Northern Ports & Transpennine	North East and Humber HAW
	12. Felixstowe to West Midlands & the North	West Midlands 775m train length
Other options	1. East Midlands & Yorkshire	East Coast Speed North
	2. Felixstowe to West Midlands & the North	East Midlands HAW
	3. Northern Ports & Transpennine	North West HAW
	4. Northern Ports & Transpennine	East Lancashire HAW
	5. South West & Wales to the Midlands	Western speed
	6. Midland Main Line	Sheffield HAW
	7. Midland Main Line	MML North speed (from 60mph or above)
	8. Northern Ports & Transpennine	Immingham speed
	9. East Midlands & Yorkshire	East Midlands & Yorkshire HAW
	10. Northern Ports & Transpennine	Liverpool speed
	11. Midland Main Line	MML South speed (from 60mph or above)

Capability types (excluding gauge)

Speed	Remove sections of low line speed for freight trains to: - reduce journey times - provide a more consistent speed profile - make better use of line capacity.
Loop entry and exit speed	Increase the speed of loop entry and exit to make better use of line capacity.
Heavy Axle Weight (HAW)	Remove speed restrictions for heavy axle weight traffic by addressing structures that carry the railway.
Train length	Provide infrastructure to allow increased freight train length enabling more commodity per train to be carried.

9.2.2 Rail freight to/from major ports

The strategy for the future rail freight network prioritises capacity and capability enhancements for access to the major ports. This reflects the strong growth forecast in ports intermodal volumes in the Freight Market Study. There are significant environmental benefits to transporting freight by rail as opposed to road, which can be exploited for intermodal services following the required investment.

For capacity schemes, consideration regarding routeing options is crucial to optimise path availability, journey times and passenger service interaction. An example of where the freight industry has created a core freight route is on the Felixstowe to the West Midlands and the North route, routeing services 'cross-country' to avoid the capacity and performance issues of travelling across London and on two congested main lines.

To increase the capability to enable the network to handle the advancing requirements of intermodal freight, the recommended strategy is to enhance intermodal flows to W10 and W12 gauge, increase train length to a minimum of 775m, electrify route sections and develop nodal yard concepts to improve freight paths on the key congested routes listed below.

The Freight Market Study assumed significant growth in the number of rail connected warehousing sites to support the growth of intermodal traffic, reflecting the government's commitment as set out in the Strategic Rail Freight Interchange (SRFI) policy guidance. This Study notes that, in supporting intermodal growth, it is essential that new warehousing and terminal facilities be enabled with a rail connection where practically possible.

Felixstowe to the West Midlands and the North

The Felixstowe to the West Midlands and the North corridor ('cross-country', via Ely) is to increasingly develop as the primary route of intermodal traffic for the forecast growth in services from the Port of Felixstowe to the Midlands, North West and North East of England and further afield to Scotland. Further investment in establishing a 'cross-country' freight route avoiding London with 775 metre length and W12 gauge capability is a key short-term priority for the freight industry.

Short-term priority investment comprises full line of route enhancement, requiring capacity enhancement works at specific locations including between Felixstowe and Ipswich, Haughley Junction (near Ipswich), Bury St Edmunds, between Ely and Soham, Ely and Leicester areas, plus route wide enhancement to signalling and level crossings.

London Gateway and Cross London routes

The Freight Market Study has indicated that there will be significant growth in demand on the cross London corridor in future years, both as a core and diversionary freight route. This growth is primarily driven by new intermodal shipping flows into London Gateway port. Additionally, due to the increase in demand for passenger services, interventions are required to ensure the freight capacity is safeguarded.

Enhanced cross London freight capacity on the North London Line and Gospel Oak to Barking lines is expected to be required in the short term. Outputs will be developed through in the coming years to segregate the movement of freight services joining / leaving these orbital London lines from the high frequency passenger services. It is also recommended that consideration be given to balancing the demand for freight and passenger paths during different hours of the day on this corridor to maximise the value of the route.

In the longer term, it is recommended that Forest Gate Junction is grade separated, and that substantial capacity enhancements are undertaken on both the North London and Gospel Oak to Barking Lines. This includes headway reductions and improved freight regulation facilities.

Southampton to the West Midlands and the North

There has been enhancement to rail freight capability on this corridor during the previous and current funding (control) periods. The strategy recommends the continued investment in the route to increase capacity and diversionary route capability to enhance the route's ability to support greater volumes of intermodal traffic.

Short-term recommendations include electrification of the diversionary route via Andover (subject to the electrification of the existing 'cross country' being completed), potential grade separation at Didcot and capacity enhancements in the Oxford area.

Channel Tunnel

This study has prioritised the need to enhance the capability of the route to enable new flows, thereby growing the Channel Tunnel market. Current constraints to gauge are limiting opportunities for freight operating companies (FOCs) to develop European flows.

In the short-term gauge clearance of 'classic' network routes to W12 standards to facilitate flows between the Channel Tunnel and Wembley European Freight Operating Centre is recommended. In addition full compatibility of all 'classic' routes with electric traction would allow more efficient electric locomotives to be used.

9.2.3 Northern Ports and Transpennine

Freight growth is constrained across the Pennines due to a lack of available paths and infrastructure restrictions in accessing the key ports. The route has a strategic role in enhancing the growth of rail freight across the North of England and promoting regional growth.

The strategy identified in this study is twofold. Firstly, to enhance Transpennine capacity, from eastern and western ports to regional terminals. Secondly, to enhance capability, including in the short term a primary W12 gauge cleared route, to unlock new markets and flows for the freight industry.

The emerging picture of freight commodity volumes is changing due to the earlier than anticipated decline in Electrical Supply Industry (ESI) coal. The Transpennine corridor is also experiencing strong passenger growth. The capacity and capability of the network needs to be enhanced to reflect these developments. The specific freight requirements will be outlined in greater detail in the forthcoming North of England Route Study.

9.2.4 Other main line interventions

This study also recommends short-term interventions on the West Coast Main Line to provide capacity on this strategic freight corridor. Priority interventions include increasing capacity north of Preston through dynamic loops, remodelling of Carstairs and capacity enhancements in the Bletchley and Milton Keynes area to accommodate traffic from East West Rail[1].

1 East West Rail is a route currently under development with phase 2 seeing completion of a new through route between Oxford and Bedford via Bletchley. This route is expected to continue eastwards to Cambridge in the future.

The strategic priority for the East Midlands and Yorkshire corridor is to provide enhancements to enable the infrastructure to accommodate the commodity shift in demand from coal to intermodal. This is to be achieved by utilising freight capacity released by coal traffic to provide additional intermodal routeing options. Short-term enhancements including gauge clearance to improve access to Rossington intermodal terminal, just south of Doncaster.

For the Midland Main Line, the study promotes the requirement for the Leicester Area Capacity scheme, reflecting the forecasts over the short-term. Works required include new platforms at Leicester station, additional track capacity between Wigston North Junction and Syston East Junction and grade separation at Wigston North Junction.

Short-term capacity requirements to meet expected freight demand proposed for Anglo-Scottish flows include dynamic loops at Grantshouse on the East Coast Main Line, four-tracking in the Hare Park Junction area near Leeds, and capacity improvements on the Edinburgh Suburban line[2] .

9.2.5 Longer term options

This study has identified a number of long-term enhancements required to deliver the 2043 capacity requirements. The interventions are required to provide a step change in capacity on the corridors and are primarily major schemes with a high degree of project complexity and cost.

Across the corridors assessed in this study, possible 2043 capacity options include:

- grade separation at key junctions
- track capacity enhancement including four-tracking and dynamic loops
- electrification
- bypass/avoiding lines at key locations
- signalling enhancements.

Examples of interventions for each corridor have been listed in Appendix 2. An analysis of all options being considered was provided in Section 8.

The 2043 interventions are dependent on the growth in commodity volumes, and should be reviewed and developed accordingly over future control periods to reflect the requirements based on commodity growth per route.

9.2.6 Additional options for consideration

Digital Railway

The Digital Railway is a rail industry-wide programme designed to benefit the national economy by accelerating the digital enablement of the railway. The programme is integrating digital modernisation of the railway with industry planning. It spans technology, business change and commercial innovation, offering a more cost-effective and higher-performing railway delivering greater economic benefit.

The Digital Railway could provide benefits for the freight industry through:

- additional capacity
- improved quality of freight paths
- train control and operation
- improved safety.

The Digital Railway programme is currently in development and so it is a key recommendation of this strategy that the freight industry is fully engaged with the development, design and rollout process to ensure optimum benefits for the industry.

2 Schemes also driven by the forecast increase in passenger services.

9.3 Potential strategy for future capability of rail freight

9.3.1 Speed and axle weights

Addressing sections of low line speeds to increase average speed and makeing end-to-end journey times more efficient have been identified as a priority. Small sections of low line speed have a greater impact on freight because of the challenge of accelerating long, heavy freight trains. For this reason, restrictive line speeds are a significant detriment to end-to-end journey times for freight services.

The short-term strategy recommends the removal of sections of low line speeds, improving slow line speeds and increasing loop and terminal entry and exit speed across the freight network to reduce end-to-end journey times. Where speed restrictions are removed/ linespeeds increased, it is essential that the changes be recognised accordingly in the timetabling process.

Increasing the maximum line speed for freight services may not always lead to significant journey time benefits, depending on the geography of the route and availability of paths on fast lines. Nonetheless, with the right combination of traction and pathing, benefits to journey time and capacity could be achieved. A wider programme of maximum line speed increases is identified as a long-term enhancement.

Ongoing research into the feasibility and impact of increased axle weights for freight commodities is recommended. Short-term assessment is required to model and simulate the dynamic behaviour and fatigue life of axles, in addition to the braking capability of heavier units, before recommendations to the industry can be made.

9.3.2 Freight train lengthening

Building upon the enhancements in previous Control Periods, the short-term priority is to deliver 775m train length capability on all intermodal routes.

Routes identified for short-term enhancement include, but are not limited to, Felixstowe to the West Midlands and the North, Anglo Scottish and the WCML.

Investment in the capability for increased train length enables the rail freight sector to take advantage of economies of scale, increase productivity and become increasingly competitive relative to road. In the longer term, the rail freight industry believes there could be a case to consider longer lengths on certain intermodal routes, for example, to achieve a 1,500m length. Additionally, there exists an aspiration to extend construction trains beyond the currently targeted 450m baseline to 600m. This will allow gross trailing weights of up to approximately 3,000 tonnes, where traction permits.

Typical enhancement works to increase train lengths include loop lengthening, signalling adjustments, level crossing and terminal/ reception siding enhancements. Where signalling works are required to facilitate increased length, this may affect business cases due to increased costs. A full line of route, from port to terminal, must be upgraded in order for the benefits to be realised.

9.3.3 Electrification of rail freight

There is currently a major programme of upgrades underway, which, will see significant electrification across many routes including the Great Western and Midland Main Lines. During 2016, Network Rail has considered the case for further electrification of the network beyond the schemes currently in delivery and development, including freight specific schemes. The approach to future route electrification and upgrades will be set out in due course.

The primary routes identified by the rail freight industry for consideration include:

- Felixstowe to the West Midlands and the North: Initially Felixstowe to Ipswich and Birmingham-Nuneaton, then the entire route
- Gospel Oak to Barking route extensions: Thames Haven Branch to London Gateway and and Junction Road Junction to Carlton Road Junction in North London
- Avonmouth terminal, near Bristol and Sutton Park line, near Birmingham
- Yorkshire terminals[3]
- Southampton to the West Midlands diversionary route via Andover[3]

- Channel Tunnel core route full compatibility[3]
- Edinburgh south suburban line[3] .

As explained in Section 5.4.1, investment in electrification capability requires not only delivery of line of route electrification infrastructure but also investment by the whole rail freight industry in new locomotives and enhancements to ports and terminals. It is recommended that an industry-wide strategy is developed by both public and private sectors.

9.3.4 Gauge enhancement

The potential strategy recommended in this study is to develop, in the short and long term, the W10 and W12 capability of the network to provide the capability and capacity for the growth in the intermodal market.

For W10 development, the priority of the industry is to build upon the current W10 network to increase operational flexibility and resilience. The key priorities centre on creating an increased number of diversionary routes during times of core route closure. Additional diversionary routes can also enable additional regular capacity through new pathing opportunities. Chapter 7.1 identifies the priority W10 routes.

To develop intermodal capability and enable the network to handle new commodity flows, a core W12 network has been outlined. The current network is restricting the ability of Freight Operators to cater for larger box sizes and, to date lacks the connectivity required by the industry. Chapter 7.1 prioritises key routes to clear to join into existing W12 sections and create cohesive flows from ports to terminals that will enable the rail freight industry to grow.

In addition to a connected W10 and W12 gauge cleared network, there is a long term aspiration to establish GB1+ gauge cleared routes, enabling comprehensive European box and wagon combinations to travel from the Channel Tunnel to terminals on the UK network. It is, however, noted that the expected substantial cost of providing clearance for the considerably larger gauge profile of GB1+ is unlikely to offer value for money at present.

3 Subject to completion of electrification of remaining 'cross country' routes

9.3.5 Other considerations

Nodal yards

Building on the operational model currently established and following the completion of the scheme proposed at Ripple Lane in East London, it is recommended that this concept be developed further. In the short term, the development of suitable proposals for the next wave of such facilities should be considered. Such locations could be:

- Eastleigh; serving Southampton Port automotive and intermodal traffics; 1,500m standage capability to match splitting/joining of future 'superlong' automotive services;
- Bescot; with multiple route connectivity and short haul accessibility to both the current and future West Midlands terminals
- Crewe and Mossend – 1,500m standage for automotive trains and post HS2 'superlong' train operation over WCML North.

Diversionary routeing options

A key enabler for growth of the rail freight industry is the ongoing requirement for comprehensive, joined up and flexible routeing options for commodity flows. Diversionary routes provide additional capacity to permit increased freight volumes and enhanced operational capability during times of network disruption, ensuring freight services can still operate.

Additional routeing options should be considered on lines where high growth is forecasts for high speed and/ or frequent urban passenger services, in addition to freight growth. An example of this is cross London flows on the North London Line where both passenger and freight growth is constrained by the infrastructure and the future mix of services may affect overall network performance.

The strategy recommends the short term development of routeing options for freight services through enhancements to gauge, train length and electrification capability on additional lines. The strategy emphasises the importance of considering complete line of route enhancements to enable the immediate and full use of alternative routes.

Trans-European Transport Network (TEN-T)
This study has considered the gaps in achieving the TEN-T objectives by 2030. Based on the strategy and priority choices for funders proposed above, it is expected that the following gaps will remain:

- **Route Availability (22.5 tonne axles loads)**: Between Ipswich and Felixstowe and Swansea and Llanelli
- **Train Length (740m)**: The network will not meet this standard including route sections on the following corridors: Channel Tunnel, Felixstowe to the West Midlands and the North and 'Anglo-Scottish'
- **Electrification**: There remain a number of core routes not expected to be electrified as part of the existing electrification programme. The electrification of such routes is likely to be driven primarily by a value for money case based upon the passenger services being operated.
- **Line speed (100km/h)**: The core network broadly satisfies this requirement. Key gaps include some short sections of the Felixstowe to the West Midlands and the North corridor, some parts of the route from Grimsby to Derby, and also parts of the Great Western Main Line in South Wales.

The rail industry in Great Britain suggests that there is not currently the case for prioritising the achievement of the above TEN-T requirements. Rather, the focus is to accommodate forecast growth in rail freight through the capacity and capability schemes identified as choices for funders.

