Partnership Board Meeting
Friday 21st June 2019
Item B6. ECMA Update

East Coast Main Line Authorities (ECMA) Update

1. Introduction

1.1 This report provides an update to the Board on recent discussions relative to the East Coast Main Line, following an ECMA Officers' Group meeting which took place on 29 May 2019.

2. SYSTRA Presentation / Q&A on 2019 Research Study on East Coast Mainline Benefits of Investment

2.1 As advised previously, a study entitled, "Investing for Economic Growth" was undertaken by JMP on behalf of ECMA, in 2016. SYSTRA has recently been appointed to refresh / update the 2016 study.

2.2 SYSTRA gave a presentation on the findings of their study, entitled "East Coast Main Line Authorities, Benefits of Investments.", attached at **Appendix 1.**

2.3 In building the case for investment the following was highlighted:

- The **East Coast Mainline** and its economy
- The story of **recent** developments
- Developing the railway to support the **economy**
- **Planned** and **future** services
- The impact on the economy
- Further **opportunities**

2.4 The study is based on total GVA per annum and is focussed on 14 economic centres located between the Scottish Highlands and Hertfordshire, including London.

2.5 The introduction notes that ECML connects significant and diverse regional economies and that freight is obviously important but ECML paths are becoming increasingly constrained.
Other industries such as financial services, tourism and "tech" all demand connections.
The report goes on to cover existing services, constraints and improvements and states that the modelling is based on an approach taken by Network Rail in carrying out market studies, in 2013.

2.6 4 economic "tests" are described as follows:

2.7 **Test A**: Committed Timetable Changes 2019-21

3% uplift in annual GVA for Scotland
Benefit / cost ratio (BCR) 2.73

2.8 **Test B1**: HS2 Base Case
2% uplift in annual GVA for Scotland
BCR >1!

2.9 **Test B2**: HS2 + York to Newcastle Investment
2% uplift in annual GVA for Scotland
BCR 1.26

2.10 **Test B3**: HS2 + York – Edinburgh Investment
6% uplift in annual GVA for Scotland
BCR >1

2.11 The report concludes that:

- the line is of considerable strategic importance, connecting communities that generate close to half of the UK economy and half of the Scottish economy,
- there is a strong case for strengthening HS2 with complementary investment north of York, and North of Newcastle to Edinburgh,
- there is a critical opportunity to be grasped between now and the advent of HS2 to improve the ECML in terms of reliability and flexibility,
- the Investments for 2021 timetable are VFM,
- there is a good case for incremental investment in smaller schemes – better resilience.

3. LNER Update

3.1 Two Azuma sets are now in service. The first scheduled service from Edinburgh to London will leave Waverley at 0540, stopping only at Newcastle. The HST fleet is to be retired, beginning in September and the full Azuma timetable will be operational in 2020 and will include journey time savings.

4. Network Rail Update

4.1 Network Rail has recently been through a major structural reorganisation of their geographical routes, with a specific East Coast Route established.

4.2 The first phase of the plans is the formation of the new regions which will take place in June this year following a consultation.

5. Transport Scotland Update

5.1 Feasibility studies of potential high speed rail links in Scotland have now been completed.

5.2 The remit of Transport Scotland is now to commission a Strategic Business Case on behalf of both the UK and Scottish Governments. Transport Scotland activity is fully integrated with DfT and Network Rail work.

5.3 The importance of rail infrastructure between England and Scotland was emphasised as was the need to press the case for improvements on both the ECML and WCML to be delivered in the next decade.

6. ECMA Engagement with Scottish Government

6.1 A meeting between Councillor Ian Gillies (departing ECMA Chair) and Michael Matheson, the Cabinet Secretary, was arranged for 23 May 2019. SEStran's Chair and Partnership Director were also scheduled to attend. This was with a view to promoting investment in ECML within Scotland. However, the meeting was postponed to accommodate a similar meeting but with the new ECMA Chair when elected, hopefully to take place in July.

6.2 The Partnership Director attended the April meeting of the Cross-Party Rail Group at Holyrood. The main speaker was Jonathan Pugh from Network Rail who outlined plans for their work during CP 6. A follow-up meeting between Network Rail and SEStran took place on 3 May 2019, to discuss in more detail, plans related to ECML.

7. Recommendations

7.1 That the Board notes the content of the report.

Jim Grieve
Partnership Director
12 June 2019

Appendix 1: East Coast Main Line Authorities, Benefits of Investments

Policy Implications	None
Financial Implications	None
Equalities Implications	None
Climate Change Implications	None

ECML Authorities **12/05/2019**

Reference number 108454/GB01T19A14

ECML: BENEFITS OF INVESTMENT

ECMA

Newcastle City Council

SYSTRA

ECML AUTHORITIES

ECML: BENEFITS OF INVESTMENT

IDENTIFICATION TABLE	
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1. INTRODUCTION

1.1.1 The Consortium of East Coast Mainline Authorities (ECMA) is a collaborative group of Councils, Combined Authorities and Regional Transport Partnerships united by an interest in maintaining improving and developing rail services using the East Coast Mainline and associated routes. The area served stretches from London to Aberdeen and Inverness, covering over 500 route-miles.

1.1.2 SYSTRA has been commissioned to undertake an update to the research presented in the "Investing for Economic Growth" 2016 study, an analysis of the wider economic impacts of service improvements on the ECML undertaken by JMP Consultants (now SYSTRA).

1.1.3 This updated study has made a number of findings about the value of investment in the ECML and its relationship to the wider economy. The main findings are:

- The forthcoming changes to the timetable in 2021 will deliver £1.35bn to the economy over the period to the scheduled start of HS2 services in 2034
- HS2 will deliver over £8.5bn over 60 years to the economy of the ECML in addition to the benefits of the 2021 timetable described above.
- Additional investments in the ECML to complement HS2 would deliver up to an additional 3bn over 60 years; in addition, there are likely to be additional complementary benefits which have not been assessed in detail
- Improving the reliability of service might be worth up to £62m per annum to the economy.

1.1.4 Arising from this are four key messages:

- The investments being delivered now to serve the 2021 timetable change will support significant growth in the economy
- There is a strong case for complementary investment in the route north of York to support both HS2 and NPR services in addition to the benefits to the existing services.
- There is an urgent need to realise the opportunities of released capacity from HS2 to redefine the role of the ECML south of York.
- Significant value can be realised by improving reliability, with the additional benefit that investment in schemes to improve service performance will also will help provide more flexibility in the planning of services in the long term.

1.1.5 The structure of this report is set out as follows:

- The East Coast corridor and its importance to the UK economy
- The shape of the existing rail service, including committed changes
- Future service developments
- The Wider Economic Impacts of investment in the route

2. THE EAST COAST NETWORK

2.1.1 The ECML links London, the East Midlands, Yorkshire, the North East and Eastern Scotland. The route is often thought of as a single trunk route linking London with Leeds and Edinburgh, but it should better be considered as a linear **network**, with a wide range of services converging with and diverging from it and a number of branches providing onward links to range of destinations.

2.1.2 Whilst services on the core part of the route are dominated by LNER, many other train operators use the route including GTR, Cross Country, Trans Pennine Express and Northern. Direct links from the East Coast network penetrate the South East, South West, North West and East of England, as well as providing links throughout Scotland. Set out below are key services utilising the ECML network and the operators providing them:

- **LNER:** London to Leeds and West Yorkshire, Hull, York, Newcastle and the North East, Edinburgh, Glasgow, Dundee, Aberdeen and Inverness
- **Cross Country**: Edinburgh – Newcastle – York - Sheffield – Birmingham – Plymouth/Reading and Stansted – Cambridge – Peterborough – Birmingham
- **GTR**: Peterborough/Cambridge – London – Brighton/Horsham and local services between Cambridge, Stevenage and London including via Hertford.
- **Trans Pennine Express:** Newcastle/Middlesbrough/Scarborough/Hull – York – Leeds – Manchester – Manchester Airport/Liverpool
- **Northern:** Local services in Yorkshire and the North East
- **Hull Trains:** Open access services between London and Hull
- **Grand Central**: Open access services between London and Bradford, Teesside and Sunderland
- **East Midlands Trains**: Norwich – Peterborough – Nottingham – Sheffield – Manchester – Liverpool and local services in the East Midlands
- **ScotRail**: Local and long distance services within Scotland

2.2 The role of the East Coast corridor in the UK economy

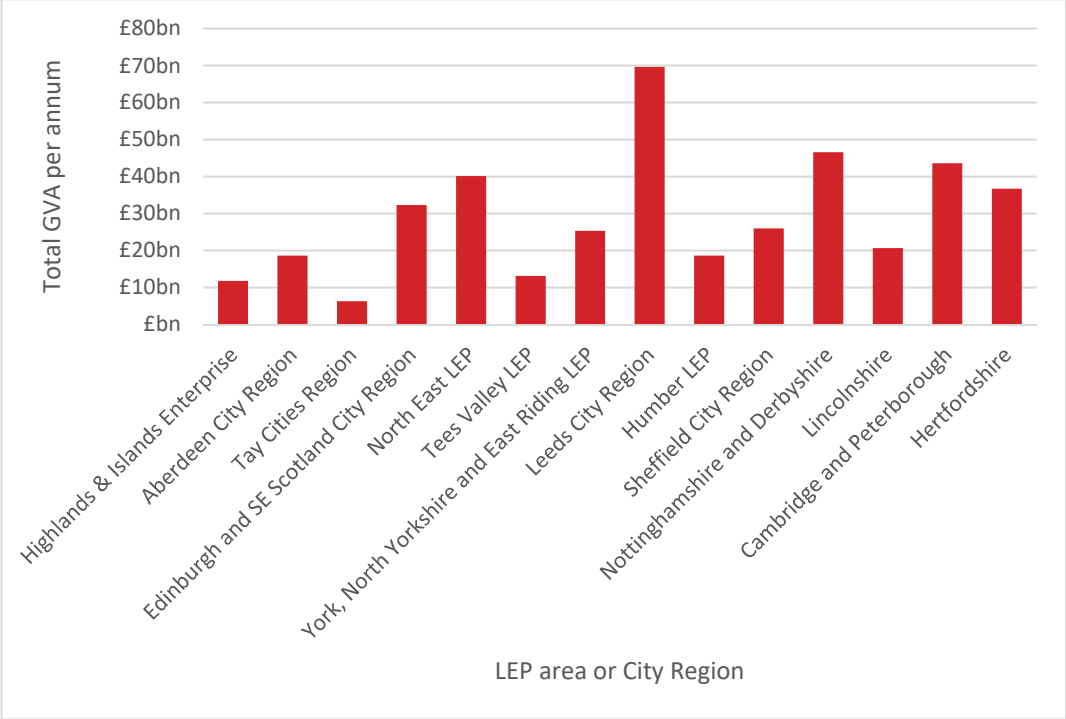
2.2.1 The local and regional economies that are served by the ECML play a significant role in the economic outputs of the UK as a whole. With the corridor stretching almost the entire length of the country, the diversity of economic geographies, regional transport service levels and socio-economic demographics is significant.

2.2.2 Including the London Economic Action Partnership, the Local Enterprise Partnership (LEP) for London, the LEPs and City Regions along the ECML were responsible for £840bn of GVA output in 2017. This represents just under half of the UK total of £1.8tn.

2.2.3 Even if London is discounted from the data, the ECML corridor generates over £400bn of GVA per year around a quarter of UK GVA. Apart from London, Leeds City Region is the largest economy along the corridor, generating £70bn annually. Figure 2-1 below presents GVA output by LEP and City Region in 2017.

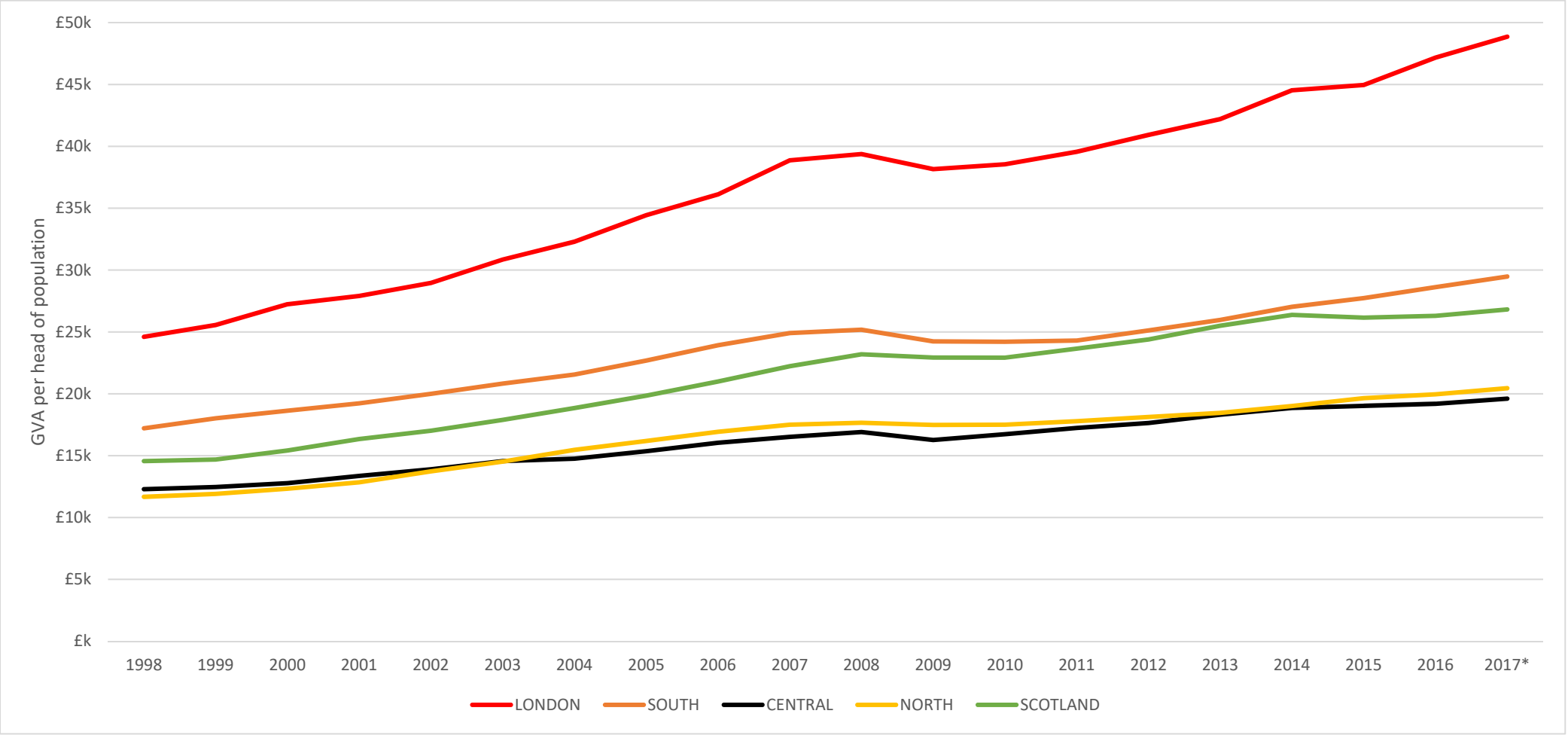
2.2.4 In Scotland the economies directly served by the ECML represent 53% of the total value of the Scottish economy.