9.4 Next steps

The Freight Network Study was published as a draft for consultation on the 11th August 2016, published on Network Rail's website and was consulted for 90 days, closing on the 9th November 2016. Since the consultation, Network Rail has considered and incorporated the comments received from the industry consultation. The Freight Network Study has been updated in response to this accordingly.

In early 2017, Network Rail, in conjunction with the wider rail industry, contributed to the initial industry advice (IIA) to funders (the Department for Transport, Transport Scotland and others). The IIA sets out priorities for the enhancement of the rail sector to meet the expected demand for, and the needs of, the rail industry and on funding for the period 2019 to 2024 to enhance the rail freight sector. The Freight Network Study, including the expected growth of the rail freight sector, has been taken into account in this advice.

It is expected that the Department for Transport (England and Wales) and Transport Scotland will publish High Level Output Specifications (HLOSs), outlining the outputs the rail industry will be funded to delivery in the next funding (Control) period, CP6, from 2019 to 2024. The Freight Network Study is also intended to inform other potential funders (including Local Enterprise Partnerships, Local Authorities, regional transport bodies, Rail Freight and Port and Terminal Operators) on the priorities to enhance the rail freight sector.

10. Consultation

10.1 Stakeholder consultation

The development of the Freight Network Study (FNS) was overseen by a Working Group, consisting of representation from a number of organisations with an interest in the rail freight industry. This process was outlined in chapter 1. This study therefore represents a holistic industry view of the priorities for rail freight investment. A wider consultation with stakeholders is also essential to the successful development of a Network Study. Close involvement of stakeholders helps to ensure that:

- The widest range of options is considered
- The resulting decisions approach optimality
- The delivery of the outcomes is faster.

This section provides a summary of the responses to the consultation and the principal changes to the Draft for Consultation that have taken place.

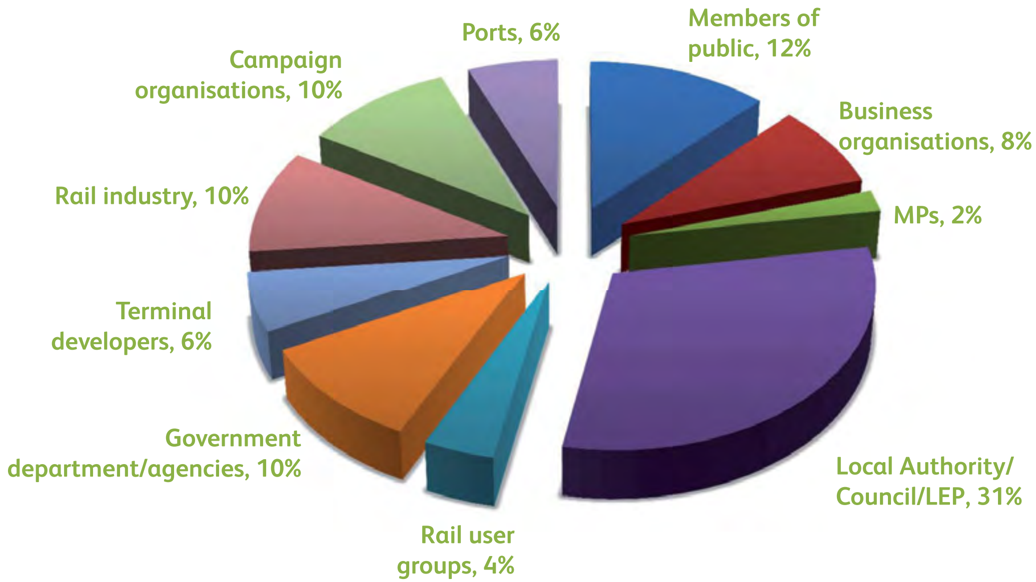
10.2 Consultation Process

The Freight Network Study Draft for Consultation was published on the Network Rail website on 11 August 2016, for a 90-day consultation period, which ended on 9 November 2016. A further Working Group convened on 14 February 2017, at which Network Rail presented its response to the comments received during consultation. The Working Group endorsed Network Rail's response and provided approval for the publication of the Freight Network Study as a final document.

10.3 Consultation responses

During the consultation period, 48 responses were received. They came from a broad spectrum of interested parties, the distribution of which is shown in Figure 10.1. Consultation responses are published on the website alongside this study.

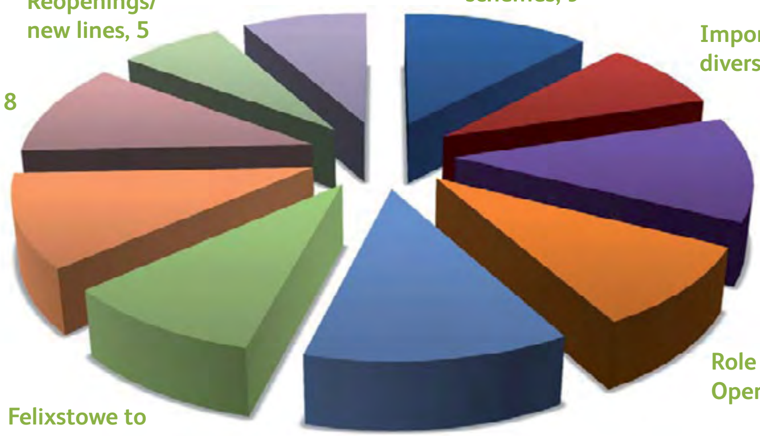
Figure 10.1: Makeup of the 48 respondents



The responses Network Rail received were wide ranging and comprehensive. In general, the response to the content of the study was positive, welcoming a long-term strategy for rail freight in the Great Britain, recognising that it reflects the significant changes that have occurred in the industry in recent years and the challenges now faced by the rail freight industry.

Analysis of the responses shows that 36 discrete themes were identified by respondents. Generally, these were either requests for more detail to be provided, or for the study to give a matter more consideration. Of the themes identified, most were raised by more than one respondent. The ten most commonly referenced themes have been summarised below in Figure 10.2, which illustrates the number of respondents who raised each of these themes.

Figure 10.2: Top ten themes raised by respondents



10.4 Top ten key themes raised by respondents

Each of these ten key themes is discussed below.

Challenges to the scope of the capacity interventions included within the draft study (nine respondents)

Several responses challenged the extent and timings of specific capacity interventions detailed in the study. The document identifies locations on the network, either where current capacity constraints already exist, or where future constraints are anticipated, based on the growth forecast (in passenger and freight services). At this stage of the Long Term Planning Process, the study is simply providing recommendations of options for funders, and the detail it provides of the interventions is reflective of that given in the relevant route studies.

Should the interventions proposed in the study continue through the development process for delivery funding, their specification will be further developed to ensure that the enhancement scope delivers an effective solution to the capacity constraint identified by the FNS. Network Rail's Governance of Railway Investment Projects process (GRIP), is designed to provide a robust and effective framework for governing enhancement projects. Key components of the GRIP process are requirements definition and option selection.

In relation to the timing of the proposed interventions, during the consultation period further work was carried out to assign a priority score to each of the short-term interventions included in the study. This provides an indicative timing for each scheme and has since been incorporated into the final study document.

The development of rail-connected terminals is a key requirement for growth (nine respondents)

Respondents identified the need to increase the number of rail-connected terminals if the projected growth in intermodal traffic is to be realised. The Freight Market Study (FMS, from where the forecast data used in the FNS is taken) makes stated assumptions on the level of terminal development to 2043. Unlike enhancements to the rail infrastructure, terminal development is not primarily driven by the rail industry, but by the markets. However, the rail industry does recognise the importance of growth in rail connected terminals, and that significant growth in intermodal traffic will not be delivered without a substantial increase in the number (and total area) of rail-connected warehousing sites across Great Britain.

The final version of the FNS more clearly articulates the need to expand rail-connected terminals to enable future growth in intermodal rail freight.

Additional Transpennine freight capacity urgently required (nine respondents)

A number of respondents highlighted the lack of rail freight capacity across the Pennines as a key concern, referencing the aspirations of the northern ports and Transport for the North to convey far greater volumes of freight by rail, and of the opportunity that the Transpennine corridor presents to achieve modal shift from road to rail. The proposal in the study to enhance Transpennine freight capacity in the short term was positively supported.

However, a number of respondents highlighted the need for such enhancements to be delivered as early as possible in Control Period 6 (CP6, the funding period 2019-24), that gauge clearance be provided as part of the planned Transpennine Route Upgrade (TRU), and that freight paths be provided over alternative routings during the possessions necessitated by the TRU works. The study has been updated to reflect these points, and Network Strategy and Capacity Planning have proposed that Transpennine gauge clearance be included in the scope of the TRU.

Prioritisation of short-term enhancement schemes required in the final FNS (eight respondents)

Respondents requested that the schemes classified in the study as 'short term' require a greater level of prioritisation to give an indication of which require to be completed first.

The final study has addressed this point by carrying out an exercise to prioritise the short-term interventions. The process was agreed with the Network Study Working Group. In summary, where schemes have business cases, prioritisation will be based on value for money criteria, such as the benefit cost ratio, as well as other criteria, such as the strategic case for the scheme. However, business case results will not be available for the majority of the short-term schemes before the final version of the FNS is published.

For schemes without business cases, criteria to score each individual scheme have been developed enabling all short term schemes to be ranked as being high, medium and low priority, based on the relativity of their individual scores. Following this prioritisation exercise, the development and implementation of individual schemes will still be subject to business case work, as required by funders.

Comment on timing and/ or scope of Electrification schemes (eight respondents)

Several respondents identified sections of the network and proposed that they be electrified to benefit rail freight. In the process to determine national electrification priorities, rail freight benefits are a key factor in driving decisions. Further information regarding the national electrification strategy (and the timing of delivery of key sections of the national network) will determine where the electrification of more freight specific sections will deliver most benefit to rail freight.

The study has been updated to emphasise this point and to request greater clarity on the timing of electrification of key sections of the national rail network. Priority routes that would enable rail freight to utilise these electrified key sections to derive economic benefit are detailed in the FNS.

The role of the System Operator in ensuring that the capacity of the current infrastructure is optimised (seven respondents)

Respondents positively supported the stated intention to maximise the capacity delivered by the existing rail network through non-infrastructure interventions. Several respondents queried the emerging role of the 'System Operator' in Network Rail as a means of achieving this.

The study has been updated to included reference to the creation of the System Operator in Network Rail. The key objective is to strengthen planning functions to deliver a more joined up, end to end process from forward planning through to the allocation of network capacity. Key components of this function include more focused, continuous long term planning, more robust clienting of projects, and more effective planning of timetables and granting of access

More emphasis on the Felixstowe to the West Midlands and the North corridor (seven respondents)

A number of respondents highlighted the particular importance of the Felixstowe to the West Midlands and the North corridor (F2N). It was recognised that the study includes proposals for major short-term enhancements on this route. However, several respondents requested that proposals should be more ambitious than those already included in the study, for example, the full doubling of the Felixstowe to Ipswich line in the short term.

On the basis of known current constraints and forecast demand, the schemes currently included in the FNS will deliver the required capacity on the route. These have scored very highly in the prioritisation work undertaken during the consultation period. Whilst further doubling of the Felixstowe branch remains a long-term aspiration, the study only support this to the extent that it is required to meet forecast growth in the market. Rather, once the current additional doubling is completed (later in CP5), the Working Group have identified higher priorities, to the west of Ipswich, to maximise full line of route capacity.

The final version of the FNS puts more emphasis on the national significance of this corridor, and articulates that it represents the highest priority for short-term rail freight investment.

The criticality of 24/7 availability of the network and the importance of diversionary routes (six respondents)

Many respondents emphasised the importance of diversionary routes to provide 24/7 availability of the network, enabling freight operators to provide a guaranteed frequency of service to their customers.

The recent changes in the rail freight market place (as described in the Draft FNS) have further increased the need for diversionary routes. The decline in bulk markets and the growth in intermodal traffic has resulted in more rail freight now travelling on key passenger arteries, e.g. the East and West Coast Main Lines. The volume of traffic on these busy corridors necessitates more regular maintenance possessions than occurred on lines primarily used by freight-only traffic. Additionally, intermodal traffic is more likely to be time-sensitive and, unlike the bulk commodities, cannot be stockpiled, instead requiring a regular, uninterrupted flow.

In order to ensure that freight operators can continue to provide the service their customers require, it is essential that diversionary routes are available, ideally with the same gauge and length capabilities as the core route. Although the Draft FNS did recognise the significance of diversionary routes, the final version elucidates this further.

More coherent strategy required for increasing train length capability (six respondents)

Respondents were strongly supportive of the stated aspiration in the study to increase train length, but some responses requested more specificity on the length aspirations for intermodal and

construction traffic, and the focal locations where interventions are proposed.

Whilst the study stipulated that the minimum baseline for intermodal traffic is 775m, it has been updated to recognise that, where 775m capability is not achievable (and there may be valid reasons why this is not possible), maximising the possible train length within the local constraints is nonetheless still the aspiration. A shorter passing loop will not necessarily reduce the overall length limit of the route, only the length of trains that require regulation at that point.

For construction traffic, the FNS has been updated to reflect stakeholders' long-term aspiration for trailing loads of 3,000 tonnes (necessitating train length of around 600m), in addition to the 2,000 to 2,600 tonnes baseline targets. More detail has also been provided as to the locations on the network where interventions would be required to enable longer construction trains to operate.

Requests for the reopening of former railway lines/ opening of new railway lines (five respondents)

Several respondents requested either that previously closed lines be reopened, or that new sections of railway be built. All these responses related to the locality from which the responder originated.

The study does not exclude the prospect of reopening/ opening lines. Rather, in assessing the current and forecast capacity constraints on the network, it has considered this as an option. It includes three reopenings and one new line as potential options for funders, all of which have received stakeholder support. Although the reopenings/ opening proposed by responders are not currently recommended as choices for funders, if during the lifecycle of the FNS the market conditions change, these schemes will be duly considered. In particular, whilst the Skipton to Colne reopening is not proposed as a standalone freight scheme, the existence of another Transpennine route would almost certainly provide benefits to rail freight. Were it to progress as a passenger driven scheme, any such freight benefits associated with the reinstatement would be factored into the business case.

10.5 Other themes highlighted by respondents

Other common themes highlighted by respondents were:

- The strategic importance of the West Coast Main Line, suggesting that the urgent need to provide more capacity north of Preston be given greater emphasis in the study.
- The Nodal Yard concept was welcomed, but several respondents raised the risk that rather than being used to the benefit of rail freight, they could serve as additional locations to loop freight trains. This would lengthening journey times and, therefore, be disadvantageous to rail freight.
- Whilst the study does refer to the opportunities presented by HS2 to bolster future construction traffic volumes, there are other significant infrastructure projects, such as Sizewell C in Suffolk and Hinckley point in Somerset, that also provide opportunities that are not referenced.

Each of the points above have been incorporated into this document.

The remaining 23 themes were also by respondents are listed below.