Figure 1. Total GVA (£m per annum) (2017) by LEP and City Region (excluding London)



2.2.5 In terms of productivity, many of the local economies display high levels of economic activity, with London highest at £48,857 GVA per head of population in 2017. This has nearly doubled in the past 20 years and is an indication of the world-leading finance and business sectors in the capital. Figure 2-2 overleaf presents the growth of productivity along the corridor since 1998 by ECMA area

Figure 2. GVA per head of population at current basic prices by ECMA Area (data published December 2018)



2.2.6 Other strong performers in the corridor include North Eastern Scotland at £37,924. However, this area suffered a fall post-2014, which can be attributed to the decline in global oil prices which hit the oil and gas sector this area of the UK is so reliant on, and the region's performance has since levelled out.

2.2.7 Hertfordshire (£31,073), Cambridgeshire (£29,049), Peterborough (£28,315) and Eastern Scotland (£28,258) are also significant regions in the corridor in terms of productivity. These regions, as well as West Yorkshire, benefits from well performing financial and business service industries. Southern England in particular also has a rapidly growing technology and science sector; the Cambridgeshire and Peterborough Independent Economic Review (2018) states that the pace of economic growth in this area of the country has outstripped that of the East of England and the UK over the last ten years, attributable to high value innovation industries and a young population at working age.

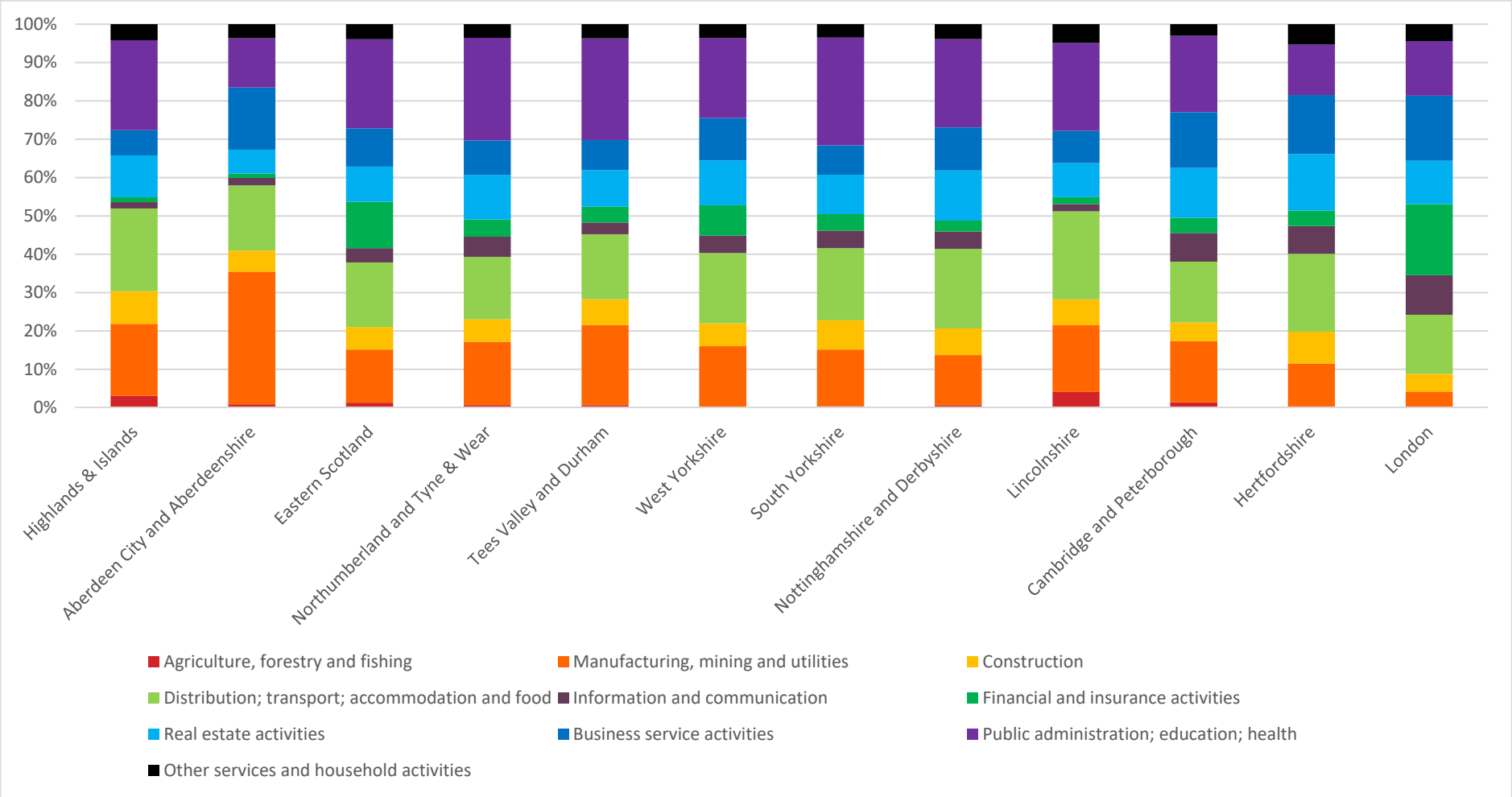
2.2.8 In terms of the respective contributions to GVA of industry sectors, Figure 2-3 outlines the break down in each region.

2.2.9 The manufacturing, mining and utilities sector varies greatly between each region, contributing as little as 4% in London and as much as 35% in Aberdeenshire. Indeed, the data indicates that the profile of London's economy differs significantly from many of the other regions. This is to be expected given its strong financial and business services, at nearly a fifth of its output, and its very low levels of manufacturing.

2.2.10 Public administration, education and health contributes at least 13% in each region, and as much as 28% in South Yorkshire, the largest sectoral proportion in any region.

2.2.11 Other industry sectors that represent large proportions of a region's economic output include public administration, education and health in Northumberland and Tyne Wear, and Tees Valley and Durham (both 27%), and distribution in Lincolnshire (23%) and the Highlands (22%).

Figure 3. GVA by sector (2012 data)



2.3 Economic linkages

2.3.1 As described above, the local and regional economies along the East Coast corridor continue to perform well and, in some cases, are outperforming the UK as a whole. The performance and continued success of these economies rely on strong connectivity between goods and markets, fast and reliable business-to-business links and access to a diverse workforce. The route has strengths in a number of specific sectors and the ECML plays an important role in linking the regional centres of these sectors.

Finance, technology and digital

2.3.2 Spread across the length of the corridor from London to Edinburgh are a diverse range of financial, professional, technological and digital industries that benefit from rapid business-to-business links and require access to a highly skilled workforce to maintain their growth.

2.3.3 Leeds City Region boasts the largest financial services sector in the country outside of the capital and the ECML provides vital connections between London, Leeds and Edinburgh, where there is also a strong financial services presence. Furthermore, it is widely accepted that London is more than just a financial hub, with it globally recognised as the seat of the UK government, a major tourist attraction and a city with international business and leisure connections via its airports. Because of these factors, connectivity with London is seen as a major benefit for the rest of the East Coast corridor and the ECML is critical to access from Leeds to central London.

2.3.4 The South East Midlands boasts rapidly expanding science, digital and technology sectors in the Oxford-Cambridge-Milton Keynes (CaMKOx) corridor, centred around the Universities of Oxford and Cambridge and the high-value start-up firms that are continuing to emerge. The potential of the area is evidenced by the following:

- Nine of the UK's top 100 (and two of the top 10) high growth tech firms are located in the corridor.
- Milton Keynes boasts 25% higher productivity per worker than the national average.
- Northampton has 100 new business start-ups per 10,000 residents (second only to London).

2.3.5 The National Infrastructure Commission (NIC) highlights expansion in and around the Sandy area in central Bedfordshire to exploit the north-south connectivity provided by the ECML. Potential relocation of the existing mainline station at Sandy is also mooted[1].

2.3.6 The Government, responding to the report by the NIC that called for investment in housing, road and rail, has committed to several infrastructure investments to facilitate this growth.

2.3.7

[1] Partnering for Prosperity: A new deal for the Cambridge-Milton Keynes-Oxford Arc, National Infrastructure Commission, 2017. www.nic.org.uk/publications/partnering-prosperity-new-deal-cambridge-milton-keynes-oxford-arc/.

Energy

2.3.8 North East Scotland is heavily reliant on the high value oil and gas industry, which was illustrated by the global downturn in oil prices in 2014. As well as these global factors, the performance of the industry is predicated on access to the related renewable, oil and gas industries in areas further south along the corridor such as the Tees Valley and the Humber. The 'Energy Estuary' on the south bank of the Humber includes the UK's largest Enterprise Zone, offering space for and significant investment in the rapidly expanding offshore wind and marine energy sectors. Quality connections between these growth areas are key to their continued success, there are however examples where connections could be improved further.

2.3.9 As a result of uncertainty around oil prices in recent years, the Scottish oil and gas industry has made moves to diversify into other energy sectors. Scottish Enterprise, a non-departmental public body of the Scottish Government which encourages economic development, enterprise, innovation and business investment, produced a 2017 Oil and Gas Diversification Opportunities guide that highlights the potential of offshore wind in the UK. The sector attracted £10bn of investment between 2010 and 2015, and a further £18bn of investment is planned up to 2020.

2.3.10 To highlight partnership working along the ECML corridor and the importance of connectivity between regions, in 2018 private sector economic development body Opportunity North East begun working with Scottish Enterprise to jointly support Scottish oil and gas supply chain SMEs in accessing the new offshore decommissioning sector, providing additional opportunities for existing oil and gas skills. Opportunities in offshore wind, nuclear decommissioning, water and waste, and wider utilities will also be explored.

2.3.11 The ECML has played an important role in linking the North East of Scotland with North East of England as well as the rest of the UK to support these activities, and has historically been used by offshore staff to reach their homes across the UK.

Tourism

2.3.12 Tourism, as noted above, is a major element of London's economic output, but the visitor economy is also important to regions throughout the ECML corridor. Since 2010, tourism has been the fastest growing sector in the UK in employment terms, and Britain is forecast to have a tourism industry worth over £257bn by 2025. Data from 2013 suggests that nearly 10% of all jobs in the UK are in the tourism sector and that it represents 9% of UK GDP.

2.3.13 The ECML network enjoys a very strong built and natural environment, covering historic cities, coasts and countryside.

2.3.14 Scotland in particular has experienced a boom in visitor numbers and tourism spend; 2017 saw a growth in visits of 17%, to a record 3.2 million, with visits to Edinburgh, Aberdeen and Inverness totalling nearly 6.9 million between 2015 and 2017[2]. UK and international visitors attracted by the spectacular landscapes and remoteness of the Scottish Highlands and Islands

[2] Regional Spread of Inbound Tourism, VisitBritain, 2019. www.visitbritain.org.

have the option of flexible touring and rover tickets offered by the ScotRail regional services franchise, providing the freedom to explore.

2.3.15 National Parks such as Northumberland, the North York Moors and the Yorkshire Dales also have high levels of tourist activity and are in close vicinity to the ECML corridor, with connecting regional services that the ECML provides vital access to, linking urban centres with rural tourism hotspots that are in otherwise remote locations.

2.3.16 The ECML can also boast connections between the cathedral cities of York, Lincoln and Durham, and the shopping and nightlife offers of Sheffield, Leeds and Newcastle, all making a significant contribution to the local and regional economies.

Manufacturing

2.3.17 Manufacturing, covering a broad range of disciplines, is another vital sector of the UK economy that is spread across the ECML corridor. It represents 10% of the UK's economic output and 45% of the UK's total exports, and currently operates ahead of the UK economy as a whole in terms of productivity[3].

2.3.18 With its strong automotive offer, the manufacturing sector represents a quarter of the North East's economic turnover, well ahead of the national average It also represents a significant proportion of the economies in Yorkshire and the Humber, where aerospace and nuclear sectors are receiving investment. Providing links to freight routes to move goods across the country, and to labour markets to access a highly skilled workforce, is vital to support this sector. A recent addition to the manufacturing strengths of the North East has been the opening of the Hitachi Plant at Newton Aycliffe which has been responsible for assembling new Class 800 series trains for LNER, Trans Pennine Express, Hull Trains, as well as constructing new trains for Great Western Railway and ScotRail. The rail engineering sector has also been supported by the opening of a production facility in Seaham by Vivarail.

2.3.19 Whilst historicallyfreight traffic represented the main contribution of rail to the manufacturing industry, the passenger railway now plays an increasingly important role in allowing businesses to interact with suppliers, partners and clients across the UK.

Summary

2.3.20 The ECML connects significant and diverse local and regional economies across the length of the UK. Each region is distinctive and has its own ambitions for growth. However, connectivity with London is a common priority throughout the area that the corridor serves, even in the North East of Scotland. There may however be the opportunity to develop non-London connectivity further in the long term, particularly in the context of capacity released by HS2, to support a more balanced economy.

2.3.21 The importance of freight connections between industrial hubs and ports to move goods and produce is apparent for the manufacturing and energy sectors but, as is addressed in the next section, the capacity for new and existing freight paths on the ECML is increasingly

[3] Make UK: The Manufacturers' Organisation, 2018. www.makeuk.org.

constrained. The growth of the renewable energy sector and the recent significant decline in traditional freight-heavy industries such as steel, coal and textiles illustrate the changing needs for freight paths on the ECML.

2.3.22 Other sectors, such as financial services, tourism and technology, rely on reliable business-to-business links and access to skilled labour markets. The growth in digital and technology, particularly in the South East Midlands and London, has been significant, increasing the importance of connectivity to these locations. These industries also demand international connections, and the ECML is able to facilitate onward links to London's airports and Eurostar services.

3. SHAPE OF THE EXISTING SERVICE

3.1 Introduction

3.1.1 The ECML connects London, the East Midlands, Yorkshire and the Humber, the North East of England, and the East and North of Scotland. The profile of services that run on it is diverse, with a mixture of long distance high speed passenger services, commuter services in London and the South East, regional intercity services and some freight operations.

3.1.2 This section outlines the existing service on the ECML, and the proposed and committed improvements that will improve connectivity and develop the network further.

3.2 Existing service

Long distance high speed services

3.2.1 There are four main operators of long distance high speed services on the ECML. A summary of their operations are outlined below.

London North Eastern Railway (LNER)

3.2.2 LNER is the publicly-owned company that operates the InterCity East Coast franchise, taking over the franchise from the privately-owned Virgin Trains East Coast in 2018 after the latter was unable to meet its financial obligations. It is the current intention of the Department for Transport that a public-private partnership be established in 2020 to run the services.

3.2.3 Currently, the standard weekday off-peak service pattern that operates on the route is:

- Two trains per hour London King's Cross – Leeds
- One train per hour London King's Cross – Edinburgh
- One train per hour London King's Cross – Newcastle, with most services extending to Edinburgh
- One train per hour London King's Cross – Newark, with alternate services extending to York

3.2.4 The above services serve a number of key destinations, including Peterborough, Doncaster, York, Durham and Newcastle.

3.2.5 In addition to the above hourly services, LNER also operates a number of non-core routes from King's Cross:

- a daily service to each of Bradford Forster Square, Glasgow Central, Harrogate, Hull, Inverness, Stirling, Lincoln, Perth and Skipton
- three trains per day to Dundee and Aberdeen

Cross Country

3.2.6 Cross Country operates two trains per hour on the section of the ECML from Doncaster / Leeds to York and Newcastle, with their services originating in Plymouth and Reading:

- Plymouth-Edinburgh – one train per hour, via Leeds and York
- Reading-Newcastle – one train per hour, via Doncaster and York

3.2.7 North of York all services call at Darlington, Durham and Newcastle, with less frequent calls at Morpeth, Alnmouth and Berwick-Upon-Tweed. North of Edinburgh, four trains per day operate to Dundee and Aberdeen, serving intermediate stations, while a broadly two-hourly service operates to Glasgow Central.

3.2.8 The current Cross Country franchise is due to expire in December 2019, having been extended from 2016. However, the Department for Transport announced in September 2018 that it will not be awarding the new franchise until the Williams review into the rail industry has been concluded. Services will continue to be operated by the existing franchisee, and options beyond this will be considered in due course.

TransPennine Express

3.2.9 FirstGroup operates the Transpennine Express franchise, running services on the ECML between Leeds and Newcastle. These are hourly services as follows:

- Manchester Airport - Newcastle – via Leeds, York, Darlington and Durham
- Liverpool Lime Street - Newcastle – via Leeds, York, Northallerton, Darlington and Durham
- Manchester Airport - Middlesbrough – via Leeds, York, Thirsk and Northallerton
- Liverpool Lime Street - Scarborough – via Leeds and York
- Hull – Manchester Piccadilly via Leeds

From December 2019 the hourly Liverpool – Newcastle service will be extended to Edinburgh, providing a two trains per hour between Leeds and Edinburgh.

Open access operators

3.2.10 The ECML is unique in the UK in that it is currently the only area to support Open Access operators. These operators provide services between locations which historically have either not been served directly or alternatively have only had a very infrequent direct service.

Hull Trains

3.2.11 The first Open Access operator in the UK, Hull Trains, has operated up to seven trains per day between Hull and London King's Cross since 2000, currently providing a roughly two-hourly service throughout the day with calls at Brough, Howden, Selby, Doncaster, Retford and Grantham.

3.2.12 The operator provides an important link between Hull and London. Prior to Hull Trains there was only one through train per day each way between these destinations.

Grand Central

3.2.13 In addition to Hull Trains, Grand Central also operates services from the capital, providing links to Sunderland and Bradford Interchange throughout the day. These are as follows:

- London King's Cross-Sunderland – five trains per day, via York, Thirsk and Northallerton
- London King's Cross-Bradford Interchange – four trains per day, via Doncaster

London and the South East

3.2.14 Since 2014, Govia Thameslink Railway has operated the Thameslink and Great Northern routes out of London King's Cross and Moorgate, providing suburban and commuter services for the London catchment area.

Thameslink

3.2.15 Thameslink services to Cambridge and Peterborough operate from London King's Cross. The weekday off-peak services are as follows:

- London King's Cross-Cambridge – one train per hour
- London King's Cross-Cambridge North – one train per hour

3.2.16 The Thameslink network also includes services that also use the ECML north of London King's Cross, via St Pancras International:

- Brighton-Cambridge – one train per hour
- Horsham-Peterborough – one train per hour

Great Northern

3.2.17 Weekday Great Northern stopping services operate from London King's Cross and Moorgate stations to a number of destinations on the ECML. These services occupy significant capacity on the approaches to London King's Cross, restricting the long distance East Coast service provision. The standard off-peak service from London King's Cross is:

- London King's Cross-Ely – one train per hour via Cambridge
- London King's Cross-Kings Lynn – one train per hour via Cambridge

3.2.18 The standard off-peak service from Moorgate is:

- Moorgate-Welwyn Garden City – four trains per hour
- Moorgate-Stevenage – one train per hour
- Moorgate-Watton-at-Stone – one train per hour
- Moorgate-Hertford North – two trains per hour

Regional services

3.2.19 A number of east - west regional services operate across the ECML, providing connections to a number of local destinations off the corridor for travellers choosing to interchange at ECML stations.

3.2.20 The main regional service operators using the ECML are Northern Rail and ScotRail.

Northern Rail

3.2.21 Northern Rail operates the majority of services in northern England, although only two of these currently use the ECML. Northern operates an hourly Newcastle-Morpeth service, which is extended to Chathill during the peak periods. Three morning peak period services between Middlesbrough / Saltburn and Carlisle also call at Darlington and Durham on the ECML.

3.2.22 Northern also operates a number of feeder services across Yorkshire and the North East, providing access to ECML services. The key interchanges for these services are at Doncaster, Leeds, York and Newcastle.

ScotRail

3.2.23 The ScotRail franchise incorporates all Scottish regional and commuter rail services. Currently, the operator runs five trains per day from Edinburgh to Dunbar, as well as an hourly service to North Berwick.

3.2.24 ScotRail also provides connections to regional and local destinations in Scotland from Edinburgh, including Aberdeen and Inverness along the ECML.

3.2.25 New stations at East Linton and Reston are also proposed to be delivered in Control Period 6 prior to 2024. It is proposed that these would be served by a new stopping service between Edinburgh and Berwick-upon-Tweed; this is yet to be confirmed.

Freight

3.2.26 The ECML is used by a diverse range of freight services. Much of this traffic operates in Yorkshire & Humber and the North East, as well as container traffic from Felixstowe in the south. The three main operators are DB Schenker, Freightliner and GB Railfreight.

3.2.27 Between London and Doncaster, the upgrade of the Great Northern Great Eastern Joint Line via Sleaford and Lincoln, has provided a diversionary route for freight traffic providing additional capacity for passenger services on the mainline and providing a dedicated route for freight traffic, supporting the growing deep sea container market. This will be further supported by the grade separation of Werrington Junction north of Peterborough, which will remove the need for northbound freight trains to cross the ECML at grade to access the Joint Line.

3.2.28 There is a strong flow of biomass freight traffic between the ports and power stations in Yorkshire and the Humber, particularly from the Port of Immingham to power stations in the

Aire Valley. Although not directly running on the ECML, oil trains from Immingham to the Midlands and Wales cross the ECML at Newark Flat Crossing, acting as constraint to passenger services on both the ECML and the Lincoln-Nottingham line.

3.2.29 Although coal traffic in the North East has reduced in recent years, there are still residual operations that impact on the constrained network between Northallerton and Newcastle. Furthermore, strong growth is forecast in the intermodal market via domestic and international container services.

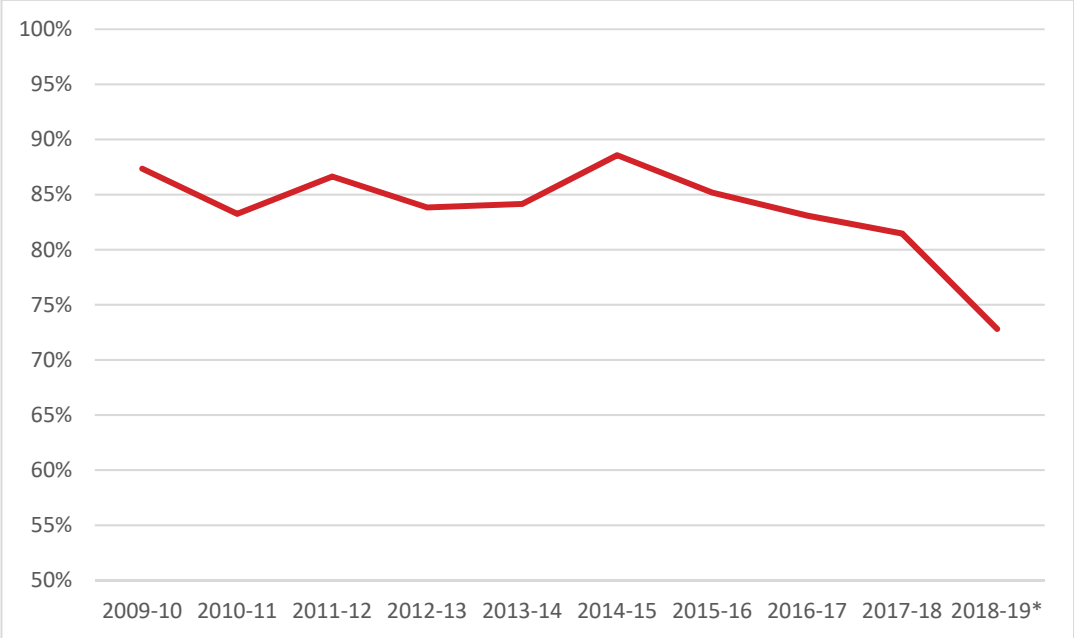
3.2.30 North of Newcastle and into Scotland, freight flows mostly comprise a mix of container traffic, cement and nuclear cargos.

3.3 Constraints and improvements

3.3.1 The ECML suffers from a number of capacity constraints and infrastructure shortcomings that combine to impact on its performance, and stifle its capability to improve its performance and grow its passenger market.

3.3.2 In recent years, the performance of the InterCity East Coast franchise has suffered, as indicated in Figure 3-1 below. Currently, its Public Performance Measure as an annual average has dropped below 80% for the first time in ten years.

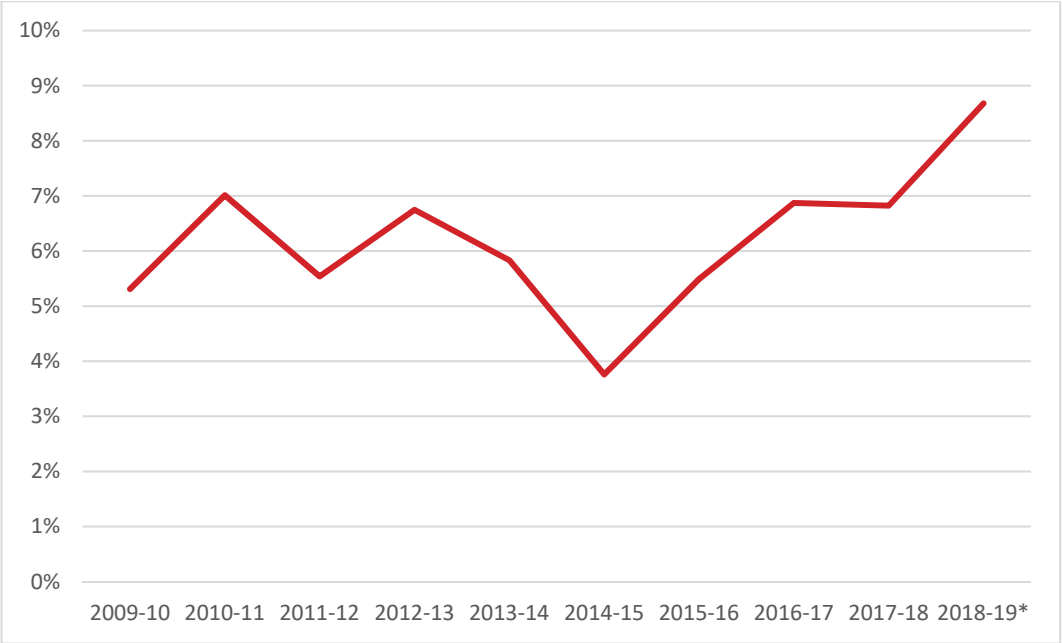
Figure 4. Public Performance Measure (annual average) for the InterCity East Coast franchise



* Quarters 1 to 3 only

3.3.3 The annual average data for cancelled and significantly late services for the last ten years, shown in Figure 3-2 below, further illustrates its worsening performance. However, it should be noted that the data for the first three quarters of 2018-19 in Figures 3-1 and 3-2 can be partly attributed to the Govia Thameslink Railway and Northern Rail timetabling changes that caused significant performance issues between May and December 2018.

Figure 5. Proportion of services cancelled or significantly late for the InterCity East Coast franchise

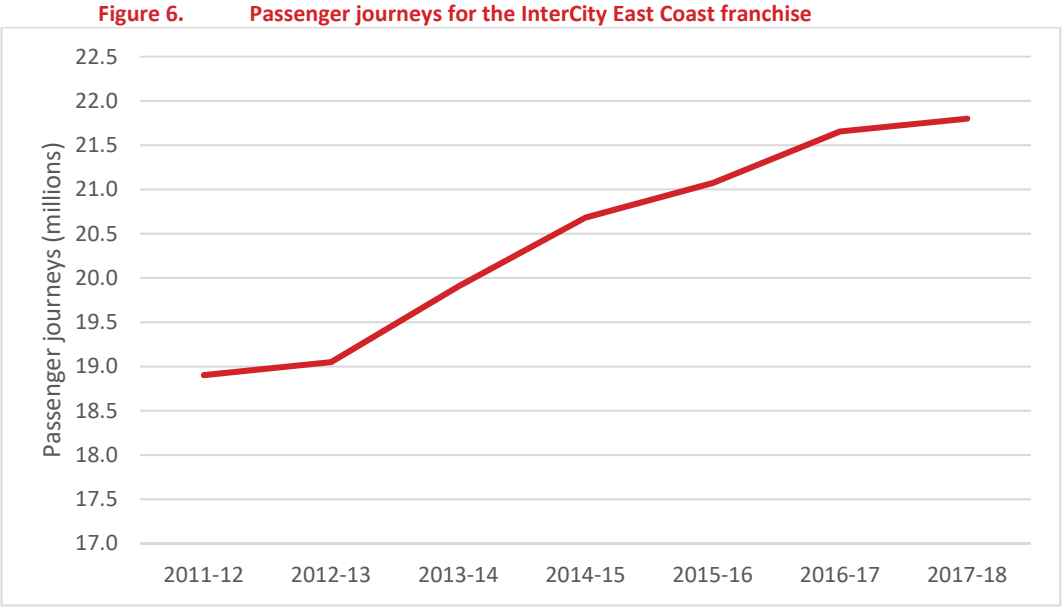


* Quarters 1 to 3 only

3.3.4 Since electrification in the early 1990's, is generally considered that there has been a sustained period of under-investment in the ECML that has contributed towards the worsening performance trend shown above, particularly when compared to the West Coast Mainline (WCML), which benefited from a £9bn modernisation project up to 2008. By contrast, spend on the ECML in Control Periods 4 and 5 (2009-2019) totalled around £1.1bn.