- Publication of the DfT's Rail Freight Strategy shortly after the FNS, along with the existence of Transport for the North and Midlands Connect rail freight strategies, has created confusion as to what provides overall strategic direction for rail freight
- Comments on the appropriateness of/ omissions from the 11 key freight corridors identified by the study
- The outputs of the capacity interventions included in the study could be better defined
- The need for improved connectivity at either end of journeys (i.e. ports and terminals)
- The FMS forecasts are optimistic and road will become more attractive relative to rail
- More detail on the benefits Digital Railway will provide to rail freight
- More consideration of the impact of HS2 on the classic network,

and the opportunities it creates

- The key imperative for rail freight, above all else, is to enhance network capacity
- The study should highlight the risk that the schemes deferred by the Hendy Review are further deferred
- Gauge clearance to W12 of a Channel Tunnel route should be listed as a key priority
- Speed aspirations should include 75mph (as opposed to 60mph) for bulk commodities, and the removal of WA10 restrictions
- Queries as to the process for providing notice when the FNS was published on the NR website
- Requests to make reference to the 'virtual' Freight and National Passenger Operator route
- More detail to be provided on express freight opportunities
- Queries as to whether the FMS includes the anticipated 5 trains per day during the construction of Sizewell C
- More information to be provided as to the infrastructure restrictions impeding growth of Channel Tunnel rail freight
- Suggestion that the rail freight industry communicate directly with end users, e.g. shippers and hauliers, to attract new markets
- The amount of freight paths through London should be reduced
- Reference to Brexit should be made in the study
- Reference should be made to complete line of route enhancements in the Executive Summary
- The study should link freight requirements to the asset renewals strategy
- The study should reflect the growth in the Northern Ports, and that the West Midlands and the north together account for 60% of imports
- More information to be provided on future network charging arrangements.

All of these themes have been considered and the study has been updated accordingly. Formal responses have been issued to each of the 48 respondents.

10.6 Publication of responses

A summary of the responses is provided on the Network Rail website. To comply with the requirements of the Data Protection Act, Network Rail holds (where supplied) the name, email, telephone, organisation and postal address information of respondents for the purpose of strategic planning. This includes the Long Term Planning Process including the Market, Route and Route Utilisation Study projects, as well as ongoing route planning purposes. This information will not be used for any other purpose by Network Rail.

The Network Study Working Group wishes to thank those individuals and organisations that have taken the time to read the Draft for Consultation Freight Network Study and provided responses.

Appendix 1: Technical feasibility study details

Intermodal

Higher Axle Loads

Current intermodal flat wagons would not be able to carry heavier loads than today's levels. They are limited in their carrying capacity by their axles. Axles with a larger cross sectional area ('fatter' axles) could be fitted which would allow heavier loads to be carrier. To achieve this, the fatigue life for larger axles would need to be modelled to ensure it was within acceptable limits. The dynamic behaviour of modified vehicles would also need to be examined through modelling and simulation.

Higher Maximum Speed

A wagon's bogies limit its maximum speed. The dynamic behaviour of the predominant bogie fitted to intermodal flat wagons in the UK is unlikely to meet the requirements to travel above 75mph. It may prove necessary to fit a wheel slide protection (WSP) system to freight wagons in order to achieve satisfactory braking when operating at speeds in excess of 75mph. Further investigation is required.

Bulk

Braking performance is a constraining factor on freight train speed. It is probable that this would need to be improved to allow bulk flows to travel at 75mph in laden condition (currently restricted to 60mph). Network Rail is interested in investigating this possibility further.

Aggregates

Some aggregate trains are currently classified as Class 7 due to the maximum speed of their wagons. These wagons are restricted to 45mph. It is believed this may be due to the way braking performance was historically assessed. Using modern methods may allow a speed increase to 60mph and the trains to be reclassified as Class 6. VTG Rail UK Limited and Network Rail intend to investigate historic reasons for these vehicles being Class 7.

Locomotive Requirements

For all the scenarios described above it will be necessary to assess the ability of locomotives to haul the wagons and current tractive effort capability. Modifying current locomotives will result in compromises in other areas of performance. If the industry is minded to support an increase in train speed and/or heavier axle loads then this should be considered when locomotives are scheduled for major overhaul, or new locomotives are being procured.

Summary

Further work is required. The questions can be answered by understanding; the relationship between the locomotives tractive effort curve and the train's resistance curve, the braking curve for the train, and the gradient and curvature of the route. Furthermore, modelling, simulation and network trials will provide the industry confidence that the solutions are both compliant and capable of the enhanced specifications.

Appendix 2: Longer term capacity interventions

Examples of longer term interventions for each corridor include, but are not limited to:

West Coast Main Line:

- Track capacity north of Preston
- Grade separation of Law Junction

East Midlands and Yorkshire:

- Diversionary route access for Immingham and Teesport
- Further electrification of Yorkshire freight routes

Felixstowe to the West Midlands and the North:

- Four-tracking between Haughley Junction and Ipswich, or grade separation at Haughley Junction
- A new avoiding line at Ely
- Track and signalling enhancements between Leicester and Nuneaton
- Four-tracking Peterborough to Werrington Junction

Southampton to the West Midlands:

- Passing loops between Eastleigh and Basingstoke
- Grade separation at Basingstoke
- Capacity enhancements between Southcote Junction and Oxford Road Junction, including grade separation at Southcote Junction
- Enhanced signalling and crossovers at Leamington Spa station to enable greater use of bay platforms for passenger services
- Additional capacity at Water Orton including elements of four tracking and grade separation

Cross London freight flows including Essex Thameside:

- Enhanced signalling headway and possible new platform at Gospel Oak to enable 4tph freight alongside 6tph passenger
- A freight regulation loop at Kensal Rise
- Grade separation at Forest Gate Junction
- Investigate the feasibility of a new rail link between Pitsea and Ingatestone to facilitate routeing of Thames Gateway traffic via the Felixstowe to Nuneaton corridor

South West & Wales to the Midlands:

- Electrification of key freight terminals, including Lawley Street and Hams Hall
- Separation of passenger and freight flows in the Barnt Green and Kings Norton areas
- Reopening the Stourbridge to Walsall/ Lichfield line

Northern Ports & Transpennine:

- Increasing Transpennine freight capacity for Liverpool and Humber ports
- Loops at Edale and Grindleford in the Hope Valley
- Improved line speeds and capacity on the Calder Valley line
- Rearranging maintenance schedules to allow night-time access to the Chat Moss corridor

Midland Main Line:

- Capacity enhancements in the area South of Bedford area including grade separation at Harpenden and Leagrave Junctions
- Enhancements in the Bedford area including a new platform and new turnback south of the station
- Kettering – Wigston North Junction enhancements: 4 tracking Kettering North Junction to Kilby Bridge Junction
- A new line linking Stenson Junction to the Midland Main Line at Trent Junctions
- Increased line speed between Stenson Junction (near Derby) and Sheet Stores Junction (near Sheffield)

Great Western Main Line:

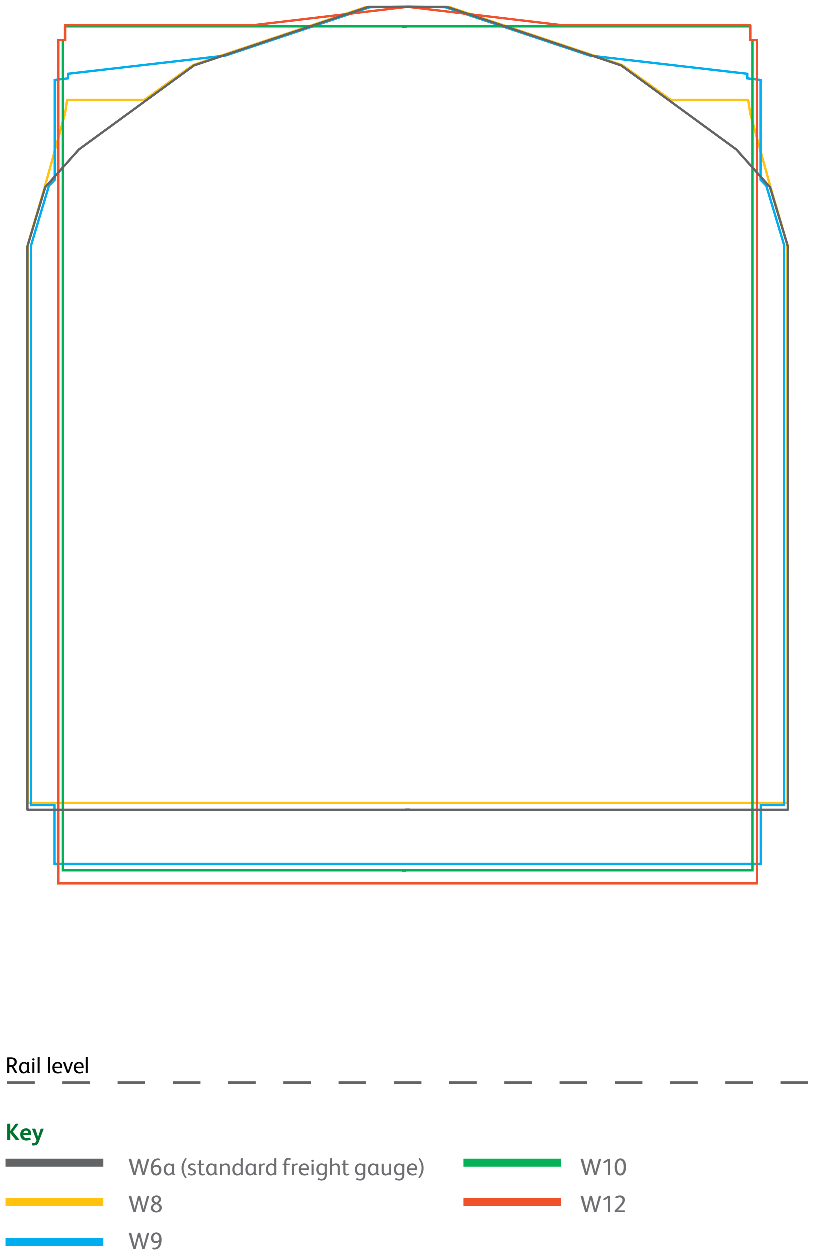
- Remodelling of Bishton Flyover and Severn Tunnel Junction
- Grade separation at Maindee West Junction (near Newport)
- Headway improvements between Bishton and Maindee Junction (near Newport)
- Headway improvement on the main and/ or relief lines between Ebbw Junction and Cardiff Central
- Electrification of the Avonmounth branch near Bristol

Anglo-Scottish and Northern Regional Traffic:

- Interventions on the East Coast Main Line between York and Newcastle, including consideration of new alignments.

Appendix 3: Gauge standards

Figure A3.1: Static gauge profiles



This diagram is intended to allow the freight gauges referred to in this document to be compared. The profiles are indicative and reflect the static co-ordinates of the gauges based on straight, level track. Application of these gauges to vehicles is dependent on factors including suspension type, vehicle length and wheelbase, whilst application to infrastructure is dependent on local conditions including cant, curvature, speed and the type of track (i.e. ballast, slab etc.).

Note that this diagram shows only 'upper gauges'. Separate gauge profiles are used to ensure clearance to low-lying structures.

Please refer to Railway Group Standard GE/RT8073 and associated Guidance Note GE/GN8573 for further information

Table A3.1: Indicative gauge requirements for container sizes

Length	Height	Width	Minimum gauge required on standard height (1000mm) wagon
Deep sea boxes			
20ft	8ft 6in (a handful of 8ft units exist)	2.44m	W8
40ft	8ft 6in	2.44m - 2.50m	W8
40ft	9ft 6in	2.44m - 2.50m	W10
Most common short sea boxes			
40ft or 45ft	9ft or 9ft 2in	2.50m	W10
40ft or 45ft	9ft or 9ft 2in	2.55m	W12
40ft or 45ft	9ft 6in	2.50m	W10
40ft or 45ft	9ft 6in	2.55m	W12
40ft or 45ft	8ft 6in	2.50m	W8
40ft or 45ft	8ft 6in	2.55m	W8
40ft or 45ft	8ft 9in	2.50m	W9
40ft or 45ft	8ft 9in	2.55m	W9

Appendix 4: Assumptions used in the Freight Market Study (FMS) forecasts

This Appendix contains extracts from the FMS, published by Network Rail in 2013. It summarises the general assumptions used for the forecasts under the central case and then summarises the sector-specific assumptions that were used to derive the intermodal forecasts under the central case. Finally it summarises the sector-specific assumptions that were used to develop the intermodal forecasts under the higher and lower scenarios.

General assumptions for the central case forecasts

The following general assumptions were used to develop the central case forecasts:

- freight demand is considered without addressing the ability of the rail network to cater for it.
- economic growth is returning to the UK and to the global economy, following the recent recession. This is a key assumption, particularly for the ports intermodal sector, which is linked to trade volumes, and to the domestic intermodal sector, which is linked to domestic economic activity. For bulk sectors, such as metals, industrial minerals and ore, the return to economic growth is one of the factors that enables rail freight volumes to stabilise or increase, following recent declines.
- increases in labour and fuel costs are shown in Table 2. Overall, the effect of these changes is to improve rail's competitiveness relative to road, because fuel and drivers' wages are a lower proportion of costs for rail, than for road.
- no change in rail productivity relative to road productivity during the forecast period.
- the forecasts take account of expected changes to track access charges for freight operators during CP5. The forecasts do not assume any further changes (in real terms) in access charges after CP5.
- a distance-based road charging system for road freight is not introduced during the forecast period.

Table A4.1: Forecast increases in fuel and labour costs

Forecast increases in real terms relative to base year (year to September 2012):	Fuel	Drivers' wages
2023 forecast	+13%	+23%
2033 forecast	+21%	+48%
2043 forecast	+24%	+83%
Notes: data are based on the DfT's WebTAG guidance		

Intermodal assumptions for the central case forecasts

The following sector-specific assumptions were used to derive the central case forecasts for the intermodal sector, in addition to the general assumptions above. Each intermodal sub-sector is addressed in turn.

For ports intermodal:

- deep sea containerised cargo into Britain is forecast to increase by 2.7 per cent per annum to 2023, by two per cent between 2023 to 2033 and by 1.7 per cent per annum between 2033 and 2043 (in terms of units). The forecasts implicitly assume that economic growth returns but that trade growth rates do not return to pre-recession rates: the average growth rate (in deep sea containerised cargo) between 2001 and 2007 was 6.4 per cent per annum (DfT Maritime Statistics). The high growth rates noted prior to 2008 partly reflect the transfer of manufacturing capacity from the UK to the Far East, although the slowdown in growth recognises that there are limits to this change. Deep sea container port capacity is assumed to grow in line with this forecast demand, and is sufficient to cater for that demand. The ports intermodal forecasts focus on deep sea cargo because rail traffic related to short sea cargo is expected to continue to be much lower in volume than deep sea. The relevant short sea ships, in general, serve a more regional market, with shorter distances between the port and the origin/destination, which are less suited to rail, apart from, in some cases, to Scotland. Although the rail market related to short sea cargo is limited, the ports intermodal forecasts include rail traffic related to this cargo.
- expansion of rail-connected warehousing sites - see domestic intermodal assumptions.

For Channel Tunnel intermodal:

- a £20 per container reduction in costs for Channel Tunnel through rail intermodal traffic, relative to other modes, from 2023. This reflects the following factors: the fuel and wage growth assumptions (see above), the introduction of the French eco tax (from January 2014), increased fuel costs for ships following the introduction of a low sulphur zone (from 2015) and the DfT's proposed new charging scheme for Heavy Goods Vehicles (HGVs) (from April 2014). Although this assumption is expressed as a reduction in costs per container, an equivalent reduction is applied to bulk commodities using the Channel Tunnel.
- short sea containerised cargo into Britain is forecast to increase by 1.2 per cent per annum to 2023, by 1.9 per cent between 2023 to 2033 and by 1.6 per cent per annum between 2033 and 2043 (in terms of units). As with the deep sea forecast, this represents a slowing down of growth relative to pre-recession levels: between 2001 and 2007 growth was 2.6 per cent per annum (DfT Maritime Statistics). The growth rates are lower than the deep sea forecasts until 2023; after this year the forecasts are almost the same.
- expansion of rail-connected warehousing sites - see domestic intermodal assumptions.