3.3.5 Coupled with its worsening performance is a continued uplift in passenger journeys for the InterCity East Coast franchise, increasing load factors and supporting the case for greater investment.

Figure 6. Passenger journeys for the InterCity East Coast franchise



3.3.6 In July 2018, the Government announced a £780m spending commitment to fund infrastructure upgrades to the ECML in Control Period 6 (2019-2024), coupled with the introduction of the new Intercity Express rolling stock. The following section outlines the key constraints and improvements recently completed and planned on the ECML.

London to Peterborough

London King's Cross

3.3.7 The biggest planned project on the ECML route is the remodelling of London King's Cross, which includes an increase in track capacity through Gas Works Tunnel just north of the station by reopening a currently disused tunnel. In addition to the tunnel works, some platform lengthening will also take place, taking advantage of the longer Intercity Express Azuma trains when they are introduced.

3.3.8 The southern end of the ECML is currently operating at the limits of timetabling capacity. The extra track through the tunnel will release capacity on the station approaches, at a location where the footprint of the station precludes the construction of additional platforms. Signalling control for the south end of the route will be transferred to the York Rail Operating Centre (ROC), in anticipation of the CP7 introduction of the European Train Control System (ETCS) and European Rail Traffic Management System (ERTMS) as part of the Digital Railway roll-out.

The Welwyn Gap

3.3.9 An as-yet unresolved network constraint is the two-track section between Digswell and Woolmer Green junction, running through the Digswell viaduct and the Welwyn north and south tunnels. The slower services that call at Welwyn North station, situated between the viaduct and the tunnels, further constrain the timetable. The alternative route via the Hertford loop is also two-track, and is constrained by freight services and an intensive inner suburban timetable.

3.3.10 There is currently no planned scheme in place to address this issue.

Stevenage station – new bay platform

3.3.11 Although the works have been delayed, there are proposals in place to install a new bay platform at Stevenage station will allow a half hourly service to be introduced between Stevenage and Hertford, and will provide additional capacity for GTR services; in particular, by removing the current train which starts and terminates in Platform 4 at Stevenage each hour from the northbound slow line..

Digital Railway

3.3.12 In conjunction with the physical infrastructure commitments, there is an intention over the next three Control Periods to introduce European Train Control System (ETCS) operation to the East Coast route, starting with the line north from King's Cross and Moorgate to Sandy.

3.3.13 The project is part of Network Rail's Digital Railway programme, which aims to deploy modern signalling and train control technology to unlock additional capacity, reliability and safety

benefits from the existing infrastructure. Early analysis indicates that performance can be improved by up to 10% in terms of delay minutes reduction through the introduction of the ERTMS automated Traffic Management System and ETCS signalling reducing the space needed between trains, allowing more trains to be run.

Huntingdon to Peterborough

3.3.14 Between Huntingdon and Peterborough the ECML reduces from a four track railway, firstly to three tracks (two lines northbound and one southbound) and then between Holme and Fletton Jn to two tracks. This presents a constraint on capacity particularly for southbound train between Peterborough and Huntingdon. To mitigate this, it has been proposed that the former Up Slow line be reinstated between Wood Walton and Huntingdon, a distance of around 6 miles. This would provide a second southbound line helping increase capacity. For northbound service greater us of the Down Slow lines between Fletton Jn and Peterborough supported by an increase in the line speed on the slow line has been proposed to increase capacity.

3.3.15 The former scheme was to have been delivered as part of Control Period 5 but in 2018 Network Rail announced that they were still considering if the scheme was required to deliver current timetable plans.

Werrington Junction

3.3.16 In August 2018, a Transport and Works Act Order was granted by the Secretary of State to undertake works at Werrington Junction just north of Peterborough.

3.3.17 The project will connect the GNGE Line to the Peterborough - Stamford Line and allow freight trains to access the GNGE line (used by ECML freight traffic between Peterborough and Doncaster) by passing under the ECML avoiding conflicting movements with passenger trains increasing capacity and improving reliability. Work has already started, and the dive-under should be completed by 2021.

Peterborough to Leeds and York

Peterborough station

3.3.18 In March 2019, Network Rail completed a £10m project at Peterborough that aims to allow higher line speeds into the station. Due to the number of conflicting movements that take place, it previously acted as a bottleneck on the network.

3.3.19 The work involved the replacement of two sets of switches and crossings, and some signalling and track renewal that has increased the line speeds approaching the station from 40mph to 75mph, reducing “knock-on” delays to following services.

Doncaster north chord

3.3.20 A major scheme to release capacity completed in 2014 was the Doncaster North Chord, which was built to eliminate the need for slow-moving freight traffic to cross the ECML, restricting high-speed passenger services.

3.3.21 Freight traffic can now use a new grade separated link from the Stainforth-Adwick freight line to the Shaftholme junction-Knottingley line, providing extra capacity and flexibility to both passenger and freight services.

Doncaster station

3.3.22 Another scheme recently completed was an upgrade to Doncaster station, another key pinch point on the ECML. The improvements were completed in 2016 and include a new bay platform, platform zero, to accommodate terminating services from the Thorne lines and relieve pressure elsewhere at the station.

3.3.23 Platform zero was part of a £21m programme of improvements, including line upgrades and the installation of new 'bi-directional' signals, that have helped to relieve congestion at Doncaster where there is a large volume of passenger and freight traffic interacting on the network.

3.3.24 However, despite the improvements, Doncaster station remains a pinch-point on the network due to its complex operations and the convergence of 6 routes carrying large volumes of passenger and freight traffic. The main sources of conflict in the operation of the station are services from Leeds to London which cross form the west to east side of the station area and services from Sheffield to Hull and Cleethorpes which cross form the south west to north east side of the station area. The performance impacts of these conflicts often manifest themselves in additional time included in timetables to manage timetable conflicts and provide a performance buffer.

Leeds station

3.3.25 Network Rail are currently carrying out a programme of improvements at Leeds station to increase capacity and network resilience. The improvements include a new platform zero and the upgrade of track and signals to provide greater efficiency for terminating and through traffic at the station. The reconfiguration of signalling control to the York ROC was completed in December 2018.

3.3.26 Construction work is due to be completed by 2021.

Power supply upgrade

3.3.27 Given the number of new services that have been introduced onto the ECML in recent years, with further services planned, the power supply on the railway has required upgrades in preparation for these service improvements and the introduction of the new InterCity Express rolling stock. The sub-station upgrades in the southern section of the corridor have been completed, and the improvements works in the north are continuing.

3.3.28 Improvements of overhead line equipment is also being carried out, replacing lightweight "head-span" installations with heavier structures to reduce the need for maintenance and repair, improving the overall resilience of the network and reducing the need for temporary speed restrictions during periods of high wind.

Northallerton to Newcastle twin track

3.3.29 There is currently a severe constraint north of Northallerton where the route reduces from four to two tracks, remaining like this to Newcastle. The impact of this is that the passenger service is "flighted" (where services operating at a similar speed run in quick succession to optimise the use of capacity) in order to accommodate slower freight traffic, preventing the passenger service from operating at optimum regular intervals. Without further capacity being released along this section, a more intensive passenger service could not be delivered without further flighting.

3.3.30 In previous years, one possible solution that was mooted were a number of freight loops to allow freight train to be recessed to allow passenger trains to overtake. However, given the reduction in demand for freight paths due to the decline in heavy freight in this area, it appears that this particular intervention will not be taken forward.

3.3.31 Another possible solution that is being pursued is the reinstatement of the Leamside Line between Tursdale junction and Pelaw junction by providing a strategic diversionary route avoiding Durham and releasing capacity on the ECML. The route would also provide a rail connection to the new town of Washington and major industrial zones such AS Follingsby Park and the International Advanced Manufacturing Park (IAMP).

3.3.32 However, there would be a number of engineering obstacles to overcome in re-opening this section of track, including the condition and alignment of the Victoria viaduct over the River Wear. Possible solutions to overcome this constraint have included a new branch line that avoids the viaduct and connects with the ECML via a junction north of Chester-le-Street.

3.3.33 Alongside use of the Leamside Line as a diversionary route, expansion of the Tyne and Wear Metro to Washington using the northern section of the line is also being considered. This would provide a dedicated commuter service for communities south of the Tyne and into County Durham.

Journey times between Newcastle and Edinburgh

3.3.34 Journey times of services between Newcastle and Edinburgh are currently constrained by the formation of the network on this section of the route. The section has a large number of tight curves which restricts the maximum speed of the line and causes services to have a lower average speed than the rest of the ECML. At locations such as Morpeth the speed restrictions due to curves are as low as 50mph..

3.3.35 As the constraint is due to the route alignment, the introduction of bypasses or new alignments would be the only solution that would provide significantly improved journey times north of Newcastle. The feasibility of a new alignment between Newcastle and Edinburgh is discussed under plans for High Speed rail in Scotland in the following sections.

4. THE FUTURE SERVICE

4.1 Introduction

4.1.1 There are a number of firm and longer-term changes to the pattern of services on the ECML planned in the short to medium term. The firm changes are being delivered as a result of investment in those schemes discussed above that are currently being delivered, whilst the medium term changes planned rely on the delivery of major national infrastructure projects such as HS2.

4.1.2 These planned and aspirational changes form the basis of the modelling work that has been undertaken in this study. These changes are summarised in the sections below and are described in greater detail in Chapters 6-9 outlining the assessment results.

4.2 ECML long distance

4.2.1 Over the period to 2021 there are a number of changes to services on the ECML planned that represent the most significant shift in services since 2011.

4.2.2 The current dominant operator of Long Distance East Coast services, LNER, plans to introduce a number of significant changes to their timetable over the period to 2021. These service improvements have been facilitated through the completed infrastructure works outlined in the previous section and the upcoming introduction of the new Intercity Express (IET) rolling stock, giving improved acceleration, higher seating capacity and additional trainsets.

4.2.3 By 2021, it is intended that six LNER trains per hour in each direction will operate from London King's Cross, with a seventh train operating in alternate hours. Currently there are five trains per hour in each direction.

4.2.4 Transpennine Express also plan to operate an enhanced service with one train per hour from Liverpool to Newcastle being extended to Edinburgh. In addition to this service extension, new rolling stock will also be introduced, including IET trains capable of 125mph operation, which will reduce journey times.

4.2.5 First Group also intend to introduce a new Open Access service linking London with Edinburgh, from 2021. The service will call at Stevenage, Newcastle and Morpeth and five services per day will operate in each direction; this service will also utilise new IET trains.

4.3 High Speed 2

4.3.1 After the delivery of the 2021 timetables changes the next major change about which details are known relate to the delivery of HS2 Phase 2B; this will provide a new railway between London, Birmingham, Leeds and York, and is scheduled for completion by 2034.

4.3.2 HS2 Phase 2 will provide a significant number of additional services between London and Leeds, allowing the ECML to use the released capacity for the development of alternative passenger and freight services. The current indicative service specification for the HS2 eastern leg is outlined below.

Table 1. HS2 eastern leg indicative service pattern

PRIMARY SERVICE	CALLS	FREQUENCY	END-TO-END JOURNEY TIME
London Euston to Newcastle	Old Oak Common, York, (Darlington 1 tph)	2 tph	2 hours 17 minutes
London Euston to York	Old Oak Common, East Midlands Interchange (divides at EMI and calls at Chesterfield and Sheffield Midland)	1 tph	1 hour 24 minutes
London Euston to Leeds	Old Oak Common, (Birmingham Interchange 1 tph), East Midlands Interchange (1 tph divides at EMI and calls at Sheffield Midland)	3 tph	1 hour 21 minutes
Birmingham Curzon Street to Newcastle	East Midlands Interchange, York, Darlington, Durham	1 tph	1 hour 58 minutes
Birmingham Curzon Street to Leeds	East Midlands Interchange, Sheffield Midland	2 tph	49 minutes

4.3.3 It will be noted that in this specification all HS2 services terminate at Newcastle, with no services to Edinburgh. This is because, as currently planned, HS2 Edinburgh services will operate vis the West Coast Mainline as this route, with HS2 in place, will provide a faster journey time to Edinburgh.

4.4 High Speed Rail in Scotland

4.4.1 In March 2016, the UK and Scottish Governments made a joint commitment to work together to identify options that could be implemented between 2019 and 2029 that could improve journey times, capacity, resilience and reliability on the rail routes between England and Scotland. The North of HS2 to Scotland Working Group – comprising of Department for Transport, Transport Scotland, HS2 Ltd and Network Rail – was set-up to deliver this commitment.

4.4.2 The Working Group initially identified a shortlist of options for further investigation, slimmed down from approximately 200 potential interventions that had been identified in previous studies. In 2017, Transport Scotland commissioned a feasibility study to look at options on both the East and West coast routes between Scotland and England.

4.4.3 The findings of the study indicated that construction of a new high speed rail alignment between Newcastle and Edinburgh was technically and environmentally feasible, providing a journey time of below 45 minutes. In combination with HS2 services to Leeds, this would provide a journey time of approximately 3 hours between London and Edinburgh.

4.4.4 In addition to this, the potential for developing a dedicated high speed shuttle service operating between Glasgow Central and Edinburgh Waverley, with an intermediate stop at Haymarket was considered. This shuttle would operate at a frequency of five trains per hour in the peak periods and four trains per hour in the off-peak. The initial estimated journey time was 28 minutes.

5. CONTEXT AND APPROACH TO MODELLING THE BENEFITS

5.1 The regional economies

5.1.1 The economies along the length of the ECML serve approximately 18.7 million people, with a working age population of 14.3 million. As noted previously, this generated a GVA output of £840bn in 2017, representing just under half of the UK's total economic output.

5.1.2 Chapter 2 has already demonstrated the diversity of economic geographies along the rail corridor, and how these economies link and operate together. Many sectors of the economy benefit from strong connectivity to enable, for example, the transport of goods to markets and for cities to benefit from business connections to synergistic places. This diversity means that the range and variety of connections between the areas is complex.

5.2 Approach to estimating the benefits

5.2.1 In order to estimate the economic value of investment in the ECML and the new HS2 corridor, we have used a model that we have used in previous studies for ECMA and is based on an approach originally developed by Network Rail as part of their series of Market Studies in 2013. The model estimates change in GDP as a result of changes to rail services.

Agglomeration economies

5.2.2 The benefits are based largely on the impacts of agglomeration between economies. At their broadest level, agglomeration economies occur when individuals benefit from being "near" to other individuals, and exist when the spatial concentration of economic activity gives rise to increasing returns in production. Transport and communications play a crucial role because, in most contexts, speed and low costs in transportation and communication provide a direct substitute for physical proximity[4]. For example, if the economies of Nottingham and Newcastle are brought 'closer' together through improved rail links the model predicts the scale of the increase in the level of interaction between the two economies, measured in GDP.

The model

5.2.3 We have assessed the wider economic impacts of various improvements along the ECML corridor. Although the analysis is based on the Network Rail model, we have adapted it to include the impact that different sectors of the economy will have on the scale of the benefits. The importance of this segmentation by economic sector has been highlighted in research on agglomeration and the 'connectedness' of locations[5].

5.2.4 This approach deals solely with economic growth and GVA impacts and does not include any form of transport user benefits (time and cost savings) that are normally included within a conventional transport appraisal. Any such benefits would be additional to those that are presented here.

[4] Daniel Graham & Patricia Melo, *Advice on the Assessment of Wider Economic Impacts: a report for HS2*, March 2010.

[5] Daniel Graham & Patricia Melo, March 2010, op cit.

5.2.5 The data incorporated into the modelling to define economic sectors was taken from Department for Transport WebTAG guidance on wider impacts (WebTAG Unit A2-1). The four sectors defined within the modelling are:

- Construction
- Manufacturing
- Consumer services
- Producer services

5.2.6 These sectors represent the main economic sectors described in the sectors above. While the first two sectors are relatively self-explanatory the components of the last two perhaps requires further definition, provided in the table below.

Table 2. Definition of consumer and producer services segments

CONSUMER SERVICES	PRODUCER SERVICES
Motor trade	Financial
Wholesale	Insurance
Retail	Auxiliary/financial
Hotels/restaurants	Machinery renting
Land transport	Computer services
Water transport	Research and development
Travel support	Other business services
Post telecom	

5.2.7 In order to provide suitably disaggregate models that reflect the spatial geography of the economy, access times to stations have been produced for each of the four economic sectors, with access times weighted by the distance of jobs in each sector from each station. This was achieved by zoning the catchment areas of stations at Middle Super Output Area (MSOA) level. This enables us to reflect the tendency for producer services employment, such as financial or business support services, to be located in city centres, whilst manufacturing employment might be located further out of city centres, in the results.

5.2.8 As well as economic data, the model utilises information on existing and future rail services, including information on journey times, service frequencies, the number of interchanges required and the impact of access times to stations.

Figure 7. Model inputs and outputs

- **Size of the economies (number of jobs)**
- **Structure of the economies (type of jobs)**
- **How far apart are the stations**
- **The change in service between them (connectivity improvement)**
- **The result is the marginal uplift in GDP from one service level to another**

Stations included in the model

5.2.9 A broad range of station were included in the model, a full list is included in Appendix A. The stations can be divided into the following groups:

- **East Coast Core:** Stations between London, Leeds and Edinburgh
- **Associated Stations:** Stations located within the East Coast network including stations such as Scarborough, Grimsby or stations in Scotland beyond Edinburgh such as Aberdeen and Inverness
- **HS2 Stations:** Where HS2 has been modelled additional stations have been included that are not currently part of the East Coast network, these include East Midlands Interchange, Birmingham Curzon St, and Birmingham Interchange. Flows to these locations have been included if the flow uses some part of the ECML. For example Newcastle – Birmingham, however Leeds to Birmingham has not been included as the trip would not currently be considered part of the East Coast network.

5.2.10 The catchments for each station generally represent the local authority district in which the station is located, although in some cases where districts are geographically large a more realistic tighter catchment has been used. Equally, where appropriate, catchments have been extended into adjacent districts. In the case of London, all inner London boroughs were included in the model, with MSOAs within London allocated either to Old Oak Common or London Euston stations when HS2 is complete.

5.2.11 For proposed 'hub' stations (Meadowhall and East Midlands Interchange) the catchment areas for surrounding stations have been adapted from the present situation for the 'with HS2' scenarios to reflect the different access to the network that these stations would afford.

5.2.12 Details of the service patterns modelled are presented in the relevant results chapters.

Interpreting the outputs

5.2.13 The outputs of the model are presented in terms of the uplift to gross value added (GVA), and are presented relative to the existing level of service (April 2019). When interpreting the results one has to consider the relative size of the economies and the relative change in accessibility that the proposed improvements could bring about. For example, the value of improving links between two large economies that are already well served might be more limited than improving links between two smaller economies that are presently poorly served.

5.2.14 The results are presented in terms of additional GDP per annum for the economies as they are today (i.e. they do not account for future changes in the size and structure of the economies that could arise from the successful delivery of Strategic Economic Plans and other growth initiatives). They are shown in 2034 values (the first full year of HS2 operation) discounted to 2010 prices (the DfT Appraisal Base Year).

5.2.15 It is also worth noting that as the focus of this work is on assessing the direct benefits generated by improvements to the ECML and flows that would currently use the ECML. Further benefits that would arise through the use of existing capacity released as a result of HS2 to restructure services on the ECML, will undoubtedly exist, but have not been modelled here. The opportunities around released capacity are discussed in more detail later in this report.

6. TEST A: COMMITTED TIMETABLE CHANGES 2019-2021

6.1 Introduction

6.1.1 In 2018, LNER took over the InterCity East Coast franchise from Virgin Trains East Coast (VTEC). As part of the franchise agreement, the committed timetable improvements under the VTEC franchise have been carried through to LNER. However, delivery of the enhanced timetable has been delayed due to the delayed completion of infrastructure schemes.

6.1.2 To deliver these improvements whilst also accommodating existing services, including other long distance services operated by Open Access Operators (Hull Trains and Grand Central), requires a range of infrastructure enhancements to provide a railway that has both the capacity and resilience to operate the proposed services reliably.

6.2 The 2021 timetable

6.2.1 Based on present timescales, including those for the delivery of the required infrastructure, it is likely that the LNER timetable will be implemented in full by the time of the December 2021 timetable change. Some aspects of the timetable are planned to be delivered prior to this, beginning in December 2019.

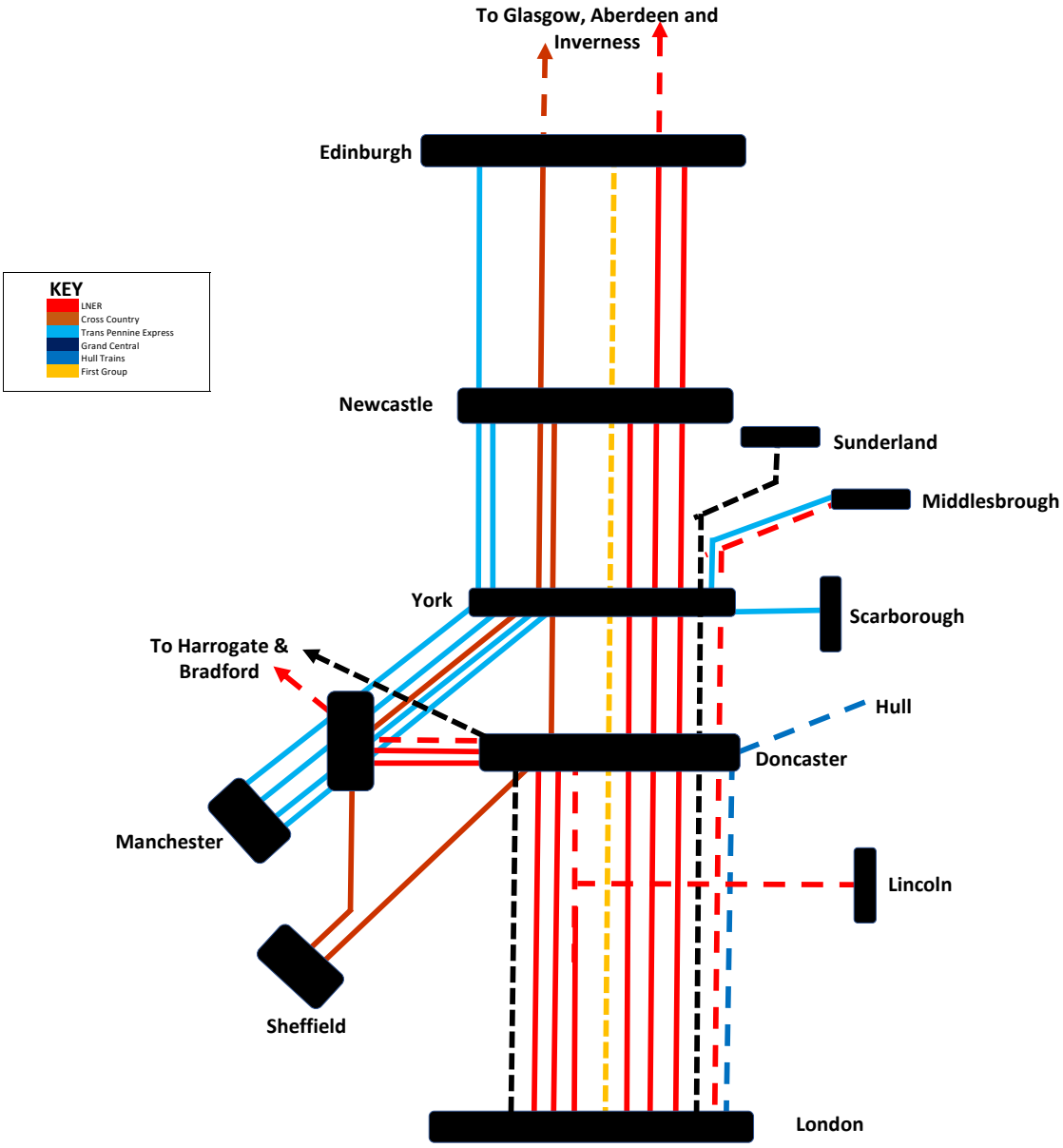
6.2.2 To model the revised LNER service pattern, information extracted from the Track Access Application has been used. Table 6-1 overleaf outlines the service pattern expected to be operational by the end of 2021 following the introduction of all the committed service improvements for LNER services.

Table 3. LNER committed service pattern

PRIMARY SERVICE	CALLS	FREQUENCY	EXTENSIONS
London King's Cross to Edinburgh	York (2 hourly), Newcastle	1 tph	
London King's Cross to Edinburgh	Peterborough, Doncaster, York, Darlington, Durham, Newcastle, Morpeth (peak only), Alnmouth (2 hourly), Berwick-upon-Tweed, Dunbar (peak only)	1 tph	
London King's Cross to Newcastle	Stevenage, Peterborough (2 hourly), Grantham, Newark North Gate, Doncaster, York, Darlington, Durham (2 hourly)	1 tph	
London King's Cross to Newark North Gate	Stevenage, Grantham	1 tph	Lincoln – 2 hourly. Harrogate via Retford, Doncaster, Leeds, Horsforth – 2 hourly.
London King's Cross to Leeds	Peterborough (2 hourly), Doncaster (2 hourly), Wakefield Westgate	2 tph	Bradford Forster Square via Shipley – 2 hourly
London King's Cross to Middlesbrough	Peterborough, York, Northallerton	2 hourly	

6.2.3 The figure overleaf illustrates the service pattern modelled showing only key locations, incorporating the Transpennine Express and Cross Country services that operate via Leeds and York to the North East and Edinburgh.

Figure 8. Test A service pattern



6.3 New rolling stock

6.3.1 As part of their agreed franchise commitments, LNER are phasing in a new fleet of rolling stock to replace the existing fleet. These trains were commissioned as part of the DfT's InterCity Express Programme and will increase the LNER fleet size from 45 to 65 trains whilst providing greater operational flexibility, with trains being able to operate in five, nine or ten car formations and with portion working becoming possible whilst also adding more than 6,000 additional seats per day for passengers. They are due to enter service in May 2019 under the brand name 'Azuma'.

6.3.2 The new trains will be a mixture of electric and "bi-modes", which can operate using either electric or diesel power. This allows the trains to operate with the characteristics of electric trains when on sections of track with overhead line equipment, with the benefits of higher rates of acceleration and quieter running, but also to continue onto non-electrified sections on diesel power. This gives the potential for fleet to provide more direct services between London and the rest of the ECML network, but will be initially used to replace diesel trains used on journeys such as London – Harrogate which only require diesel traction for a short section of the journey.

6.3.3 Bi-mode technology will also provide greater resilience to the timetable, allowing services to continue to operate on diverted or non-electrified due to disruptions to the electricity supply or maintenance work on the network.

6.3.4 A further advantage is that the new fleet will be a mixture of five- and nine-car trains, compared to the existing nine car-only fleet. Five-car trains will provide greater flexibility in planning services along the ECML, and better cost efficiency in terms of fleet management, allowing smaller destinations to be served off the primary route using the shorter trains.

6.3.5 They will also allow for services to be operated through portion working; for example, two separate destinations could be served by running two trains coupled together to a common station, such as Doncaster, before the trains divide to each serve separate final destinations, making more efficient use of spare capacity.

6.4 Infrastructure requirements

6.4.1 Delivering the timetable outlined above in a robust and reliable way whilst providing sufficient capacity for other services that use some or all of the ECML for their journey to continue to operate requires a number of enhancements to the infrastructure.

IEP infrastructure

6.4.2 A programme of infrastructure investment was required to accommodate the new IEP rolling stock. The upgrades related to gauging, platform lengths and overhead line power supply. The first phase of power supply upgrades between London and Doncaster has been completed, and the second phase between Doncaster and Edinburgh is ongoing. This work will be completed during 2019 allowing the trains to be introduced fully across the network.

Capacity enhancements

6.4.3 In addition to the investment noted above to facilitate the new rolling stock, a number of infrastructure schemes are required in order to deliver eight long distance train paths per hour from London King's Cross. These schemes were originally identified in Control Period 5 (2014-19) and allocated funding through the East Coast Connectivity Fund. Delays to some of these schemes have meant that delivery of some has extended into Control Period 6. In July 2018 the government announced an investment of £780m in investment the ECML which included King's Cross remodelling, power supply upgrades north of Doncaster, the Werrington Junction dive under and an additional platform at Stevenage.

6.4.4 The following schemes were identified as providing the additional capacity required to deliver the enhanced timetable, a number of which have been identified under the constraints and improvements section in Chapter 3:

- Peterborough station – the improvement of line speeds into Peterborough station was completed in March 2019.
- Werrington junction – this scheme would provide a grade separated junction, allowing high speed passenger trains to pass over the freight traffic on the GNGE line. The anticipated year of delivery is 2021.
- Doncaster bay platform – a new platform 0 was completed in 2016 to accommodate terminating services from Scunthorpe and Hull and provide greater through platform capacity.
- Stevenage turnback platform
- King's Cross remodelling
- Power supply upgrade

Scheme costs

6.4.5 The table below summarises the costs of the completed IEP infrastructure works and the capacity enhancements outlined in Table 6-2. The costs are based on estimates presented by Network Rail in November 2015.