For domestic intermodal:

- Rail-connected warehousing sites will expand from the current area of approximately 1.6 million square metres to approximately 5.9 million by 2023, 9.6 million by 2033 and 13.3 million by 2043. This reflects both growth of existing sites and the development of new sites. There are significant uncertainties over which of the existing sites will expand, where the new developments will take place and about the overall growth in capacity. The assumed overall annual growth in capacity is similar to the rate observed in recent years, which is consistent with the assumption that about 35 per cent to 40 per cent of new large warehousing developments will be rail connected. These growth assumptions indicate that the study is taking a positive view of the ability of the market, including the planning system, to provide new sites. This reflects the government's commitment to their development, as set out in the Strategic Rail Freight Interchange (SRFI) policy guidance.

Intermodal assumptions for the higher and lower scenarios

The higher scenario for the intermodal sector reflects the following differences from the assumptions used for the central case forecasts:

- rail productivity improves relative to road productivity over the appraisal period, for all intermodal traffic. This assumes that both average train length and the average number of operational days per week increase by 20 per cent from 2023 onwards, and that there is no change in road productivity over this period. The difference from the central case is that this scenario assumes no change in road productivity, while the central case assumes an improvement in road productivity in line with improvements in rail productivity.
- a reduction of £5 in the rail handling charge per container lift, for both ports and inland terminals from 2023. This is assumed to reflect economies of scale and increased competition, and that some ports are developing new more efficient rail terminals, which will not benefit container transfers to HGVs.
- a £50 per container reduction in costs for Channel Tunnel through rail intermodal traffic, relative to other modes, from 2023. This reflects the impact of a £30 reduction in Channel Tunnel charges as well as the factors behind the £20 cost reduction assumed for the forecasts (for illustration only). As with the central case forecast, under this scenario the cost reduction was applied to bulk commodities on an equivalent basis, as well as to containers.

The lower scenario for the intermodal sector reflects the following difference from the assumptions used for the central case forecasts:

Rail-connected warehousing sites will expand by about half the rate assumed in the central case i.e. by 2033 the total area of rail-connected warehousing sites is 4.8 million square metres rather than 9.6 million. This reflects a less positive view of the ability of the market, including the planning system, to deliver new sites, with growth broadly restricted to sites which currently have planning consent.

Appendix 5: Full results of prioritisation exercise

The tables below present the full results of the prioritisation exercise, based on weighting & scoring systems. For each scheme option they show the total weighted score and the prioritisation category. The prioritisation categories (high, medium and other) are the categories referred to in Chapter 9. The scores and categories are presented for each scheme type (i.e. capacity, gauge, and capability excluding gauge schemes) in turn, as follows:

- Table A5.1: Total weighted score by scheme option for capacity schemes;
- Table A5.2: Total weighted score by scheme option for gauge schemes; and
- Table A5.3: Total weighted score by scheme option for capability (excluding gauge) schemes.

The purpose of the prioritisation exercise is to rank schemes within each scheme type (such as capacity schemes), not between scheme types (such as between capacity and gauge schemes). Therefore scores for different types of scheme are not directly comparable.

In this context, different weighting & scoring systems were used for each scheme type, reflecting the fact that different objectives apply to each type of scheme – for example different objectives apply to capacity and gauge schemes.

For each scheme option, the tables show a corridor number and scheme option number. These numbers are referred to in the tables (and in some cases the maps) in Chapter 8.

Appendix 6 explains the weighting & scoring systems that have been used and presents the unweighted score for each scheme.

The prioritisation exercise does not include schemes included in the baseline. An exception is Leicester area capacity, since this scheme is only partially committed in CP6 (see Table 8.30).

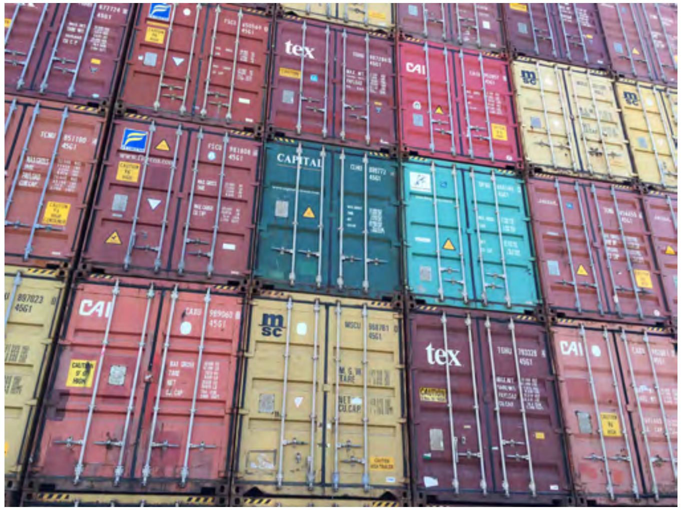


Table A5.1: Total weighted scores by scheme option for capacity schemes

Schemes in total weighted score order			Weighted scores by criteria						Out of 50	
Corr. no.	Sch. Opt. no.	Scheme	Forecast growth	Capacity constraints	Passenger benefits	Deliverability/ complexity	Dependency on other schemes	Stakeholder support	Total weighted score	Priority category
3	2	A loop facility at Haughley Jn (near Stowmarket), including doubling of the junction	12.5	10.0	10.0	4.0	4.0	7.5	48.0	High
3	3	Headway reductions at Bury St Edmunds	12.5	10.0	8.0	4.0	4.0	7.5	46.0	High
3	5	Infrastructure works at Ely such as level crossings enhancements and additional tracking	12.5	10.0	10.0	2.0	2.0	7.5	44.0	High
3	6	Signalling enhancements in the Syston East Jn to Peterborough area	12.5	10.0	6.0	4.0	4.0	7.5	44.0	High
6	7	Cross London freight capacity	12.5	10.0	10.0	3.0	3.0	4.5	43.0	High
1	19	Doubling of Stafford South Jn	12.5	8.0	8.0	4.0	4.0	6.0	42.5	High
9	4	Leicester area capacity: New platforms at Leicester Station, two additional tracks between Wigston North Jn and Syston East Jn, grade separation at Wigston North Jn	12.5	10.0	10.0	1.0	1.0	7.5	42.0	High
1	2	Preston Station area capacity enhancement and remodelling	10.0	10.0	10.0	1.0	3.0	7.5	41.5	High
4	5	Grade Separation at Didcot East and Oxford North jns and capacity improvements at Oxford Station	10.0	10.0	10.0	1.0	3.0	7.5	41.5	High
4	6	Grade separation at Didcot East Jn, four-tracking between Didcot and Oxford and at Oxford Station	10.0	10.0	10.0	1.0	3.0	7.5	41.5	High
3	1	Further doubling of the Felixstowe Branch Line	12.5	8.0	4.0	4.0	5.0	7.5	41.0	Medium
1	3	Dynamic down loop Tebay to Shap Summit in Cumbria	10.0	10.0	6.0	3.0	4.0	7.5	40.5	Medium
1	4	Dynamic up loop between Carlisle and Plumpton (near Penrith)	10.0	10.0	6.0	3.0	4.0	7.5	40.5	Medium
1	5	Dynamic up loop between the Eden Valley (near Penrith) and Shap Summit	10.0	10.0	6.0	3.0	4.0	7.5	40.5	Medium
1	10	Remodelling of Carstairs, in order to improve freight regulation	10.0	10.0	6.0	3.0	4.0	7.5	40.5	Medium
1	18	Reduction of headways on Northampton loop and remodelling of Northampton Station to allow higher linespeeds	7.5	8.0	10.0	4.0	4.0	6.0	39.5	Medium
8	11	Transpennine freight capacity	5.0	10.0	10.0	4.0	2.0	7.5	38.5	Medium
6	8	Infill electrification Jn Rd Jn to Carlton Rd Jn	12.5	4.0	6.0	4.0	2.0	6.0	34.5	Medium
11	1	Dynamic loops on ECML at Grantshouse and four-tracking between Prestonpans and Drem	2.5	10.0	10.0	3.0	3.0	6.0	34.5	Medium
11	5	Four tracking existing two track railway in the Hare Park Jn area, south of Leeds	2.5	10.0	10.0	2.0	4.0	3.0	31.5	Other
11	2	Edinburgh Suburban Line capacity improvements	2.5	10.0	6.0	3.0	3.0	4.5	29.0	Other
5	2	Electric traction capability for Channel Tunnel routes, addressing the Redhill track circuit issue	5.0	2.0	4.0	4.0	5.0	7.5	27.5	Other
8	12	Level crossing enhancements: Teesport to Northallerton	2.5	6.0	4.0	5.0	5.0	4.5	27.0	Other
11	6	Freight loop at Camperdown (north of Dundee)	2.5	6.0	6.0	4.0	4.0	3.0	25.5	Other
11	7	Looping strategy for freight between Dundee and Aberdeen	2.5	6.0	6.0	4.0	4.0	3.0	25.5	Other
8	9	Level crossing enhancements at East Boldon and Tile Shed for increased Tyne Dock traffic	2.5	4.0	4.0	5.0	5.0	1.5	22.0	Other
4	3	Electrification of the diversionary route via Andover and potentially Eastleigh to Romsey	5.0	2.0	2.0	3.0	1.0	3.0	16.0	Other

Table A5.2: Total weighted scores by scheme option for gauge schemes										
Schemes in total weighted score order			Weighted scores by criteria						Out of 50	
Corr. no.	Sch. Opt. no.	Scheme	Forecast growth	Capacity constraints	Operational efficiency	Passenger benefits	Deliverability/ complexity	Stakeholder support	Total weighted score	Priority category
5	1	W12 between the Channel Tunnel and Wembley via Maidstone and/or Tonbridge	4.0	4.5	15.0	0.5	2.5	7.5	34.0	High
1	21	W12 WCML Midlands Terminals to Wigan/Trafford Park	10.0	3.0	12.0	0.5	1.5	6.0	33.0	High
8	14	W12 Transpennine route	4.0	3.0	15.0	0.5	2.5	7.5	32.5	High
1	20	W12 WCML Wembley to Midlands terminals	6.0	3.0	13.5	0.5	0.5	7.5	31.0	High
2	1	W12 South Yorkshire Joint Line	4.0	4.5	12.0	2.0	3.0	5.3	30.8	High
1	22	W12 WCML Wigan to Coatbridge	8.0	3.0	12.0	0.5	1.5	5.3	30.3	Medium
1	17	W12 WCML Coatbridge to Grangemouth	4.0	3.0	12.0	0.5	3.5	5.3	28.3	Medium
3	17	W12 Felixstowe to Nuneaton via Ely	6.0	3.0	12.0	0.5	3.5	3.0	28.0	Medium
4	12	W8 Bathampton Jn to Bradford Jn (Dundas Aquaduct)	2.0	4.5	10.5	3.0	4.0	3.8	27.8	Medium
9	13	W12 between London and Bedford (including Gospel Oak to Barking)	4.0	3.0	12.0	0.5	2.0	6.0	27.5	Medium
10	8	W12 infill between London, Bristol and Cardiff	4.0	3.0	12.0	0.5	2.5	5.3	27.3	Other
9	12	W10 between London and Bedford (including cross London routes infill)	4.0	3.0	10.5	0.5	2.5	6.0	26.5	Other
10	9	W12 Cardiff to Severn Tunnel Jn	2.0	3.0	12.0	0.5	2.5	3.8	23.8	Other
7	4	W10 Bristol to Birmingham	4.0	3.0	10.5	0.5	2.5	3.0	23.5	Other
4	11	W10 Diversionary Route via Westbury and Melksham	2.0	3.0	10.5	0.5	3.5	3.0	22.5	Other

Table A5.3: Total weighted scores by scheme option for capability (excluding gauge) schemes

Schemes in total weighted score order			Weighted scores by criteria						Out of 50	
Corr. no.	Sch. Opt. no.	Scheme	Forecast growth	Capacity constraints	Operational efficiency	Passenger benefits	Deliverability/ complexity	Stakeholder support	Total weighted score	Priority category
6	12	Cross London speed (HAW)	5.0	4.5	11.3	7.1	2.5	7.5	37.9	High
1	29	West Coast North loop entry and exit speed	10.0	4.1	7.9	6.4	3.0	6.0	37.4	High
3	19	Anglia speed	12.5	3.4	7.5	4.4	2.3	5.3	35.3	High
1	26	Northampton Station speed	7.5	4.5	10.0	6.8	0.5	5.3	34.5	High
1	27	West Coast West Mids to NW speed	12.0	3.0	7.3	4.4	2.6	5.1	34.3	High
6	10	London Gateway 775m train length	12.5	3.0	8.8	1.5	2.0	6.0	33.8	High
6	11	Cross London speed	12.5	4.5	5.0	4.5	2.5	4.5	33.5	High
9	19	MML North speed (from less than 60mph)	9.6	3.3	8.0	3.9	2.2	5.0	32.1	High
9	17	MML South speed (from less than 60mph)	10.0	3.4	8.3	4.5	1.9	3.8	31.8	High
1	28	West Coast South loop entry and exit speed	7.5	3.3	7.1	5.0	3.0	4.5	30.4	High
9	15	Corby speed (HAW)	5.0	3.5	10.0	3.8	2.5	5.3	30.0	Medium
10	10	Acton speed	10.0	3.0	6.3	4.5	2.5	3.8	30.0	Medium
9	14	MML South speed (HAW)	5.0	3.8	8.3	5.0	2.5	5.3	29.8	Medium
3	20	Anglia speed (HAW)	2.5	3.5	10.0	4.5	2.5	6.8	29.8	Medium
7	6	West Midlands speed (HAW)	2.5	4.0	9.4	5.6	2.5	5.3	29.3	Medium
8	16	Transpennine speed (HAW)	5.0	3.2	8.1	4.9	2.5	5.4	29.2	Medium
1	30	West Coast South speed (HAW)	2.5	4.1	9.7	5.1	2.5	5.3	29.1	Medium
1	25	West Coast NW to Scotland 775m train length	10.0	2.0	7.5	1.5	2.0	6.0	29.0	Medium
1	24	West Coast West Mids to NW 775m train length	6.8	2.9	9.6	1.5	2.0	6.0	28.8	Medium
11	8	East Coast North speed (HAW)	2.5	3.9	8.6	5.9	2.5	5.3	28.7	Medium
8	18	North East and Humber speed (HAW)	2.5	3.7	9.2	5.5	2.5	5.3	28.6	Medium
3	18	West Midlands 775m train length	5.0	3.0	10.0	1.5	3.0	6.0	28.5	Medium
2	4	East Coast North speed	2.5	3.7	8.8	5.5	2.5	5.3	28.2	Other
3	21	East Midlands speed (HAW)	2.5	3.7	9.2	4.8	2.5	5.3	27.8	Other
8	17	North West speed (HAW)	2.5	4.0	7.5	6.0	2.5	5.3	27.8	Other
8	19	East Lancs speed (HAW)	5.0	3.0	7.5	4.5	2.5	5.3	27.8	Other
7	5	Western speed	2.5	3.0	8.8	5.3	2.5	5.3	27.3	Other
9	16	Sheffield speed (HAW)	2.5	3.1	8.1	5.1	2.5	5.3	26.6	Other
9	20	MML North speed (from 60mph or above)	10.0	1.5	2.5	3.8	2.5	5.3	25.5	Other
8	15	Immingham speed	2.5	3.0	7.5	4.5	2.5	5.3	25.3	Other
2	5	East Mids & Yorks speed (HAW)	2.5	2.9	7.5	2.7	2.5	5.3	23.3	Other
8	20	Liverpool speed	2.5	3.0	7.5	1.5	2.5	5.3	22.3	Other
9	18	MML South speed (from 60mph or above)	5.0	1.3	3.2	3.4	1.9	3.8	18.5	Other

Appendix 6: Details of weighting & scoring systems used for prioritisation exercise

This appendix presents the details of the weighting & scoring systems (including the details of each scheme option's scores) that have been used to derive the weighted scores shown in Appendix 5.