Table 4. Cost of infrastructure enhancements (2015 prices)

TYPE OF ENHANCEMENT	PROJECT	COST (£)
Ongoing & Completed Works	Gauging, station works and overhead line equipment upgrades and power supply upgrades	£329m
	Doncaster bay platform	£21m
	Peterborough station approach line speeds	£14m
Forthcoming Works	Werrington junction grade separation	£200m
	Stevenage bay platform	£14m
	King's Cross Remodelling	£237m
TOTAL		**£801m**

6.5 The wider economic impact of the committed LNER timetable

6.5.1 We have assessed the wider economic impacts of the committed changes to the timetable from 2021. Overall we estimate that the changes to the timetable have the potential to generate approaching **£174m** of GVA per annum. Within this figure the vast majority of flows see an increase in GVA, although some individual flows see a reduction where, for example, stopping patterns have been amended breaking existing links.

6.5.2 The tables below presents the results grouped in a number of different ways around the geography of the East Coast network. We begin with aggregate results divided in the four ECMA regions, plus London.

Table 5. GVA Impacts of Test A by ECMA Region

ECMA AREA	GVA IMPACT (£M PER ANNUM)	%
London	£79.29m	46%
Southern Area	£8.52m	5%
Central Area	£11.78m	7%
Northern Area	£68.46m	39%
Scotland	£5.60m	3%
Total	£173.65m	100%

6.5.3 The distribution between the different ECMA areas is very stratified but is unsurprising. London represents the largest economy in the UK, and is also a significant beneficiary of the timetable changes to be implanted between now and 2021 with reduced journey times to key destinations such as Leeds, York, Newcastle and Edinburgh and new direct services to Lincoln, Middlesbrough, Bradford and Harrogate.

6.5.4 The southern and central areas receive a relatively low proportion of the benefits as they include a small number of stations and there are relatively few direct impacts on these stations as a result of the service changes. The main changes are a result of changes to stopping patterns and limited reductions in journey times.

6.5.5 The Northern area receives the second greatest level of benefit reflecting the very large number of stations in the area and the significant changes to services, with three train per hour from Newcastle to London for example and two hour journey times form Leeds to London along with new direct services from Middlesbrough, Harrogate and Bradford.

6.5.6 Scotland sees only limited benefits. The main change relate to the delivery of headline four hour journey time from Edinburgh to London as well as limited frequency enhancements. Although this gives a small improvement over the existing service, it does not make significant inroads into potential agglomeration benefits as the journey time is still too great to be attractive for business trips within a working day. The impact on Scotland is also muted by the change in stopping patterns for services between Aberdeen/Inverness and London, with additional stops included to facilitate the four-hour Edinburgh – London service.

6.5.7 The table below presents the top 10 GVA increases, it is notable, but perhaps unsurprising, that all of these flows are to or from London.

Table 6. Top 10 GVA Increases

RANK	FLOW	GVA IMPACT (£M PA)
1	Bradford – London	£34.5m
2	Leeds – London	£29.01m
3	Newcastle – London	£20.84m
4	Lincoln – London	£15.02m
5	Wakefield – London	£13.75m
6	Eaglescliffe – London	£6.56m
7	Stevenage – London	£6.10m
8	Huddersfield – London	£4.88m
9	Middlesbrough – London	£4.87m
10	Hull – London	£4.08m

6.5.8 The results presented above are largely intuitive, with all of the top ten flows being either stations that receive a new direct service to London (for example Bradford or Lincoln) or see a significant journey time reductions (Wakefield or Leeds). The results for Eaglescliffe may seem anomalous, however the station supports a wide catchment south of Middlesbrough, with the station being more attractive to access than some more central stations. This wider catchment has already been exploited by Grand Central as part of their Sunderland – London service. With a train every two hours Eaglescliffe would be served by approaching an hourly service to London. Huddersfield – London may also seem to generate an anomalous result, however it serves a wide catchment and benefits from improvements in services from Leeds to London supported by high frequency connecting services.

6.5.9 The table below presents the results divided into “core” and “associated” route sections. The core sections relates to flows on the London – Leeds – York – Newcastle – Edinburgh route where direct services operate at an hourly frequency or better. Associated routes and stations either do not have direct service on the core East Coast network (such as Scarborough) or have a service frequency that is less than hourly, such as Harrogate.

Table 7. Results divided by Core & Associated Routes

STATION TYPE	AREA	GVA £M PA	%
London		£79.29	46%
Core Stations	South	£7.55	4%
	Central	£2.64	2%
	North	£34.73	20%
	Scotland	£4.56	3%
Associated Stations	South	£0.97	1%
	Central	£9.14	5%
	North	£33.73	19%
	Scotland	£1.04	1%

6.5.10 Table 3 presents a number of interesting results. First the importance of London to the results is very clear, representing 46% of the total. The second main finding is the differing balance between core and associated stations across the route geography. In the South and Scotland areas the vast majority of additional GVA rests with the core stations in the area, which given the shape of timetable changes is unsurprising. The results for the North and Central areas are more complex. In the Central area only around 1/3 of the benefits accrue to the core stations with 2/3 accruing to the associated stations. This finding is driven by the relative lack of change to services at stations between Peterborough (exclusive) and Doncaster (exclusive) and the significant improvement in services to Lincoln, an associated station. In the North Area the balance between core and associated stations is approximately 50:50. This, along with the size of the benefits generated shows the scale of benefits to station in the north with the benefits being driven by core statins such as Leeds and associated stations such as Middlesbrough, Bradford and Harrogate that gain two-hourly services to London.

6.6 Appraisal of Test A

6.6.1 Having examined both the costs and wider economic impacts of delivering the timetable changes proposed as within Test A it is possible to undertake an appraisal. To achieve this we have assumed that the timetable to be introduced to 2021 remains in place until the completion of HS2 in 2034. We assumed capital costs of £801m as described in the sections above and have discounted all costs and benefits to the 2010 base year as specified by DfT for business case appraisal. It should be considered that our approach does not include user benefits or train operators operating costs and revenues and is purely a comparison of capital costs compared to wider economic impacts.

6.6.2 The table below summarises these findings.

Table 8. Test A; Appraisal of Capital Costs and Wider Economic Impacts 2021-34

	TEST A IMPACTS
Present Value of Costs	£0.49bn
Present Value of Benefits	£1.35bn
Net Present Value	£0.85bn
Benefit Cost Ratio	2.73

6.6.3 It can be seen that Test A will support benefits worth approaching three times the value of the capital costs of the schemes required to deliver the timetable.

7. TEST B1: HS2 BASE CASE

7.1 Introduction

7.1.1 Test B1 is the first of three incremental tests that have been conducted that consider the introduction of HS2 services from Birmingham to Leeds, York and Newcastle. The inclusion of the HS2 services is in addition to the committed improvement to the classic services timetable that has been modelled in Test A.

7.1.2 As noted in Chapter 4, the HS2 eastern leg connecting to Leeds is anticipated to be constructed by 2034.

7.2 Timetable of HS2 and classic services

7.2.1 The HS2 timetable that has been modelled uses the service pattern and journey times previously detailed in Chapter 4, consisting of:

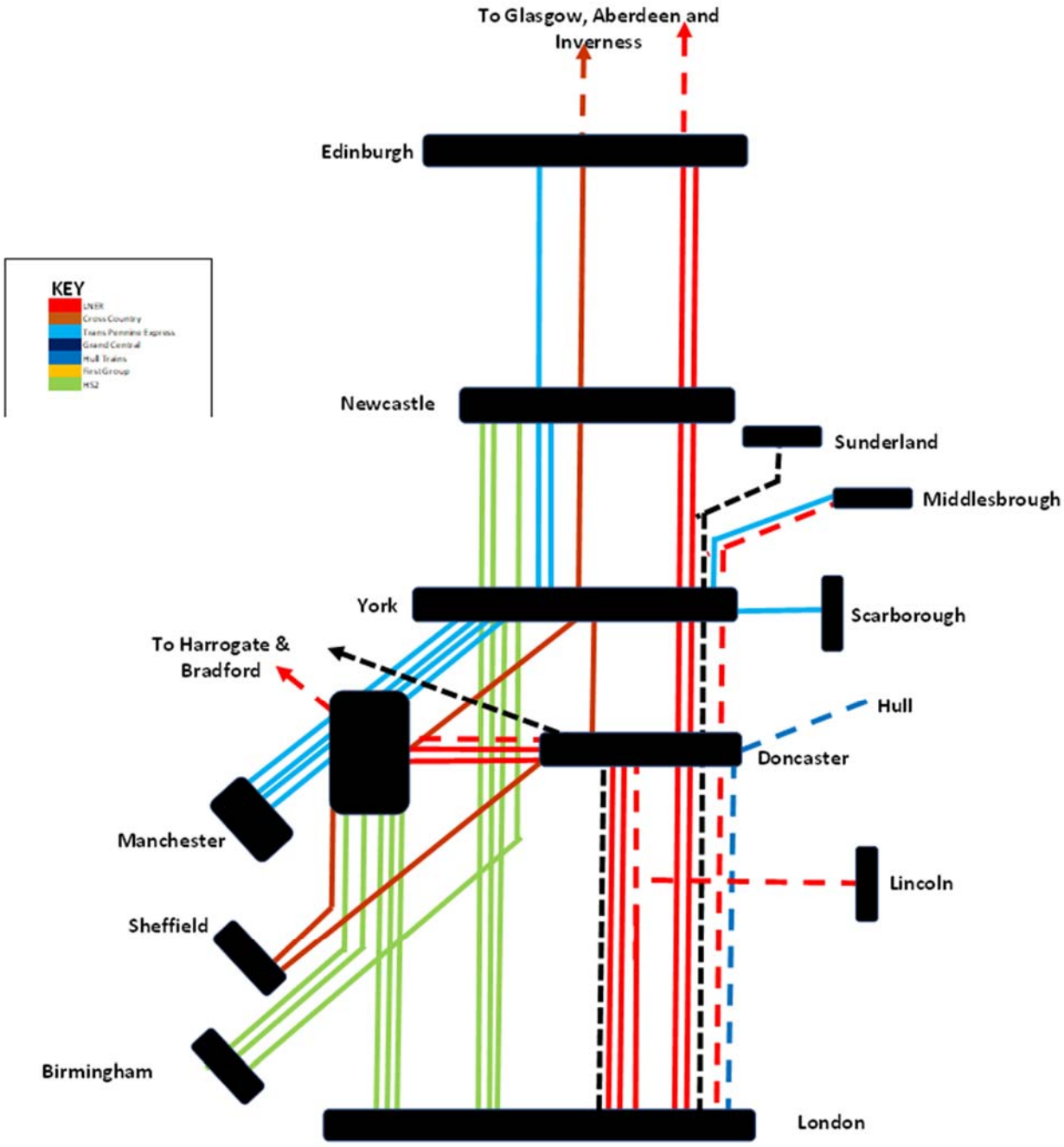
- London Euston-Leeds – 3 trains per hour
- London Euston-Newcastle – 2 tph
- London Euston-York – 1 tph
- Birmingham Curzon Street-Leeds – 2 tph
- Birmingham Curzon Street-Newcastle – 1 tph

7.2.2 Due to the number of train paths required to deliver the above HS2 service, and the constraints of the existing track infrastructure north of York, amendments to the classic services are required in order to accommodate the high speed services. These changes are as follows and have been accounted for in the modelling for Test B1:

- London King's Cross-Newcastle, LNER – 1 tph removed and stops at intermediate stations redistributed amongst other services
- Reading-Newcastle, Cross Country – service truncated at York

7.2.3 The figure below presents the service pattern tested. For clarity the number ogf stations included has been simplified.

Figure 9. HS2 & Classic Line Service Pattern



7.3 Infrastructure requirements

7.3.1 HS2 will be a new high speed railway providing increased capacity and connectivity between 8 of the 10 largest cities in the UK. HS2 services will also be able to run on to the existing rail network, continuing on the existing West and East Coast routes.

7.3.2 Phase 1, due for completion in 2026, will connect London and Birmingham. The Phase 2b route will provide a high speed line from Birmingham, via East Midlands Interchange, to Leeds with a connection to the existing network at Church Fenton, south-west of York. From this

point, services would continue on the Leeds to York line for a few miles before joining the ECML, calling at York and Darlington, and terminating at Newcastle.

7.3.3 In addition to the HS2 infrastructure, the enhancements outlined for Test A would also be required to operate the committed timetable on the classic network.

7.4 Scheme Costs

7.4.1 HS2 Ltd has been allocated a budget of £55.7bn by the government to deliver rail lines from London to Birmingham and on to Manchester and Leeds. However, it is difficult to allocate the specific costs to east coast flows due to their interaction with non-east coast flows south of Birmingham.

7.5 Wider Economic Impacts of HS2 Flows

7.5.1 We have estimated the impact of HS2 in its currently planned form on the economy of the ECML network. We estimate that HS2 would generate a total of around of **£453m** of GVA per annum relative to the existing service or **£280m** per annum relative to the enhanced service that will be in operation from 2021. Unlike the Test A the range of benefits is more stratified with a smaller number of origin – destinations pairs generating the majority of the incremental impact, beyond that generated by Test A. The results presented are in some respects an underestimate of the potential of HS2, as there is no assessment within this work of the impact of released capacity south of York and the way in which service patterns could be redefined to better serve the economies of the central and southern parts of the ECMA area.

7.5.2 The table below presents the results divided by ECMA geographical area.

Table 9. GVA Impacts of Test B1 by ECMA Region

ECMA AREA	GVA IMPACT (£M PER ANNUM)	%
London	£172	38%
Southern Area	£6	1%
Central Area	£11	2%
Northern Area	£209	46%
Scotland	£8	2%
HS2 Stations	£47	10%
Total	£454	100%

7.5.3 Relative to Test A the results show a shift in the weighting away from London, and a very significant increase in the overall level of GVA generated, for example the stations in the north area with a £209m GVA uplift receive a greater uplift than the total value of Test A. The distribution of GVA is focussed on London and the North of England. The southern and central areas see a small reduction in GVA relative to Test A driven by the removal of a London – Newcastle service to accommodate HS2 north of York. The results for Scotland see a small increase relative to Test A. The HS2 stations added to the model generate 10% of all benefits as a result of new connectivity from the East Midlands and Birmingham to East Coast stations.

The north of England generates the greatest level of benefit overall driven by significant reductions in journey times from London as well as frequency increases. For some settlements such as Huddersfield which don't enjoy direct services to London a large increase in GVA is still generated via interchange, aided by high quality connecting services to HS2 via Leeds.

7.5.4 The table below presents the top 10 origin destination flows on which HS2 has an impact.

Table 10. Top 10 GVA Increases attributable to HS2

RANK	FLOW	GVA IMPACT (£M PA)
1	Leeds – London	£104
2	Newcastle – London	£79
3	Bradford – London	£47
4	York – London	£19
5	Newcastle – Birmingham	£17
6	Huddersfield – London	£13
7	Newcastle – Nottingham	£11
8	Eaglescliffe – London	£7
9	Darlington - London	£6
10	Middlesbrough - London	£6

7.5.5 The top 10 flows present an interesting pattern. The top two positions are held by Leeds and Newcastle to London flows, which is to be expected as these stations benefit from direct HS2 services to London. there are a number of flows that whilst not directly served by HS2 see an increase in GVA as a result of improved journey times via interchange, these include Bradford, Huddersfield, and stations in the Tees Valley.