The tables below present these details for each scheme type as follows:

- Table A6.1: Criteria, scoring and weighting system for capacity schemes;
- Table A6.2: Unweighted scores by scheme option for capacity schemes;
- Table A6.3: Criteria, scoring and weighting system for gauge schemes;
- Table A6.4: Unweighted scores by scheme option for gauge schemes;
- Table A6.5: Criteria, scoring and weighting system for capability (excluding gauge) schemes; and
- Table A6.6: Unweighted scores by sub-scheme for capability (excluding gauge) schemes.

The process that has been used to derive the weighted scores in Appendix 5 can be summarised as follows.

First, for each scheme type, a number of criteria were defined. These are shown in Tables A6.1, A6.3 and A6.5, with comments on each criterion. The criteria used for each scheme type are quite similar but there are some differences. They all include forecast growth, capacity constraints, passenger benefits, deliverability and stakeholder support, but for capacity schemes they include dependency on other schemes and for gauge and capability (excluding gauge) they include operational efficiency.

Next, for each scheme type, a weighting was defined for each criterion. These are shown in Tables A6.1, A6.3 and A6.5, with comments on each weighting. For each scheme type, the weightings add up to 10. The weightings vary by scheme type, reflecting differences in the importance of each criterion. For example, forecast growth has a higher weighting for capacity schemes (2.5) than gauge schemes (2).

Next, each scheme option was scored against each criterion. These unweighted scores are shown in Tables A6.2, A6.4 and A6.6. For each criterion, the maximum score is 10. These tables include comments on each scheme option where relevant. Comments on the scoring system used for each criterion are shown in Tables A6.1, A6.3 and A6.5.

Finally, for each scheme option, the total weighted score (as shown in Appendix 5) was calculated by multiplying the scores for each criterion by the weighting for that criterion. The maximum weighted score for each scheme is 50, for all scheme types.

For each scheme option, Tables A6.2, A6.4 and A6.6 show a corridor number and scheme option number. These numbers are referred to in the tables (and in some cases the maps) in Chapter 8.

For capability (excluding gauge) schemes only, the scores in Table A6.6 refer to scores for each sub-scheme rather than each scheme option. Table A6.6 shows how the sub-schemes are allocated to a particular scheme option. The results in Table A5.3 refer to the average results for all the relevant sub-schemes.

Notes relating to specific tables

Table A6.2: Unweighted scores by scheme option for capacity schemes.

This table is split into two parts.

Table A6.6: Unweighted scores by sub-scheme for capability (excluding gauge) schemes.

This table is split into six parts.

As discussed above, this table (unlike Tables A6.2 and A6.4) refers to scores for each sub-scheme rather than each scheme option. It also shows how each sub-scheme is allocated to a particular scheme option.

In the "Notes" column:

Numbers refer to indicative speed increases (in mph) as a result of the sub-scheme. For example, 10 to 40 means an increase from 10mph to 40mph (i.e. a rise of 30mph).

* denotes that this sub-scheme relates to intermodal flows only.

^ denotes that forecast growth scores have been increased by 1 to reflect TfN's higher forecasts for Transpennine flows. The forecasts for these flows refer to the three main Transpennine routes (via Diggle, via Edale and via Hebden Bridge).

# denotes that forecast growth scores have been increased by 1 to reflect higher growth prospects on this part of the WCML corridor (i.e. between London and the Midlands).

Table A6.1: Criteria, scoring and weighting system for capacity schemes

Criteria:	Forecast growth	Capacity constraints	Passenger benefits	Deliverability / complexity	Dependency on other schemes	Stakeholder support
Comments on criteria:	Reflects growth forecasts for the corridor (or part of corridor), focusing on the short term (i.e. the next ten years).	Reflects extent to which the lack of spare network capacity is constraining growth.	Reflects whether the scheme is expected to deliver benefits to passenger services as well as rail freight.	Reflects how complex and/or deliverable the proposed intervention is.	Reflects how dependent the FNS scheme is on the delivery of other schemes. Considers non-FNS schemes that are required to be delivered, or other factors (e.g. use of electric fleet of locomotives) required, in order for the full benefits of the FNS scheme to be realised.	Reflects the level of support from stakeholders. This is mainly driven by FNS consultation responses and Working Group comments. Also takes account of Route Studies and comments from route planners within Network Rail.
Comments on scoring:	Scheme scored highly if corridor (or part of corridor) has high forecast growth. Scores are primarily driven by the FMS central case forecasts for all commodities, but take account of the higher scenario construction materials forecasts in the FNS. Growth of over 20 freight train paths per day (fppd) to 2023 = 5: 15 to 20 fppd = 4; 10 to 15 fppd = 3; 5 to 10 fppd = 2; less than 5 fppd = 1.	Scheme scored highly if infrastructure is currently operating at capacity (i.e. there is no additional capacity to operate more train services) and the scheme will create new capacity, allowing additional services to run. Conversely, schemes scored low if they provide extra capacity on a section of route that still has spare train paths.	Scheme scored highly if there are passenger benefits associated with the proposed intervention. This is driven by passenger volumes on the section of route, and how constrained capacity that section of route currently is.	The more complex the scheme is to deliver, the lower the score. Complex schemes are assumed to have a greater degree of risk associated with them (e.g. risk of time and/ or cost over-runs, disruption to train services), and therefore are less desirable as a short term priority. For example, typically grade separating a flat junction is a much more complex project than doubling a single junction, and therefore the grade separating scheme would score lower under this criteria.	Scheme only scores 5 if it is not dependent on the successful delivery of any passenger schemes in the area. If no known passenger schemes exist in the area, but significant passenger growth is forecast, scored 4 on the assumption that there are some passenger schemes that will be needed to be delivered to enable this growth to occur. Schemes relating to electrification are scored 2, as being able to run electric traction depends on full industry commitment.	Scheme scored highly if it has strong stakeholder support.
Weighting (out of 10):	2.5	2	2	1	1	1.5
Comments on weighting:	The principle driver of the need to intervene. The FNS is intended to support the development of rail freight. If growth is forecast on a section of route, this is the most compelling reason to enhance capacity and ensure that the growth can be realised.	If a section of route is already capacity constrained, it is important that (where growth is forecast) an intervention occurs to increase capacity and allow growth to be realised. This is a key driver in supporting the development of rail freight.	The scheme is more likely to have a business case if it benefits both passenger and freight, hence this is considered an important criteria.	Whilst this is a relevant consideration, it is not a main driver as to whether to go ahead with the scheme, hence a weighting of 1.	Dependency on other (non-FNS) schemes on the corridor increases the risk that the full output of the FNS scheme will not be delivered. Whilst this is a relevant consideration, it is not a main driver as to whether to go ahead with the scheme, hence a weighting of 1.	Whilst the primary drivers of where to invest in enhancing the network relate to forecast growth and capacity constraints, stakeholder support is also a very relevant consideration. A weighting of 1.5 has therefore been assigned.

Table A6.2: Unweighted scores by scheme option for capacity schemes										
Schemes in corridor no. order followed by scheme option no. order			Scores (out of 5)						Total (out of 30)	
Corr. no.	Sch. Opt. no.	Scheme	Forecast growth	Capacity constraints	Passenger benefits	Deliverability/ complexity	Dependency on other schemes	Stakeholder support	Total weighted score	Comments
1	2	Preston Station area capacity enhancement and remodelling	4	5	5	1	3	5	23	
1	3	Dynamic down loop Tebay to Shap Summit in Cumbria	4	5	3	3	4	5	24	Deliverability: although in essence loops are relatively straightforward to deliver, dynamic loops will require additional land, which makes them more complex
1	4	Dynamic up loop between Carlisle and Plumpton (near Penrith)	4	5	3	3	4	5	24	Deliverability: although in essence loops are relatively straightforward to deliver, dynamic loops will require additional land, which makes them more complex
1	5	Dynamic up loop between the Eden Valley (near Penrith) and Shap Summit	4	5	3	3	4	5	24	Deliverability: although in essence loops are relatively straightforward to deliver, dynamic loops will require additional land, which makes them more complex
1	10	Remodelling of Carstairs, in order to improve freight regulation	4	5	3	3	4	5	24	
1	18	Reduction of headways on Northampton loop and remodelling of Northampton Station to allow higher linespeeds	3	4	5	4	4	4	24	Forecast growth: score increased from 2 to 3 to reflect higher growth prospects on this part of corridor. Stakeholder support: scheme supported in WCML working groups.
1	19	Doubling of Stafford South Jn	5	4	4	4	4	4	25	Stakeholder support: no expressed support from consultation responses or WG, but strong support in WCML working groups
3	1	Further doubling of the Felixstowe Branch Line	5	4	2	4	5	5	25	Passenger benefit: scheme only results in improved passenger performance, not extra passenger services. Dependency: if DfT decide to prioritise this scheme, there is the opportunity to do this additional work with the scheduled CP5 work.
3	2	A loop facility at Haughley Jn (near Stowmarket), including doubling of the junction	5	5	5	4	4	5	28	Passenger benefit: impacts the busy GEML, and will benefit Norwich in 90
3	3	Headway reductions at Bury St Edmunds	5	5	4	4	4	5	27	
3	5	Infrastructure works at Ely such as level crossings enhancements and additional tracking	5	5	5	2	2	5	24	Deliverability: ground conditions make the scheme complex. Dependency: high dependency on other passenger-driven schemes in Ely area.
3	6	Signalling enhancements in the Syston East Jn to Peterborough area	5	5	3	4	4	5	26	

Table A6.2 (continued): Unweighted scores by scheme option for capacity schemes

Schemes in corridor no. order followed by scheme option no. order			Scores (out of 5)						Total (out of 30)	
Corr. no.	Sch. Opt. no.	Scheme	Forecast growth	Capacity constraints	Passenger benefits	Deliverability/ complexity	Dependency on other schemes	Stakeholder support	Total weighted score	Comments
4	3	Electrification of the diversionary route via Andover and potentially Eastleigh to Romsey	2	1	1	3	1	2	10	Forecast growth: score reduced to reflect diversionary route. Dependency: dependent on OLE of main line. Stakeholder support: FOCs not supportive of this scheme as a short term priority, but Hampshire CC supportive, hence scored at 2.
4	5	Grade Separation at Didcot East and Oxford North jns and capacity improvements at Oxford Station	4	5	5	1	3	5	23	Dependency: some dependency on Basingstoke and other potential passenger interventions on the route
4	6	Grade separation at Didcot East Jn, four-tracking between Didcot and Oxford and at Oxford Station	4	5	5	1	3	5	23	Dependency: some dependency on Basingstoke and other potential passenger interventions on the route
5	2	Electric traction capability for Channel Tunnel routes, addressing the Redhill track circuit issue	1	1	2	4	5	5	18	Stakeholder support: raised by FOCs at WG, and received full WG support Forecast growth score: score increased from 1 to 2 to reflect higher growth prospects.
6	7	Cross London freight capacity	5	5	5	3	3	3	24	Stakeholder support: FOCs are supportive; TfL has expressed reservations; hence scored at 3
6	8	Infill electrification Jn Rd Jn to Carlton Rd Jn	5	2	3	4	2	4	20	Passenger benefit: this scheme enables the use of electric traction for freight on GOB, which should provide extra capacity for passenger services. Dependency: dependent on MML electrification.
8	9	Level crossing enhancements at East Boldon and Tile Shed for increased Tyne Dock traffic	1	2	2	5	5	1	16	
8	11	Transpennine freight capacity	2	5	5	4	2	5	23	Forecast growth: raised from 1 to 2 to reflect higher TfN forecasts
8	12	Level crossing enhancements: Teesport to Northallerton	1	3	2	5	5	3	19	Stakeholder support: North Yorkshire CC expressed support through consultation, hence scored at 3
9	4	Leicester area capacity: New platforms at Leicester Station, two additional tracks between Wigston North Jn and Syston East Jn, grade separation at Wigston North Jn	5	5	5	1	1	5	22	Dependency: relies on the successful delivery of major MML schemes
11	1	Dynamic loops on ECML at Grantshouse and four-tracking between Prestonpans and Drem	1	5	5	3	3	4	21	Dependency: dependent on the passenger driven scheme at easterly approaches to Waverley, hence scored 3 rather than 4
11	2	Edinburgh Suburban Line capacity improvements	1	5	3	3	3	3	18	Stakeholder support: strong WG support but no comments in responses. Passenger benefit: not scored higher because scheme brings mainly operational benefits for TOCs rather than service enhancements
11	5	Four tracking existing two track railway in the Hare Park Jn area, south of Leeds	1	5	5	2	4	2	19	Stakeholder support: no comment received, either at WG or through consultation responses, but LNE have developed scheme through Route Study process, and so a degree of stakeholder support is assumed
11	6	Freight loop at Camperdown (north of Dundee)	1	3	3	4	4	2	17	
11	7	Looping strategy for freight between Dundee and Aberdeen	1	3	3	4	4	2	17	

Table A6.3: Criteria, scoring and weighting system for prioritisation of gauge schemes

Criteria:	Forecast growth	Capacity constraints	Operational efficiency	Passenger benefits	Deliverability/complexity	Stakeholder support
Comments on criteria:	Reflects intermodal growth forecasts for the corridor (or part of corridor).	Reflects extent to which the scheme relieves capacity constraints on the network and/or results in better utilisation of network capacity. Gauge enhancement relieves capacity constraints by increasing the capacity of each train or by providing an alternative gauge-cleared route which relieves capacity constraints on a corridor. Gauge enhancement can result in better utilisation of the network by increasing path utilisation.	Reflects extent to which the scheme enables an improvement in the operational efficency of the network, the timetable or FOC operations. Efficiencies include (but are not limited to) diversionary route capability, wagon utilisation and journey time improvement.	Reflects potential benefits of the scheme to passenger services.	Reflects how deliverable and complex the scheme is anticipated to be.	Reflects the level of support from stakeholders. This is mainly driven by FNS consultation responses and Working Group comments. Also takes account of Route Studies and comments from route planners within Network Rail.
Comments on scores:	Scheme scored highly if it is on a corridor with high forecast growth for intermodal. Scores are primarily driven by the FMS central case forecasts for intermodal. Growth of over 20 freight train paths per day (fppd) to 2023 = 5: 15 to 20 fppd = 4; 10 to 15 fppd = 3; 5 to 10 fppd = 2; less than 5 fppd = 1.	All gauge enhancement schemes are scored at at least 2 since they relieve capacity constraints by increasing the capacity of each train. Schemes are scored at 3 if they provide an alternative gauge-cleared route on a constrained corridor or if they increase path utilisation (see above).	All gauge enhancement schemes improve wagon utilisation, both in terms of standard flatbed wagons and the possibility of greater take-up of capacity per train path. All schemes score between 3 and 5 based on the standard above, with the higher scores reflecting additional operational efficiencies.	The majority of schemes have insignificant benefits to passengers as gauge is not linked to passenger capacity or performance: these schemes are scored low. Some schemes will enable improvements to passenger services via increased freight routing options and have been given a higher score.	A low score reflects a highly complex scheme and/or deliverability issues. A high score reflects low complexity etc. Most gauge enhancement schemes have relatively low complexity; however scheme specific factors (such as challenging structures) may introduce additional complexity .	Scheme scored highly if it has strong stakeholder support.
Weighting (out of 10):	2	1.5	3	1	1	1.5
Comments on weighting:	Medium weighting to reflect the importance of potential intermodal growth on the route.	Medium weighting to reflect the importance of capacity issues for these schemes.	High weighting since operational efficiency is a key factor in encouraging modal shift.	Low weighting as passenger benefits are generally not a key aspect of gauge schemes.	Low weighting since the degree of complexity is not a key factor.	Medium weighting to reflect importance of stakeholder support.

Table A6.4: Unweighted scores by scheme option for gauge schemes											
Schemes in corridor no. order followed by scheme option no. order			Scores (out of 5)						Total (out of 30)	
Corr. no.	Sch. Opt. no.	Scheme	Forecast growth	Capacity constraints	Operational efficiency	Passenger benefits	Deliverability/ complexity	Stakeholder support	Total weighted score	Comments
1	17	W12 WCML Coatbridge to Grangemouth	2.0	2.0	4.0	0.5	3.5	3.5	15.5	Stakeholder support: reduced score to reflect dependency on full WCML W12 clearance
1	20	W12 WCML Wembley to Midlands terminals	3.0	2.0	4.5	0.5	0.5	5.0	15.5	Forecast growth: score increased from 2 to 3 to reflect higher growth prospects on this part of the corridor
1	21	W12 WCML Midlands Terminals to Wigan/Trafford Park	5.0	2.0	4.0	0.5	1.5	4.0	17.0	Stakeholder support: reduced score to reflect dependency on Wembley to Midlands section
1	22	W12 WCML Wigan to Coatbridge	4.0	2.0	4.0	0.5	1.5	3.5	15.5	Stakeholder support: reduced score to reflect dependency on Wembley to Crewe and Crewe to Wigan sections
2	1	W12 South Yorkshire Joint Line	2.0	3.0	4.0	2.0	3.0	3.5	17.5	Forecast growth: reflects ECML growth
3	17	W12 Felixstowe to Nuneaton via Ely	3.0	2.0	4.0	0.5	3.5	2.0	15.0	Forecast growth: score reduced from 5 to 3 to reflect W12 vs W10 requirements
4	11	W10 Diversionary Route via Westbury and Melksham	1.0	2.0	3.5	0.5	3.5	2.0	12.5	Stakeholder support: reduced due to route distance. Forecast growth: reduced since diversionary route.
4	12	W8 Bathampton Jn to Bradford Jn (Dundas Aquaduct)	1.0	3.0	3.5	3.0	4.0	2.5	17.0	Scheme benefits Southampton to Bristol flows
5	1	W12 between the Channel Tunnel and Wembley via Maidstone and/or Tonbridge	2.0	3.0	5.0	0.5	2.5	5.0	18.0	Forecast growth: score increased from 1 to 2 to reflect higher growth prospects on this corridor
7	4	W10 Bristol to Birmingham	2.0	2.0	3.5	0.5	2.5	2.0	12.5	
8	14	W12 Transpennine route	2.0	2.0	5.0	0.5	2.5	5.0	17.0	Forecast growth: score increased to reflect higher TfN forecasts
9	12	W10 between London and Bedford (including cross London routes infill)	2.0	2.0	3.5	0.5	2.5	4.0	14.5	
9	13	W12 between London and Bedford (including Gospel Oak to Barking)	2.0	2.0	4.0	0.5	2.0	4.0	14.5	
10	8	W12 infill between London, Bristol and Cardiff	2.0	2.0	4.0	0.5	2.5	3.5	14.5	
10	9	W12 Cardiff to Severn Tunnel Jn	1.0	2.0	4.0	0.5	2.5	2.5	12.5	

Table A6.5: Criteria, scoring and weighting system for capability (excluding gauge) schemes						
Criteria:	Forecast growth	Capacity constraints	Operational efficiency	Passenger benefits	Deliverability/complexity	Stakeholder support
Comments on criteria:	Reflects growth forecasts for the corridor (or part of corridor), focusing on the short term (i.e. the next ten years).	Reflects extent to which the scheme addresses capacity contraints on the relevant route	Reflects extent to which the scheme makes rail freight operations more efficient, for example by enabling more product to be moved on fewer trains, by increasing the number of circuits achievable on a flow with the same resources, or saving fuel by achieving a more even speed profile.	Reflects whether the scheme is expected to deliver benefits to passenger services. For example, if the scheme increases linespeeds this is likely to benefit passenger services as well as freight services.	Reflects how complex and/or deliverable the proposed intervention is. For example, a requirement for significant possession access in a difficult location or unusual engineering challenges will increase complexity.	Reflects the level of support from stakeholders. This is mainly driven by FNS consultation responses and Working Group comments. Also takes account of Route Studies and comments from route planners within Network Rail.
Comments on scoring:	Scheme scored highly if corridor (or part of corridor) has high forecast growth. Scores are primarily driven by the FMS central case forecasts for all commodities, but take account of the higher scenario construction materials forecasts in the FNS. Growth of over 20 freight train paths per day (fppd) to 2023 = 5: 15 to 20 fppd = 4; 10 to 15 fppd = 3; 5 to 10 fppd = 2; less than 5 fppd = 1. For HAW scores, score is based on non-intermodal traffic growth only.	Scheme scored highly if infrastructure is currently operating at capacity and the scheme will create new capacity, allowing additional services to run. Conversely, schemes scored low if they provide extra capacity on a section of route that still has spare train paths - or if the scheme does not provide extra capacity.	The highest scores are awarded to schemes which increase operational efficiency the most. For schemes involving speed increases, the scores are based on the indicative speed increases as follows: for increases of over 60 mph = 5; 50 to 60 = 4.5; 40 to 50 = 4; 30 to 40 = 3.5; 20 to 30 = 3; 10 to 20 = 2.5; 5 to 10 = 2. Other factors (such as gradients and the geographical extent of the changes) are also taken into account.	The highest scores are awarded to schemes that deliver the most passenger benefits.	The highest scores are awarded to schemes which are likely to be the most straightforward to deliver. The lowest scores apply to the most complex schemes.	Scheme scored highly if it has strong stakeholder support.
Weighting (out of 10):	2.5	1	2.5	1.5	1	1.5
Comments on weighting:	Highly relevant because the main objective of the investment is to realise growth	Less relevant to capability schemes than other criteria	Highly relevant to capability schemes and to promoting modal shift	Moderately relevant to freight capability schemes, as passenger benefits can be reflected in the business case	Less relevant to capability schemes than other criteria	Moderately relevent as stakeholders will inform the ultimate decisions

Table A6.6: Unweighted scores by sub-scheme for capability (excluding gauge) schemes													
Schemes in corridor no. order followed by scheme option no. order followed by sub-scheme no. order					Scores (out of 5)						Total (out of 30)	
Corr. no.	Sch. Opt. no.	Scheme	Sub sch. no.	Sub-scheme	Forecast growth	Capacity constraints	Operational efficiency	Passenger benefits	Deliver-ability/ complexity	Stakeholder support	Total unweighted score	Notes
1	24	West Coast West Mids to NW 775m train length	1	Provide 775m train length capability through Crewe Station and/or Independent Lines	5.0	3.0	4.0	1.0	2.0	4.0	19.0	
1	24	West Coast West Mids to NW 775m train length	2	Provide 775m train length capability between Winsford and Weaver Jn	5.0	3.0	4.0	1.0	2.0	4.0	19.0	
1	24	West Coast West Mids to NW 775m train length	3	Provide 775m train length capability between Weaver Jn and Warrington	5.0	3.0	4.0	1.0	2.0	4.0	19.0	
1	24	West Coast West Mids to NW 775m train length	4	Provide 775m train length capability between Crewe and Trafford Park	1.0	3.0	4.0	1.0	2.0	4.0	15.0	
1	24	West Coast West Mids to NW 775m train length	7	Provide 775m train length capability between Speke Jn and Garston	1.0	3.0	4.0	1.0	2.0	4.0	15.0	
1	24	West Coast West Mids to NW 775m train length	8	Provide 775m train length capability between Allerton and Seaforth	1.0	2.5	3.5	1.0	2.0	4.0	14.0	
1	24	West Coast West Mids to NW 775m train length	9	Provide 775m train length capability between Earlestown and Seaforth	1.0	2.5	3.5	1.0	2.0	4.0	14.0	
1	25	West Coast NW to Scotland 775m train length	5	Provide 775m train length capability between Warrington and Gretna Jn	4.0	2.0	3.0	1.0	2.0	4.0	16.0	
1	25	West Coast NW to Scotland 775m train length	6	Provide 775m train length capability between Gretna Jn and Grangemouth	4.0	2.0	3.0	1.0	2.0	4.0	16.0	
1	26	Northampton Station speed	10	Increase freight linespeed through Northampton station area	3.0	4.5	4.0	4.5	0.5	3.5	20.0	20 to 60#
1	27	West Coast West Mids to NW speed	11	Increase freight linespeed via the Crewe Independent Lines	5.0	3.5	3.5	1.5	2.5	3.5	19.5	10 to 45
1	27	West Coast West Mids to NW speed	12	Increase freight linespeed through Wigan Station area	4.0	3.0	3.0	3.5	2.5	3.5	19.5	15 to 45
1	27	West Coast West Mids to NW speed	13	Increase freight linespeed through Warrington Station area	5.0	2.5	2.5	3.0	2.5	3.5	19.0	30 to 45
1	27	West Coast West Mids to NW speed	14	Increase freight linespeed on the Slow Lines between Warrington and Winwick Jn	5.0	2.5	2.5	3.0	2.5	3.5	19.0	60 to 75
1	27	West Coast West Mids to NW speed	22	Increase Crewe Up & Down Goods Loop entry and exit speeds	5.0	3.5	3.0	3.5	3.0	3.0	21.0	20 to 40
1	28	West Coast South loop entry and exit speed	15	Increase Wembley Yard entry and exit speeds	3.0	3.0	2.5	3.0	3.0	3.0	17.5	25 to 40#
1	28	West Coast South loop entry and exit speed	20	Increase Kilburn Up & Down Loop entry and exit speeds	3.0	3.5	3.0	3.5	3.0	3.0	19.0	15 to 40#
1	28	West Coast South loop entry and exit speed	21	Increase Watford Up Goods Loop entry and exit speeds	3.0	3.5	3.0	3.5	3.0	3.0	19.0	15 to 40#
1	29	West Coast North loop entry and exit speed	16	Increase Preston Loops entry and exit speeds	4.0	4.0	3.0	4.0	3.0	4.0	22.0	15 to 40
1	29	West Coast North loop entry and exit speed	17	Increase Tebay Loops entry and exit speeds	4.0	4.0	3.0	4.0	3.0	4.0	22.0	20 to 40
1	29	West Coast North loop entry and exit speed	18	Increase Eden Valley Loops entry and exit speeds	4.0	4.0	3.0	4.0	3.0	4.0	22.0	15 to 40
1	29	West Coast North loop entry and exit speed	19	Increase speed from Caldew Jn into Carlisle Yard	4.0	4.0	3.0	4.0	3.0	4.0	22.0	20 to 40
1	29	West Coast North loop entry and exit speed	23	Increase Barton and Broughton loop entry speeds	4.0	4.0	3.0	4.0	3.0	4.0	22.0	20 to 40
1	29	West Coast North loop entry and exit speed	24	Increase Oubeck Loops entry and exit speeds	4.0	4.5	3.5	4.5	3.0	4.0	23.5	10 to 40
1	29	West Coast North loop entry and exit speed	25	Increase Lancaster Up Passenger Loop No.1 exit speed	4.0	4.5	3.5	4.5	3.0	4.0	23.5	10 to 40

Table A6.6 (continued): Unweighted scores by sub-scheme for capability (excluding gauge) schemes													
Schemes in corridor no. order followed by scheme option no. order followed by sub-scheme no. order					Scores (out of 5)						Total (out of 30)	
Corr. no.	Sch. Opt. no.	Scheme	Sub sch. no.	Sub-scheme	Forecast growth	Capacity constraints	Operational efficiency	Passenger benefits	Deliver-ability/ complexity	Stakeholder support	Total unweighted score	Notes
1	29	West Coast North loop entry and exit speed	26	Increase Carnforth Loops entry and exit speeds	4.0	4.0	3.0	4.5	3.0	4.0	22.5	15 to 40
1	29	West Coast North loop entry and exit speed	27	Increase Oxenholme Loops entry and exit speeds	4.0	4.5	3.5	4.0	3.0	4.0	23.0	10 to 40
1	29	West Coast North loop entry and exit speed	28	Increase Greyrigg Loops entry and exit speeds	4.0	4.0	3.0	4.5	3.0	4.0	22.5	15 to 40
1	29	West Coast North loop entry and exit speed	29	Increase Shap Up Goods Loop exit speeds	4.0	4.0	3.0	4.5	3.0	4.0	22.5	15 to 40
1	29	West Coast North loop entry and exit speed	30	Increase Harrisons Down Goods Loop exit speeds	4.0	4.5	3.5	4.0	3.0	4.0	23.0	10 to 40
1	29	West Coast North loop entry and exit speed	31	Increase Upperby Down Goods Loop exit speeds	4.0	4.0	3.0	4.5	3.0	4.0	22.5	15 to 40
1	29	West Coast North loop entry and exit speed	32	Increase Beattock Summit Up Passenger Loop entry and exit speeds	4.0	4.0	3.0	4.5	3.0	4.0	22.5	20 to 40
1	30	West Coast South speed (HAW)	33	Incease speed for HAW vehicles via Willesden Relief Lines	1.0	3.0	3.0	1.0	2.5	3.5	14.0	15 to 40
1	30	West Coast South speed (HAW)	34	Incease speed for HAW vehicles on Slow Lines over Bridge LEC1-174 at 52m 18ch, south of Wolverton	1.0	5.0	4.5	4.5	2.5	3.5	21.0	10 to 60
1	30	West Coast South speed (HAW)	35	Increase speed for HAW vehicles on Up Slow Line over Bridge LEC2-281A at 83m 32ch, between Nuneaton and Rugby	1.0	4.5	4.0	4.0	2.5	3.5	19.5	20 to 60
1	30	West Coast South speed (HAW)	36	Increase speed for HAW vehicles over Bridge RBS1-281B (Rugby flyover)	1.0	4.0	4.0	4.0	2.5	3.5	19.0	20 to 60
2	4	East Coast North speed	37	Increase freight linespeed at King Edward Bridge Jn South	1.0	4.0	3.5	4.0	2.5	3.5	18.5	30 to 60
2	4	East Coast North speed	38	Increase freight linespeed on low speed section of the Gateshead Lines and Sunderland Lines between King Edward Bridge Jns and Sunderland Lines	1.0	3.0	3.5	3.0	2.5	3.5	16.5	15 to 45
2	4	East Coast North speed	39	Increase freight linespeed on the Slow Lines through Thirsk Station and between Thirsk and York	1.0	4.0	3.5	4.0	2.5	3.5	18.5	40 to 75
2	5	East Mids & Yorks speed (HAW)	40	Increase speed for HAW vehicles over Bridge TCC-84 at 140m 59ch, near Clay Cross Jns	1.0	3.5	3.5	2.5	2.5	3.5	16.5	30 to 60
2	5	East Mids & Yorks speed (HAW)	41	Increase speed for HAW vehicles over Bridges THL-4 at 120m 20ch and THL-5 at 120m 25ch (Toton High Level)	1.0	2.0	3.0	0.5	2.5	3.5	12.5	20 to 45
2	5	East Mids & Yorks speed (HAW)	42	Increase speed for HAW vehicles over Bridges TJC3-150 at 165m 17ch near Aldwarke Jn	1.0	3.0	3.0	3.0	2.5	3.5	16.0	20 to 45
2	5	East Mids & Yorks speed (HAW)	43	Increase speed for HAW over Bridge SMJ2-75 at 17m 08ch Bolton on Dearne	1.0	3.5	3.5	3.5	2.5	3.5	17.5	30 to 60
2	5	East Mids & Yorks speed (HAW)	44	Increase speed for HAW vehicles over Bridge CHR-116 at 153m 41ch near Beighton Jn	1.0	3.5	3.5	0.5	2.5	3.5	14.5	20 to 60
2	5	East Mids & Yorks speed (HAW)	45	Increase speed for HAW vehicles between Clarborough Jn and Worksop	1.0	2.0	2.0	2.0	2.5	3.5	13.0	40 to 45
2	5	East Mids & Yorks speed (HAW)	46	Increase speed for HAW vehicles over the South Yorkshire Joint Line between Brancliffe E Jn and Doncaster	1.0	2.5	2.5	0.5	2.5	3.5	12.5	20 to 35
3	18	West Midlands 775m train length	47	Provide 775m train length capability between Nuneaton and Lawley Street and Birch Coppice	2.0	3.0	4.0	1.0	3.0	4.0	17.0	
3	18	West Midlands 775m train length	48	Provide 775m train length capability between over the Sutton Park Line (Water Orton/ Castle Bromwich to Bescot Jn/Darlaston Jn)	2.0	3.0	4.0	1.0	3.0	4.0	17.0	
3	19	Anglia speed	49	Increase freight linespeed through Ely Station area, especially platform 3	5.0	4.0	3.5	3.5	2.5	3.5	22.0	15 to 50
3	19	Anglia speed	50	Increase freight linespeed between Ely and Peterborough to 75mph (60mph through March)	5.0	3.0	2.5	3.0	2.5	3.5	19.5	60 to 75*
3	19	Anglia speed	51	Increase freight linespeed between Peterborough and Stamford	5.0	3.0	2.5	3.0	2.5	3.5	19.5	60 to 75*
3	19	Anglia speed	52	Increase freight linespeed at Haughley Jn	5.0	3.0	2.5	2.5	2.5	3.5	19.0	30 to 40
3	19	Anglia speed	53	Increase freight linespeed through Thurston Station area	5.0	3.5	3.0	3.0	2.5	3.5	20.5	50 to 75