7.5.6 The table below presents the results divided into "core" and "associated" stations.

Table 11. Results divided by Core & Associated Routes

STATION TYPE	AREA	GVA £M PA	%
London		£172	38%
Core Stations	South	£6	1%
	Central	£2	1%
	North	£148	33%
	Scotland	£6	1%
Associated Stations	South	£1	0%
	Central	£9	2%
	North	£61	13%
	Scotland	£2	1%
HS2		£47	10%

7.5.7 The results presented in Table 7 are relatively unsurprising, with London and core stations in the north generating the greatest level of benefits, followed by associated stations in the north and the HS2 only stations.

7.5.8 With limited or no positive changes to services and given the size of the increase in GVA at HS2 stations it is unsurprising that the central, south and Scotland area stations represent a negligible proportion of the impact. There is however the opportunity to generate further benefits by using released capacity of the ECML south of York to generate further benefits.

7.6 Appraisal of HS2 Phase 2B

7.6.1 As the completion of the HS2 Eastern Leg is part of a much larger project serving other flows not included in this work and the costs of construction is shared between these flows it is not readily possible to identify to directly appraise the scheme against the wider economic impacts. The value of the benefits of HS2 to the East Coast network economy over the 60 years from 2034 is £8.43bn; when the benefits of the 2021 timetable assessed in Test A are included, this rises to a total of £9.80bn.

8. TEST B2: HS2 + YORK-NEWCASTLE INVESTMENT

8.1 Introduction

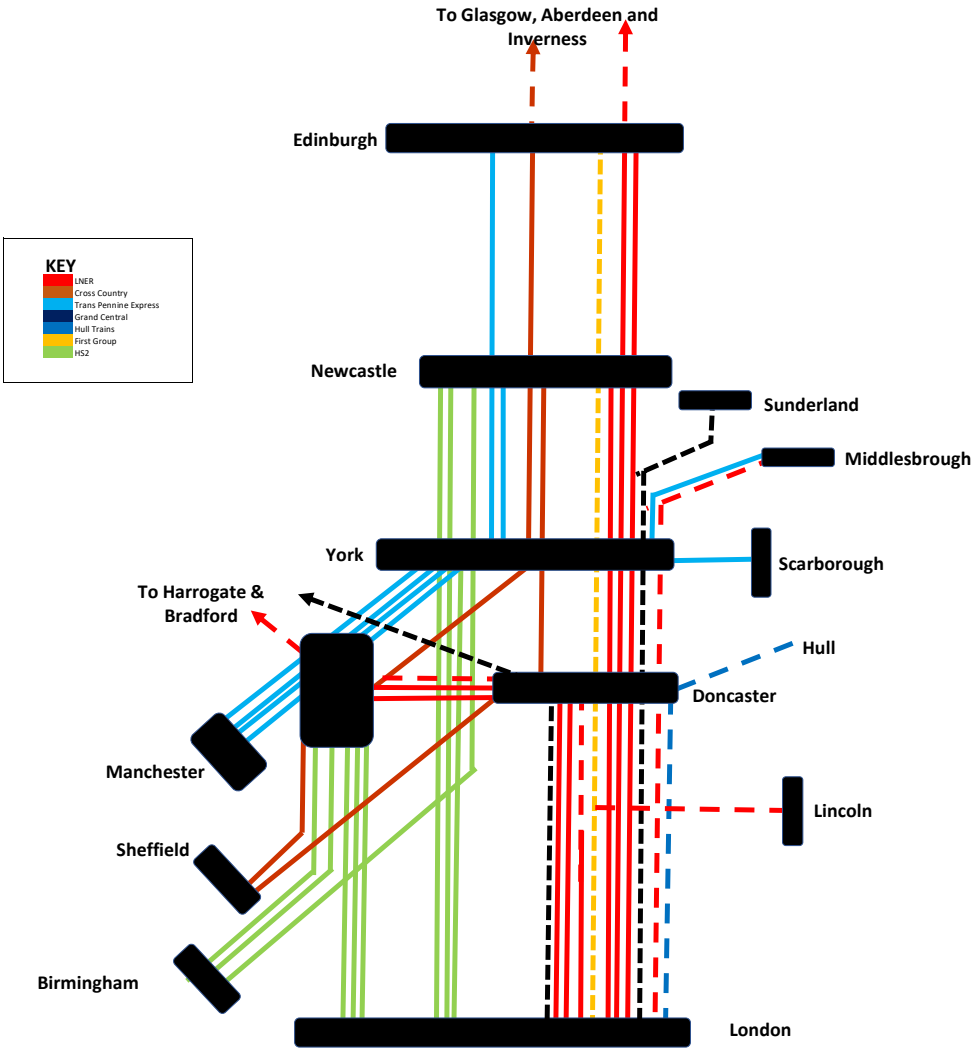
8.1.1 Test B2 builds on Test B1 and includes an additional package of complimentary infrastructure investment north of York.

8.2 Timetable of HS2 and classic services

8.2.1 The HS2 timetable modelled in this test is the same as that modelled in Test B1.

8.2.2 The capacity benefits of the complimentary infrastructure investment north of York enable the full classic service to be operated alongside HS2, which allows the LNER and Cross Country services to Newcastle lost in Test B1 to be reinstated here. The figure below presents the service pattern.

Figure 10. Proposed Service Pattern



8.3 Infrastructure requirements

Capacity enhancements

8.3.1 In addition to the HS2 infrastructure, a number of interventions (above those outlined in Test A) between York and Newcastle would also be required to deliver both the enhanced timetable and HS2 services due to the two track section north of Northallerton. The table below outlines the interventions required.

Table 12. Interventions and journey time impacts north of York

INTERVENTION	JOURNEY TIME SAVING (MINUTES:SECONDS)	DISTANCE (KM)
Bypass of Durham	03:45	17.9
Bypass between Darlington and Durham	02:27	14.7
Bypass north of Darlington	00:43	2.4
Bypass south of Darlington	01:33	17.5
Bypass west of Northallerton	01:03	14.4
Total	**09:31**	**66.9**

8.3.2 The above improvements would provide the capacity to run the full classic timetable and HS2 and would deliver journey time savings between York and Newcastle of just under 10 minutes.

8.4 Scheme Costs

8.4.1 The infrastructure outlined in Table 6-2 provides a total bypass length between York and Newcastle of 66.9km. Using estimated bypass cost per km for interventions on the network in the area[6], the cost of this capacity enhancement would be approximately £5.6bn.

8.5 The Wider Economic Impacts of Test B2

8.5.1 Within this section we consider the wider economic impacts of completing HS2 Phase 2 plus additional schemes to reduce journey times between York and Newcastle. We estimate that this option would generate around **£494m** of GVA per annum over the existing service, and **£320m** per annum more than the timetable to be delivered from 2021.

8.5.2 The table below presents a summary of the results.

[6] Broad options for upgraded and high speed railways to the North of England and Scotland, HS2 Ltd, March 2016.

Table 13. GVA Impacts of Test B1 by ECMA Region

ECMA AREA	GVA IMPACT (£M PER ANNUM)	%
London	£184	37%
Southern Area	£9	2%
Central Area	£13	3%
Northern Area	£231	47%
Scotland	£8	2%
HS2 Stations	£67	10%
Total	**£530**	**100%**

8.5.3 The results presented in Table 8 show a similar pattern to those in Test B1. The main differences are an increase in the benefits in the north of England due to improved connectivity to stations in the North East. The southern and central areas also increase, as a result of the restoration of the a full classic line service. The values for Scotland remain low as all HS2 services to Scotland would be routed via the West Coast Mainline so no benefits would accrue to the East Coast network.

8.5.4 Relative to Test B1 an additional £40m of GVA is generated per annum. This however underestimate the potential benefits of such investments. In addition to HS2 and ECML classic services the route would also be utilised by Northern Powerhouse Rail services. Such services have not been modelled as at this stage there is little detail that has been confirmed about journey times and service specifications. However in combination with substantial journey time reductions between Leeds, Manchester and Liverpool it may be possible to generate sub two hour journey times between Newcastle and Manchester, thus the results presented here are only partial representations of the power of enhancements north of York.

8.5.5 The table below presents the top ten flows impacted by HS2.

Table 14. Top 10 GVA Increases

RANK	FLOW	GVA IMPACT (£M PA)
1	Leeds – London	£104
2	Newcastle – London	£95
3	Bradford – London	£48
4	York – London	£21
5	Newcastle – Birmingham	£18
6	Huddersfield – London	£13
7	Newcastle – Nottingham	£11
8	Eaglescliffe – London	£7
9	Darlington - London	£6
10	Middlesbrough - London	£6

8.5.6 The top 10 flows present the same origin – destination pairs as Option B1 however the values change for flows in the North East.

8.5.7 The table below presents the results divided into "core" and "associated" route sections.

Table 15. Results divided by Core & Associated Routes

STATION TYPE	AREA	GVA £M PA	%
London		£184	37%
Core Stations	South	£8	2%
	Central	£3	1%
	North	£168	34%
	Scotland	£7	1%
Associated Stations	South	£1	0%
	Central	£10	2%
	North	£63	13%
	Scotland	£1	0%
HS2		£49	10%

8.5.8 The split of results by geography are similar to those presented in B1. If however Northern Powerhouse Rail were included in the results then the proportion of GVA accruing to the north of England would be greater still for both core and associated stations.

8.6 Appraisal of Option B2

8.6.1 We have conducted an appraisal of the incremental impact of Option B2 relative to Option B1 (HS2 without any additional infrastructure). As with Test A we have compared the estimate capital costs of investment with the wider economic impacts. As before it should be noted that this assessment excludes both additional operating costs but excludes user benefits and revenues to train operators. The table below presents the results of this process. The table below presents the results of this process. The values presented are discounted to 2010 values and include the deflation and discounting of costs and benefits so figures vary from those presented above.

Table 16. Test B2 Appraisal of Incremental Capital Costs and Wider Economic Impacts 60 Year Impacts

	TEST B2 IMPACTS
Present Value of Costs	£1.67bn
Present Value of Benefits	£2.12bn
Net Present Value	£0.48bn
Benefit Cost Ratio	1.26

8.6.2 The table indicates that, even without the impact of user benefits, the proposals would still represent value for money, returning £1.26 for every £1.00 invested. It should also be noted that this figure excludes the additional complementary benefits that would accrue from Northern Powerhouse Rail services, which would utilise the same infrastructure.

9. TEST B3: HS2 + YORK-EDINBURGH INVESTMENT

9.1 Introduction

9.1.1 Test B3 builds on the complimentary investment modelled in Test B2 and includes further investment between Newcastle and Edinburgh. This achieves a 45 minute journey time between Newcastle and Edinburgh and a London-Edinburgh journey time of 3 hours.

9.2 Timetable of HS2 and classic services

9.2.1 The HS2 services to Leeds, York and Newcastle are the same as those modelled in Tests B1 and B2. Services running to Edinburgh now have a 3 hour journey time from London and are able to route via the ECML using the new infrastructure, rather than routing via Glasgow Central in the indicative HS2 service specification. It has been assumed that all HS2 services terminating at Newcastle in Test B2 would extend to Edinburgh in this test. The figure overleaf presents the proposed service pattern.

9.3 Infrastructure requirements

9.3.1 In order to deliver the transformational journey time improvement between Newcastle and Edinburgh, the infrastructure enhancements outlined in Chapter 4 would need to be realised.

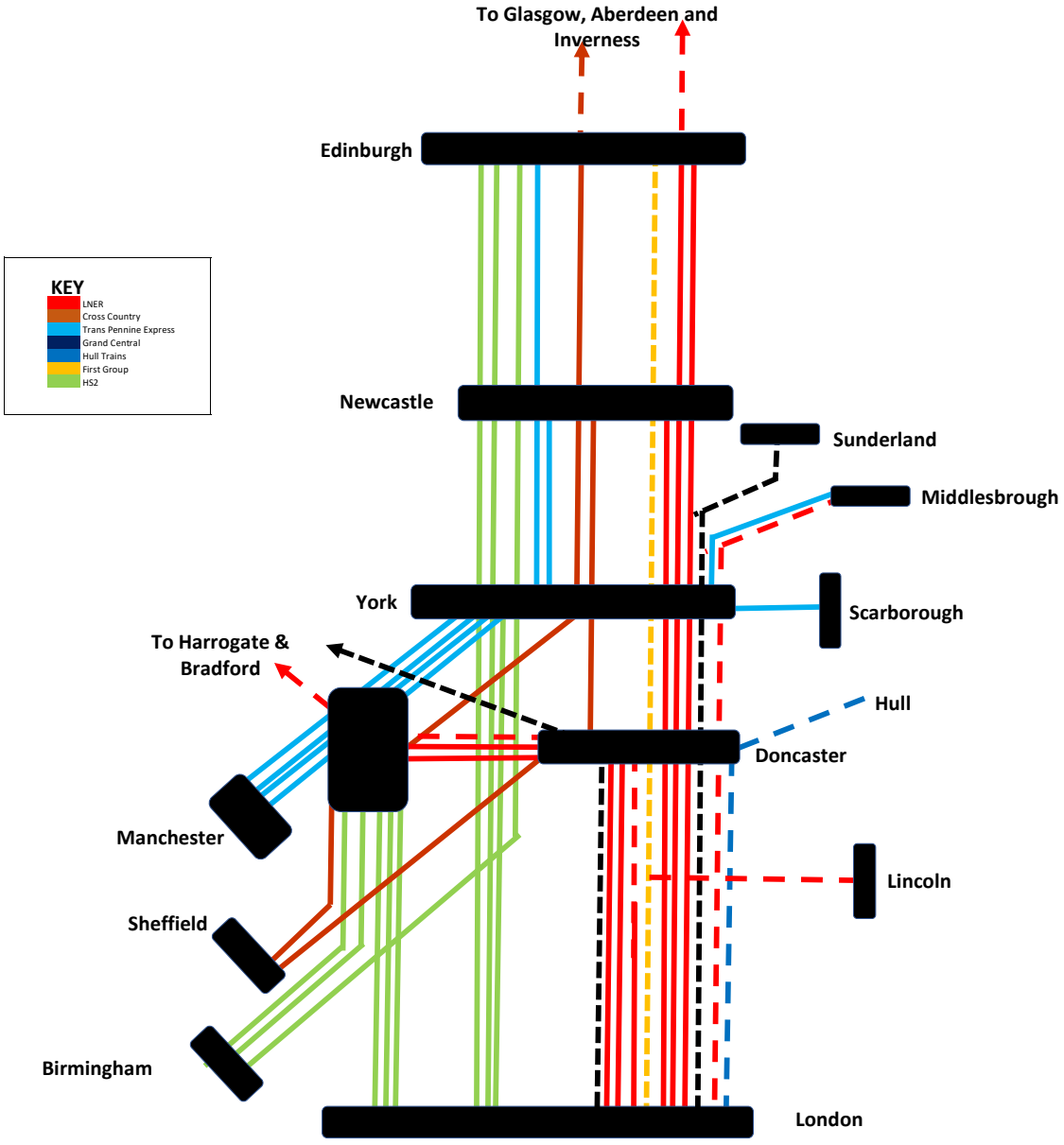
9.3.2 This would require a new high speed rail alignment north of Newcastle which would require major investment.