Table A6.6 (continued): Unweighted scores by sub-scheme for capability (excluding gauge) schemes													
Schemes in corridor no. order followed by scheme option no. order followed by sub-scheme no. order					Scores (out of 5)						Total (out of 30)	
Corr. no.	Sch. Opt. no.	Scheme	Sub sch. no.	Sub-scheme	Forecast growth	Capacity constraints	Operational efficiency	Passenger benefits	Deliver-ability/ complexity	Stakeholder support	Total unweighted score	Notes
3	19	Anglia speed	54	Increase freight linespeed through Bury St Edmunds Station area	5.0	3.5	4.0	3.5	1.0	3.5	20.5	30 to 75
3	19	Anglia speed	55	Increase freight linespeedat Chippenham Jn	5.0	3.5	3.0	3.0	2.5	3.5	20.5	40 to 60
3	19	Anglia speed	56	Increase freight linespeed on the Felixstowe branch between 74m 31 ch and Westerfield Jn	5.0	3.5	3.0	2.0	2.5	3.5	19.5	35 to 60
3	20	Anglia speed (HAW)	57	Increase speed for HAW vehicles between Ely and Peterborough. Structure locations to be confirmed.	1.0	3.5	4.0	3.0	2.5	4.5	18.5	40 to 60
3	20	Anglia speed (HAW)	58	Increase speed for HAW vehicles between Haughley Jn and Ely/Chippenham Jn. Structure locations to be confirmed.	1.0	3.5	4.0	3.0	2.5	4.5	18.5	40 to 60
3	20	Anglia speed (HAW)	59	Increase speed for HAW vehicles between Cambridge and Kings Lynn. Structure locations to be confirmed.	1.0	3.5	4.0	3.0	2.5	4.5	18.5	40 to 60
3	21	East Midlands speed (HAW)	60	Increase speed for HAW vehicles over Bridge SPC5-21 at 101m 28ch near Leicester	1.0	3.5	3.5	3.0	2.5	3.5	17.0	30 to 60
3	21	East Midlands speed (HAW)	61	Increase speed for HAW vehicles over Bridge SPC5-74 at 111m 40ch just south of Loughborough	1.0	4.0	4.0	3.5	2.5	3.5	18.5	20 to 60
3	21	East Midlands speed (HAW)	62	Increase speed for HAW vehicles between Glen Parva Jn and Nuneaton, including over bridge over bridge WNS-31 at 13m 47ch	1.0	3.5	3.5	3.0	2.5	3.5	17.0	30 to 60
6	10	London Gateway 775m train length	63	Provide 775m train length capability to London Gateway and Tilbury. Level Crossing risk is the key constraint.	5.0	3.0	3.5	1.0	2.0	4.0	18.5	
6	11	Cross London speed	64	Increase freight linespeed between Kentish Town and Camden Road	5.0	4.5	2.0	3.0	2.5	3.0	20.0	20 to 40
6	12	Cross London speed (HAW)	65	Increase speed for HAW vehicles over Bridge No.1 (Kentish Town Viaduct), 0m to 0m 60ch between Camden Road West Jn and Gospel Oak Jn	2.0	4.5	5.0	5.0	2.5	5.0	24.0	10 to 40
6	12	Cross London speed (HAW)	66	Increase speed for HAW vehicles over Bridge No.651A (Clarnico's Viaduct) & Bridge No.652 (River Lee) between Hackney Wick and Lea Jn 2m 76ch to 2m 69ch	2.0	4.5	4.0	4.5	2.5	5.0	22.5	20 to 40
7	5	Western speed	67	Increase freight linespeed between Westerleigh Jn and Yate	1.0	3.0	3.5	3.5	2.5	3.5	17.0	40 to 75
7	5	Western speed	68	Increase freight linespeed through Cheltenham Station area	1.0	3.0	3.5	3.5	2.5	3.5	17.0	40 to 75
7	5	Western speed	69	Increase freight linespeed through Worcester station area	1.0	3.0	3.5	3.5	2.5	3.5	17.0	25 to 60
7	6	West Midlands speed (HAW)	70	Increase speed for HAW vehicles over Bridge LSC2-18 at 4m 20ch - 4m 40ch near Kenilworth	1.0	4.5	4.0	4.0	2.5	3.5	19.5	20 to 60
7	6	West Midlands speed (HAW)	71	Increase speed for HAW vehicles over Bridge PBJ-2 at 0m 20ch - 0m 40ch near Duddeston	1.0	3.5	3.5	3.5	2.5	3.5	17.5	05 to 60
8	15	Immingham speed	72	Increase freight linespeed between Doncaster and Immingham	1.0	3.0	3.0	3.0	2.5	3.5	16.0	55 to 75
8	16	Transpennine speed (HAW)	73	Increase speed for HAW vehicles over Bridge MVL3-1 at 7m 77ch – 8m 10ch near Stalybridge	2.0	4.5	5.0	5.0	2.5	5.0	24.0	10 to 50^
8	16	Transpennine speed (HAW)	74	Increase speed for HAW vehicles on the Down Passenger Loop between Brewery Jn and Thorpes Bridge Jn	2.0	2.0	2.0	2.0	2.5	3.5	14.0	20 to 25^
8	16	Transpennine speed (HAW)	75	Increase speed for HAW vehicles over Bridge MVN2-105 at 19m 00ch – 19m 40ch near Todmorden	2.0	4.0	4.0	4.0	2.5	3.5	20.0	20 to 60^

Table A6.6 (continued): Unweighted scores by sub-scheme for capability (excluding gauge) schemes

Schemes in corridor no. order followed by scheme option no. order followed by sub-scheme no. order					Scores (out of 5)						Total (out of 30)	
Corr. no.	Sch. Opt. no.	Scheme	Sub sch. no.	Sub-scheme	Forecast growth	Capacity constraints	Operational efficiency	Passenger benefits	Deliver-ability/ complexity	Stakeholder support	Total unweighted score	Notes
8	16	Transpennine speed (HAW)	79	Increase speed for HAW vehicles on the Down Line through Sowerby Bridge Station between 28m 42ch and 28m 62ch	2.0	2.5	2.5	2.5	2.5	3.5	15.5	50 to 60^
8	16	Transpennine speed (HAW)	80	Increase speed for HAW vehicles through Elland Tunnel between 31m 25ch - 31m 44ch	2.0	2.5	2.5	2.5	2.5	3.5	15.5	50 to 60^
8	16	Transpennine speed (HAW)	81	Increase speed for HAW vehicles over Bridges MVN2-206 at 40m 37ch (Down Line only) and MVN2-207-02 at 40m 54ch between Thornhill Jns and Healey Mills	2.0	4.0	4.0	4.0	2.5	3.5	20.0	20 to 60^
8	16	Transpennine speed (HAW)	82	Increase speed for HAW vehicles between Thornhill Jns and Dewsbury E Jn	2.0	4.0	4.0	4.0	2.5	3.5	20.0	20 to 60^
8	16	Transpennine speed (HAW)	83	Increase speed for HAW vehicles over Bridges MVN2-231 at 47m 01ch and MVN2-238 at 47m 45ch between Horbury Jn and Wakefield Kirkgate	2.0	3.5	3.5	3.5	2.5	3.5	18.5	40 to 60^
8	16	Transpennine speed (HAW)	84	Increase speed for HAW vehicles between 22m 20ch and 23m 00ch between Slaithwaite Station and Springwood Jn	2.0	2.5	2.5	2.5	2.5	3.5	15.5	50 to 60^
8	16	Transpennine speed (HAW)	85	Increase speed for HAW vehicles over Bridge MVL3-92 at 25m 70ch near Huddersfield	2.0	3.0	3.0	3.0	2.5	3.5	17.0	20 to 40^
8	16	Transpennine speed (HAW)	94	Increase speed for HAW vehicles over Bridge DSE-107 at 19m 60ch to 20m 00ch between Parkside Jn and Patricroft	2.0	3.5	3.5	4.0	2.5	3.5	19.0	30 to 60^
8	16	Transpennine speed (HAW)	95	Increase speed for HAW vehicles between Parkside Jn and Golbourne Jn	2.0	2.5	2.5	2.5	2.5	3.5	15.5	10 to 20^
8	17	North West speed (HAW)	76	Increase speed for HAW vehicles over Bridge CMP2-17 at 185m 65ch - 185m 68ch between Heaton Chapel and Levenshulme	1.0	4.0	3.5	4.0	2.5	3.5	18.5	30 to 60
8	17	North West speed (HAW)	77	Increase speed for HAW vehicles between Manchester Piccadilly East Jn - Castlefield Jn	1.0	4.0	2.5	4.0	2.5	3.5	17.5	20 to 35
8	18	North East and Humber speed (HAW)	78	Increase speed for HAW vehicles over Bridge NOC-23 at 9m 35ch near Ulleskelf	1.0	3.0	3.0	3.0	2.5	3.5	16.0	40 to 60
8	18	North East and Humber speed (HAW)	86	Increase speed for HAW vehicles over Bridge DOW-39 at 21m 06ch between Althorpe and Scunthorpe	1.0	3.0	3.0	3.0	2.5	3.5	16.0	30 to 55
8	18	North East and Humber speed (HAW)	87	Increase speed for HAW vehicles over Bridge PED5-73 at 21m 25ch (Goods Lines only) between St James's Jn and Hexthorpe Jn	1.0	4.5	4.5	4.5	2.5	3.5	20.5	10 to 60
8	18	North East and Humber speed (HAW)	88	Increase speed for HAW vehicles over Bridges PED5-49 at 18m 33ch and PED5-54 at 19m 28ch between Conisbrough and Hexthorpe Jn	1.0	3.0	3.0	3.0	2.5	3.5	16.0	40 to 60
8	18	North East and Humber speed (HAW)	89	Increase speed for HAW vehicles over Bridge PED4-51 at 15m 50ch between Swinton and Mexborough	1.0	4.5	4.5	4.5	2.5	3.5	20.5	10 to 60
8	18	North East and Humber speed (HAW)	90	Increase speed for HAW vehicles over Bridge LEN3-137 at 55m 29ch between Yarm and Eaglescliffe	1.0	4.0	4.0	4.0	2.5	3.5	19.0	20 to 60
8	19	East Lancs speed (HAW)	91	Increase speed for HAW vehicles over Bridge FHR4-15 Pleasington Viaduct at 7m 64ch to 7m 78ch	2.0	2.5	2.5	2.5	2.5	3.5	15.5	50 to 60^
8	19	East Lancs speed (HAW)	92	Increase speed for HAW vehicles over Bridges FHR4-27 at 10m 16ch to 10m 27ch and FHR4-29 at 10m 40ch to 10m 60ch near Blackburn	2.0	3.0	3.0	3.0	2.5	3.5	17.0	20 to 40^
8	19	East Lancs speed (HAW)	93	Increase speed for HAW vehicles over Bridge FHR6-10 (Lydgate Viaduct) at 28m 60ch to 29m 00ch	2.0	3.5	3.5	3.5	2.5	3.5	18.5	30 to 60^
8	20	Liverpool speed	96	Increase freight linespeed on the Bootle Branch	1.0	3.0	3.0	1.0	2.5	3.5	14.0	20 to 45
9	14	MML South speed (HAW)	97	Increase speed for HAW vehicles over Bridge SPC1-43 at 6m 21ch between Brent Curve Jn and Hendon	2.0	3.5	3.0	3.0	2.5	3.5	17.5	40 to 60
9	14	MML South speed (HAW)	98	Increase speed for HAW vehicles over Bridge SPC1- 80 at 14m 05ch between Elstree & Borehamwood and Radlett	2.0	4.0	3.5	3.5	2.5	3.5	19.0	30 to 60
9	14	MML South speed (HAW)	99	Increase speed for HAW vehicles over Bridge SPC1-118A at 24m 57ch near Harpenden	2.0	3.5	3.0	3.0	2.5	3.5	17.5	40 to 60
9	14	MML South speed (HAW)	100	Increase speed for HAW vehicles over Bridge SPC1-125 at 26m 66ch between Harpenden and Luton Airport Parkway	2.0	4.5	4.0	4.0	2.5	3.5	20.5	20 to 60

Table A6.6 (continued): Unweighted scores by sub-scheme for capability (excluding gauge) schemes													
Schemes in corridor no. order followed by scheme option no. order followed by sub-scheme no. order					Scores (out of 5)						Total (out of 30)	
Corr. no.	Sch. Opt. no.	Scheme	Sub sch. no.	Sub-scheme	Forecast growth	Capacity constraints	Operational efficiency	Passenger benefits	Deliver-ability/ complexity	Stakeholder support	Total unweighted score	Notes
9	14	MML South speed (HAW)	101	Increase speed for HAW vehicles over Bridge SPC2-41 at 50m 72ch between Bedford and Sharnbrook Jn	2.0	3.0	2.5	2.5	2.5	3.5	16.0	50 to 60
9	14	MML South speed (HAW)	102	Increase speed for HAW vehicles over Bridge SPC2-48A at 53m 29ch between Bedford and Sharnbrook Jn	2.0	3.5	3.0	3.0	2.5	3.5	17.5	30 to 50
9	14	MML South speed (HAW)	103	Increase speed for HAW vehicles over Bridge SPC2-54A at 54m 77ch between Bedford and Sharnbrook Jn	2.0	4.0	3.5	3.5	2.5	3.5	19.0	20 to 50
9	14	MML South speed (HAW)	104	Increase speed for HAW vehicles over Bridge SPC2-59 (Sharnbrook Viaduct) at 56m 16ch between Bedford and Sharnbrook Jn	2.0	5.0	4.5	4.5	2.5	3.5	22.0	10 to 60
9	14	MML South speed (HAW)	105	Increase speed for HAW vehicles over Bridge SPC2-65A at 57m 53ch between Sharnbrook Jn and Wellingborough	2.0	4.0	3.5	3.5	2.5	3.5	19.0	20 to 50
9	14	MML South speed (HAW)	106	Increase speed for HAW vehicles over Bridge SPC2-84 at 64m 50ch between Sharnbrook Jn and Wellingborough	2.0	3.5	3.0	3.0	2.5	3.5	17.5	40 to 60
9	14	MML South speed (HAW)	107	Increase speed for HAW vehicles over Bridge SPC3-46 at 75m 05ch between Kettering and Market Harborough	2.0	3.5	3.0	3.0	2.5	3.5	17.5	40 to 60
9	15	Corby speed (HAW)	108	Increase speed for HAW vehicles over Bridge GSM1-10 at 77m 27ch between Kettering and Corby	2.0	3.5	4.0	3.0	2.5	3.5	18.5	20 to 60
9	15	Corby speed (HAW)	109	Increase speed for HAW vehicles over Bridge GSM1-42 (Harringworth Viaduct) at 85m 18ch between Corby and Manton Jn	2.0	3.5	4.0	2.0	2.5	3.5	17.5	20 to 60
9	16	Sheffield speed (HAW)	110	Increase speed for HAW vehicles between Dore South Jn and Dore Station Jn	1.0	3.0	3.0	3.0	2.5	3.5	16.0	40 to 60
9	16	Sheffield speed (HAW)	111	Increase speed for HAW vehicles over Bridge TJC1-57 at 158m 22ch near Sheffield Station	1.0	3.5	3.5	4.0	2.5	3.5	18.0	10 to 40
9	16	Sheffield speed (HAW)	112	Increase speed for HAW vehicles through Sheffield Station	1.0	2.0	2.0	2.5	2.5	3.5	13.5	10 to 15
9	16	Sheffield speed (HAW)	113	Increase speed for HAW vehicles over Bridges TJC1-78E, 78 and 78W (Attercliffe Viaduct) at 159m 37ch between Sheffield and Meadowhall Interchange	1.0	4.0	4.5	4.0	2.5	3.5	19.5	10 to 60
9	17	MML South speed (from less than 60mph)	115	Increase freight linespeed on the Up Slow Line between Carlton Road Jn and 03m 35ch	4.0	3.5	3.5	1.5	2.5	2.5	17.5	40 to 75
9	17	MML South speed (from less than 60mph)	120	Increase freight linespeed on the Up Slow Line through Luton station	4.0	2.5	2.5	3.0	1.0	2.5	15.5	55 to 75
9	17	MML South speed (from less than 60mph)	123	Increase freight linespeed on the Slow Lines between 49m 40ch (south of Bedford) and Harrowden Jn	4.0	3.0	3.0	3.0	2.5	2.5	18.0	50 to 75
9	17	MML South speed (from less than 60mph)	124	Increase freight linespeed on the Up Slow Line between 53m 00ch and 53m 20ch between Bedford North Jn and Sharnbrook Jn	4.0	4.5	4.5	4.5	2.5	2.5	22.5	20 to 75
9	17	MML South speed (from less than 60mph)	126	Increase freight linespeed on the Slow Lines through Kettering Station	4.0	3.5	3.0	3.0	1.0	2.5	17.0	40 to 60
9	18	MML South speed (from 60mph or above)	116	Increase freight linespeed on the Up Slow Line between 7m 33ch and 7m 68ch between Hendon and Silkstream Jn	2.0	1.5	1.5	2.5	2.5	2.5	12.5	60 to 75*
9	18	MML South speed (from 60mph or above)	117	Increase freight linespeed on the Down Slow Line between 7m 50ch and 7m 75ch near Silkstream Jn	2.0	1.5	1.5	2.5	2.5	2.5	12.5	60 to 75*
9	18	MML South speed (from 60mph or above)	118	Increase freight linespeed on the Slow Lines between St Albans and 20m 14ch	2.0	1.5	1.5	2.5	2.5	2.5	12.5	65 to 75*
9	18	MML South speed (from 60mph or above)	119	Increase freight linespeed on the Slow Lines between Luton Airport Parkway and Luton	2.0	1.0	1.0	2.0	1.0	2.5	9.5	70 to 75*
9	18	MML South speed (from 60mph or above)	121	Increase freight linespeed on the Slow Lines through Harlington Station	2.0	1.0	1.0	2.0	1.0	2.5	9.5	70 to 75*
9	18	MML South speed (from 60mph or above)	122	Increase freight linespeed on the Slow Lines through Flitwick Station	2.0	1.0	1.0	2.0	1.0	2.5	9.5	70 to 75*
9	18	MML South speed (from 60mph or above)	125	Increase freight linespeed on the Up & Down Slow Line between 70m 18ch - Kettering North Jn	2.0	1.5	1.5	2.5	2.5	2.5	12.5	60 to 75*

Table A6.6 (continued): Unweighted scores by sub-scheme for capability (excluding gauge) schemes													
Schemes in corridor no. order followed by scheme option no. order followed by sub-scheme no. order					Scores (out of 5)						Total (out of 30)	
Corr. no.	Sch. Opt. no.	Scheme	Sub sch. no.	Sub-scheme	Forecast growth	Capacity constraints	Operational efficiency	Passenger benefits	Deliver-ability/ complexity	Stakeholder support	Total unweighted score	Notes
9	19	MML North speed (from less than 60mph)	114	Increase freight linespeed between Sheet Stores Jn and Stenson Jn	1.0	3.5	4.0	0.5	2.5	2.5	14.0	50 to 75
9	19	MML North speed (from less than 60mph)	127	Increase freight linespeed on the Up & Down Slow Line through the Leicester Station area	5.0	3.5	3.5	3.5	0.5	3.5	19.5	10 to 45
9	19	MML North speed (from less than 60mph)	128	Increase freight linespeed on the Up & Down Slow Line between Leicester North Jn and 99m 74ch	5.0	3.5	4.0	3.0	2.5	3.5	21.5	35 to 75
9	19	MML North speed (from less than 60mph)	130	Increase freight linespeed on the Slow Lines between Syston Station and 105m 03ch	4.0	3.0	2.5	2.5	2.5	3.5	18.0	50 to 75
9	19	MML North speed (from less than 60mph)	132	Increase freight linespeed on the Up Slow Line between 111m 00ch and 112m 32ch between Barrow-upon-Soar and East Midlands Parkway	4.0	3.0	2.5	2.5	2.5	3.5	18.0	50 to 75
9	19	MML North speed (from less than 60mph)	133	Increase freight linespeed on the Up & Down Slow Line between 109m 40ch - 112m 42ch between Barrow-upon-Soar and East Midlands Parkway	4.0	3.5	3.5	3.5	2.5	3.5	20.5	40 to 75
9	19	MML North speed (from less than 60mph)	134	Increase freight linespeed on the Slow Lines between East Midlands Parkway and Ratcliffe Jn	4.0	3.0	2.5	2.5	2.5	3.5	18.0	50 to 75
9	20	MML North speed (from 60mph or above)	129	Increase freight linespeed on the Up & Down Slow Line between 99m 74ch and Syston Station	5.0	1.5	1.0	2.5	2.5	3.5	16.0	65 to 75*
9	20	MML North speed (from 60mph or above)	131	Increase freight linespeed on the Slow Lines between 105m 03ch and 109m 42ch (Down Slow)/111m 00ch (Up Slow) between Sileby and Loughborough	3.0	1.5	1.0	2.5	2.5	3.5	14.0	65 to 75*
10	10	Acton speed	135	Increase freight linespeed through Acton Jns	4.0	3.0	2.5	3.0	2.5	2.5	17.5	30 to 40
11	8	East Coast North speed (HAW)	136	Increase speed for HAW vehicles over Bridge ECM5-185 at at 64m 35ch between Tursdale Jn and Durham	1.0	4.5	4.0	4.5	2.5	3.5	20.0	20 to 60
11	8	East Coast North speed (HAW)	137	Increase speed for HAW vehicles over Bridge ECM7-10 at 0m 33ch between Newcastle and Manors	1.0	3.5	3.0	3.5	2.5	3.5	17.0	20 to 40
11	8	East Coast North speed (HAW)	138	Increase speed for HAW vehicles over Bridge ECM7-21 at 1m 03ch between Manors and Heaton	1.0	3.5	3.0	3.5	2.5	3.5	17.0	40 to 60
11	8	East Coast North speed (HAW)	139	Increase speed for HAW vehicles on the Down Slow Line through Morpeth Station	1.0	4.0	3.5	4.0	2.5	3.5	18.5	15 to 50
11	8	East Coast North speed (HAW)	140	Increase speed for HAW vehicles over Bridge ECM7-74 at 17m 48ch between Morpeth and Pegswood	1.0	4.0	3.5	4.0	2.5	3.5	18.5	30 to 60
11	8	East Coast North speed (HAW)	141	Increase speed for HAW vehicles over Bridge ECM7-89 at 29m 27ch between Acklington and Alnmouth	1.0	4.0	3.5	4.0	2.5	3.5	18.5	30 to 60
11	8	East Coast North speed (HAW)	142	Increase speed for HAW vehicles over Bridge ECM7-110 at 35m 45ch between Alnmouth and Chathill	1.0	4.0	3.5	4.0	2.5	3.5	18.5	30 to 60
11	8	East Coast North speed (HAW)	143	Increase speed for HAW vehicles over Bridge ECM7-195 at 66m 65ch between Chathill and Berwick	1.0	4.0	3.5	4.0	2.5	3.5	18.5	30 to 60

Glossary

Glossary	
Term	Meaning
Class 4	Freight services permitted to travel up to 75mph/121 km/h
Class 6	Freight services permitted to travel up to 60mph/97 km/h
Committed Enhancements	Enhancements which form part of the CP5 Enhancement Delivery Plan
Control Period	Network Rail's 5-year funding cycles
CP4	Control Period 4. This is the funding period from 2009 - 2014
CP5	Control Period 5. This is the funding period from 2014 - 2019
CP6	Control Period 6. This is the funding period from 2019 - 2024
Digital Railway	A rail industry-wide programme designed to benefit Britain's economy by accelerating the use of modern technology in several key rail areas
Dynamic Loop	A loop which is sufficiently long to allow a train to come off the running line, and continue to travel while it is overtaken by other services
East West Rail	A major project to establish a strategic railway connecting East Anglia with Central, Southern and Western England.
ECML	East Coast Main Line. Links London with Peterborough, Leeds, Newcastle and Edinburgh
EGIP	Edinburgh - Glasgow Improvement Programme. A major ongoing project to improve rail routes in the Central Belt of Scotland
ERTMS	European Rail Traffic Management System. A system for managing train movements using the European Train Control System (ETCS) to signal trains and the Global System for Mobile Communications-Railway (GSM-R) to communicate with trains
F2N	Felixstowe to the West Midlands and the North. A key route for intermodal freight running across Anglia and the Midlands
FOC	Freight Operating Company
FMS	Long Term Planning Process: Freight Market Study. This document sets out projections for future freight volumes by commodity for the entire network, up to 2043
FTA	Freight Transport Association. Represents the transport interests of companies moving goods by road, rail, sea and air
ftpph	Freight train paths per hour
ftppd	Freight train paths per day
Funders	Bodies, which pay for Network Rail projects. For the most part DfT and Transport Scotland
GEML	Great Eastern Main Line. Linking London with Chelmsford, Ipswich and Norwich
GWML	Great Western Main Line. Linking London with Reading, Swindon, Bristol and Cardiff
Haven Ports	Refers to the ports of Felixstowe, Ipswich, Harwich, Harwich Navyard and Mistley
HAW	Heavy Axle Weight. Axle weights in excess of the published Route Availability for a route
Headway	The minimum safe interval between trains on a particular section of track
HLOS	High Level Output Specification. Submitted by DfT and Transport Scotland to determine what governments require to be delivered for a control period
HS2	High Speed Two. The planned new high speed passenger railway from London to Birmingham (Phase 1) and Leeds and Manchester (Phase 2)

Glossary	
Term	Meaning
Intervention	Planned works to deliver the desired infrastructure for operational improvement to the railway
Jn	Junction
km/h, kms	Kilometers per hour, kilometers (distance)
Loop	A piece of track connected to a running line at both ends where a train may wait while allowing other rail traffic to pass
LTPP	Long Term Planning Process. Has been designed to consider the role of the railway in supporting the UK economy over the next 30 years. Sets out options for funders
MML	Midland Main Line. Links London with Leicester, Derby, and Sheffield
Modal Shift	When freight or passengers shift to a mode which has a comparative advantage, changing the modal share
OLE	Overhead Line Equipment. The wires and associated support structures used to provide AC electric power to trains. This is in contrast with ground-level third and fourth rail used on much of the railway in the South East of England.
Open Access Operator	Operators which can bid to run services on any part of the network, this includes all freight operators
ORR	Office of Rail and Road. The safety and economic regulator for the rail industry in Great Britain
Path	The schedule assigned to a specific train service along its route of travel
Regulation	The pathing of trains required to achieve a given timetable, such as a train waiting in a loop for a faster one to pass.
Remodelling	The reconfiguration of railway infrastructure to deliver enhanced outputs such as higher permitted speeds
Route Availability	A rating (between 1 and 10) applied to vehicles and infrastructure to describe axle weights and axle weight capability
Route Study	Alongside the Freight Network Study, Network Rail's devolved routes produce similar documents covering a certain geographic area
RUS	Route Utilisation Strategy. Provided recommendations for the development of train services before the creation of LTPP
SFN	Strategic Freight Network
STPR	Strategic Transport Projects Review. Transport strategy documents published by Transport Scotland in 2008
TEN-T	Trans-European Transport Network. A set of European-level corridors identified as internationally important routes for passengers and freight
tph	Trains per hour
TfN	Transport for the North
W10	Freight gauge which can accommodate container height of 9ft 6in on a standard platform
W12	Freight gauge designed to fit 9'6 container on a standard container wagon, including refrigerated containers up to 2,600mm wide. Recommended height for renewed structures.
WCML	West Coast Main Line. Links London with Birmingham, Manchester, Liverpool and Glasgow
WebTAG	Web-based Transport Analysis Guidance. The Department for Transport's appraisal guidance and toolkit.

Network Rail
1 Eversholt Street
London NW1 2DN
Tel: 0207 557 8000

www.networkrail.co.uk