9.4 Scheme Costs

9.4.1 The infrastructure enhancements between Newcastle and Edinburgh would require a new rail alignment of approximately 112km in length. Using estimated bypass cost per km for interventions on the network in the area[7], the cost of this infrastructure would be approximately £9.5bn.

[7] Broad options for upgraded and high speed railways to the North of England and Scotland, HS2 Ltd, March 2016.

Figure 11. Proposed Service Pattern



9.5 The Wider Economic Impacts of Test B3

9.5.1 Within this section we consider the wider economic impacts of completing HS2 Phase 2 plus additional schemes to reduce journey times between York and Edinburgh. We estimate that this option would generate around **£541m** of GVA per annum over the existing service, and **£367m** per annum more than the timetable to be delivered from 2021.

9.5.2 The table below presents a summary of the results.

Table 17. GVA Impacts of Test B3 by ECMA Region

ECMA AREA	GVA IMPACT (£M PER ANNUM)	%
London	£189	35%
Southern Area	£9	2%
Central Area	£13	2%
Northern Area	£241	45%
Scotland	£34	6%
HS2 Stations	£55	10%
Total	**£541**	**100%**

9.5.3 The results presented in Table 12 show a similar pattern to Test B1 and B2. However the results do show an increase in the absolute values associated with Scotland and the north of England, although the proportion accruing to Scotland remains low.

9.5.4 Relative to Test B1, an additional **£86m** of GVA is generated per annum; this is 17% above that generated by HS2 without any additional works. As with Test B2, there will be a number of complementary but unquantified benefits in addition to the HS2 impact, these include:

- Benefits to Northern Powerhouse Rail services between the North West and Newcastle, with the potential to extend services to Edinburgh
- Improved connectivity between the west of Scotland and the North East and Yorkshire & Humber, provided by services additional to those operating as part of the HS2 timetable
- Opportunity to reconsider the development of the West Coast Mainline with the potential to amend the HS2 service to reduce journey times by removing the need for Glasgow and Edinburgh portions of London – Scotland services to divide/attach at Carstairs
- Further benefits from stations north of Edinburgh if services such as Inverness – London were routed via the new route between Newcastle and Edinburgh.

9.5.5 Table 13 shows the top 10 flows that utilise the HS2 route and/or the enhanced infrastructure north of York.

Table 18. Top 10 GVA Increases

RANK	FLOW	GVA IMPACT (£M PA)
1	Leeds – London	£104
2	Newcastle – London	£95
3	Bradford – London	£48
4	York – London	£21
5	Newcastle – Birmingham	£19
6	Edinburgh – Newcastle	£14
7	Edinburgh – London	£12
8	Newcastle – Nottingham	£12
9	Darlington - London	£8
10	Edinburgh – Leeds	£7

9.5.6 The top 10 flows are very similar to those presented in Test B2; the table below shows that this further improvement in services between Edinburgh and Newcastle generates an additional £13.5m per annum.

9.5.7 The table below presents the results divided into “core” and “associated” route sections.

Table 19. Results divided by Core & Associated Routes

STATION TYPE	AREA	GVA £M PA	%
London		£189	35%
Core Stations	South	£8	1%
	Central	£3	0%
	North	£175	32%
	Scotland	£27	5%
Associated Stations	South	£1	0%
	Central	£9	2%
	North	£66	12%
	Scotland	£7	1%
HS2		£55	10%

9.5.8 The split of results by geography are similar to those presented in tests B1 and B2. As noted above, additional benefits will also be generated through further complementary service changes relating to NPR and services in Scotland.

9.6 Appraisal of Option B3

9.6.1 We have conducted an appraisal of the incremental impact of Option B3 relative to Option B1 (HS2 without any additional infrastructure). As with Test A we have compared the estimate capital costs of investment with the wider economic impacts. As before it should be noted

that this assessment excludes both additional operating costs but excludes user benefits and revenues to train operators. The table below presents the results of this process. The values presented are discounted to 2010 values and include the deflation and discounting of costs and benefits so figures vary from those presented above.

Table 20. Test B3 Appraisal of Capital Costs and Wider Economic Impacts (2010 values)

	TEST B3 IMPACTS
Present Value of Costs	£2.84bn
Present Value of Benefits	£2.99bn
Net Present Value	£0.15bn
Benefit Cost Ratio	1.05

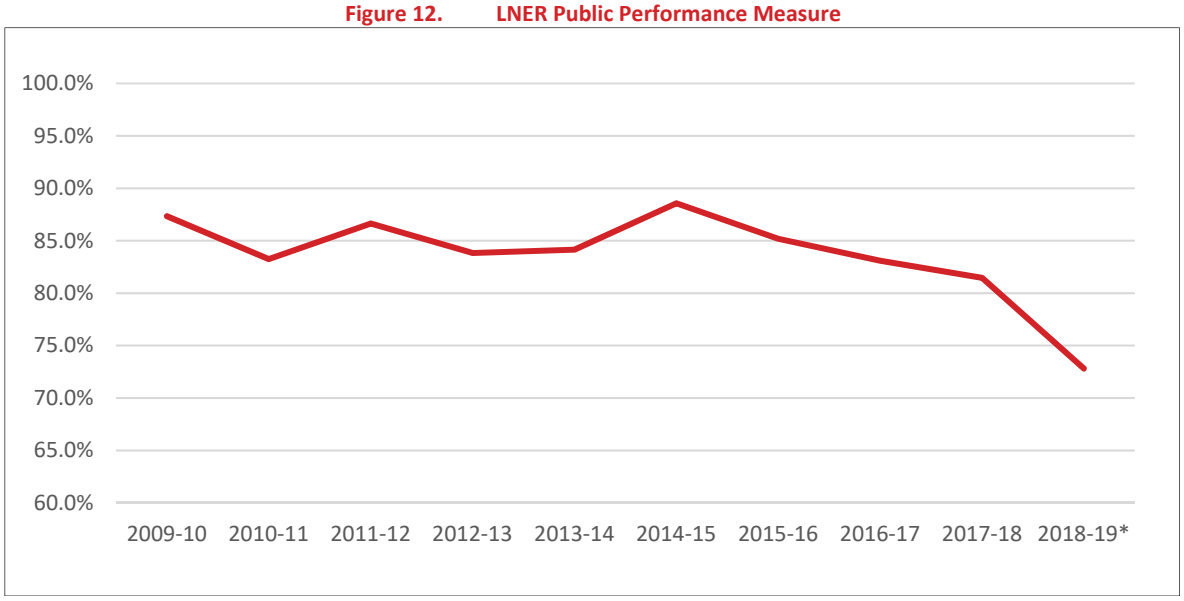
9.6.2 The results indicate that extending investment to Edinburgh still represents value for money with a return of £1.05 for every £1.00 invested, without direct user benefits, revenues or the impact of other complementary service development such as Northern Powerhouse Rail.

10. RELIABILITY

10.1.1 In addition to assessing the impact on the wider economy of changes to the timetable we have also considered the impact of improvements in the reliability of services. This stems from two issues; the first being the gradual decline in the punctuality and reliability of services in the ECML over recent years. This is part of wider industry issues, but is particularly pronounced on the ECML.

10.1.2 The figure below presents the public performance measure of service now operated by LNER since 2009.

Figure 12. LNER Public Performance Measure



10.1.3 The figure is particularly poor in the final period as a result of the impact of timetable problems with GTR and Northern services during 2018, but even allowing for this it can be seen that punctuality has dropped significantly.

10.1.4 The second issue relates to a perception that the ECML is particularly prone to suffering major incidents that cause the service to stop for long periods of time associated with the relative under-investment in the route. This is most-often seen in major overhead line dewirement events, but can also be associated with other issues such as signal failures.

10.1.5 Within this section we have sought to examine what the impact of these issues might be on the economy.

10.2 Impact of Major Incidents

10.2.1 To provide an understanding of the scale of major incidents, we have examined data from Network Rail that presents the Top 10 largest incidents by four week reporting period. This identified that across 2018 there were 12 incidents that made Network Rail's weekly "top-10" and may therefore be declared to be major incidents. This equates to one major service disruption every month.

10.2.2 Although the locations of any future incidents may vary the pattern of major incidents by ECMA area is as presented in the table below.

Table 21. Location of Major Incidents

ECMA AREA	NO. INCIDENTS
South	6
Central	3
North	2
Scotland	1

10.2.3 It is interesting to note that 75% of major incidents occur south of Doncaster, this may reflect known issues with overhead live wires between Doncaster and Peterborough (where three incidents occurred) but also reflects the greater scope for causing delay on busy sections of route with limited and complex opportunities for diverting services, resulting in many services being cancelled each time there is an incident.

10.2.4 To quantify the impact of these major incidents we made a series of simple but robust assumptions:

- That each major incident equate to a full loss of service for an entire day (this is an overestimate in the case of these incidents, however there are likely to be further incidents not included here that caused disruption to morning peak services and therefore will have heavily impacted on passengers decision to travel when making trips where they return in a day.
- That all flows within or starting/terminating within the geographical area of the incident will be impacted
- That for those flows impacted the monetary value lost for each incident would equate to 1/365 of the annual value of that flow based on the service provided in the current (2019) timetable.

10.2.5 The approach presented may be simplistic but is designed to reflect the fact that not all incidents that have an impact on peoples decision to travel will be included in the Top 10 incidents list provided by Network Rail. For example passengers may be put off making a journey if an incident (such as an engineering possession overrun) occurs early in the day and would prevent them completing their plans even if the incident clears later in the day.

10.2.6 The table below present the estimated value of major incidents to the economy .

Table 22. Wider Economic Impact of Major Incidents on ECML

ECMA AREA	GVA (£M)
South	£30.55
Central	£3.15
North	£11.81
Scotland	£0.77
Total	**£46.28**

10.2.7 It can be seen that the total value of incidents may have a large absolute impact on the economy as a whole with a potential GVA impact of around £46m per annum. Clearly it is unrealistic to expect that all of these incidents will be resolved, but given the scale of cost to the economy, a good case can made for additional investment in reliability to reduce the scale of this impact.

10.3 Improving Punctuality

10.3.1 We have also given consideration to the impact on the wider economy of improving the general punctuality and reliability of services on the ECML. To examine this we have again employed a series of assumptions to address a potentially complex issue.

10.3.2 The approach we have taken to assessing reliability is as follows:

- We have assumed that when planning journeys all passengers have a level of contingency within their plans and we have assumed that this is 10 minutes. The implications of this is that passengers will be indifferent to delays up to 10 minutes.
- Using Moving Annual Average Public Performance Measure Data, we have identified weighted average across ALL passengers based on the proportion of services delayed by more than 10 minutes or cancelled. When divided across all passengers (including those where there were no delays or delays under 10 minutes), an average delay of 6.55 minutes was identified.
- We have considered the impact on the economy of an improvement in PPM which saw a reduction of 50% in the level of delay accrued that is over 10 minutes, thus lowering the average delay per person to 3.27 minutes.
- We have applied the 6.55 and 3.27 minute tests to our Wider Economic Impacts model, treating them as additional journey times.

10.3.3 Based on the above assumptions, we estimate the impact on the economy of the existing level of punctuality relative to a halving in delays over 10 minutes to be worth **£62.8m** per annum to the wider economy for flows primarily served by LNER services. This figure will incorporate the impact of the **£46.28m** per annum figure identified above that deals with major incidents, as the impact of major incidents will be incorporated into the performance figures we have used.

10.3.4 It can therefore be seen that the impact of poor performance is worth a substantial amount each year, representing for example around 1/3 of the value of the proposed timetable improvements in 2021 examined in Test A.

11. FURTHER DEVELOPMENTS

11.1.1 This study has examined a number of substantial improvements to services on the East Coast network, including the delivery of committed service changes in the short term and the impact of HS2 and associated schemes in the long term. There are however a number of further developments that might be considered to ensure that the East Coast Network can develop to its full potential.

11.1.2 The most significant opportunity for further development relates to the re-use of released capacity south of York following the completion of HS2. This represents the greatest opportunity for 150 year to reshape the role of this part of the route. There are a number of specific opportunities that emerge from this, including:

- Opportunities to integrate with the proposed East-West Rail Central section with either an interchange at Sandy or even direct links onto the route
- The opportunity to run direct services to Cambridge from the Yorkshire & Humber area
- Refocussing services around the needs of the economies of the Central & Southern ECMA stations
- Opportunities to develop more and faster direct services to Hull, Lincoln and other destinations

11.1.3 In advance of HS2 opening, there may be other opportunities to develop services further. The delivery of the new Azuma fleet to LNER provides the opportunity in the medium term to redefine the approach to operating services, with greater scope for portion working of services to provide enhanced connectivity to a range of destinations. In Scotland for example a stakeholder aspiration to develop enhanced services to Inverness might be achievable by extending portions of Aberdeen services to Inverness via Elgin, providing settlements in North East Scotland with enhanced connectivity to England. Similarly connectivity to Perth, Stirling or Glasgow might be improved by extending portions of trains that otherwise terminate at Edinburgh onwards, providing improved links.

11.1.4 A final issue where there is likely to be a case for further development is the issue of punctuality and reliability. The East Coast route is complex to operate, and despite ongoing recent investments there are still a number of bottlenecks that impact on the operation of the railway. Notable examples on the southern part of the route include the Welwyn Gap (where the railway reduces from four to two tracks for a short distance), the Newark Flat Crossing and Doncaster station. Whilst recent investments will provide additional capacity for the new timetable these remaining bottlenecks will be stretched further with more trains passing through them increasing the risk of performance issues, this issue is compounded at the south of the route by the operation of Thameslink services where there is the potential to import and export delays across the south of England via the Thameslink core. Appended to this report is a summary of key schemes on the ECML that might help to deliver capacity and reliability improvements.

11.1.5 Further investment in such schemes to enhance capacity and reliability would continue to benefit the East Coast corridor economy after HS2 opens, as they would provide additional flexibility and capacity when services are re-planned.

11.1.6 Overall there are a range of opportunities to further enhance the East Coast Network to help it support the development of the economy within tis catchment.

12. CONCLUSIONS

12.1.1 This report has examined future developments on the ECML and their impact on the wider economy of the area it serves. The report has shown that there is substantial value to the economy of developing services, both from forthcoming changes to the timetable to be delivered by LNER and others along with longer term investment in transformational schemes such as HS2.

12.1.2 The report has also identified that there is further substantial value from smaller and earlier investments in improving the reliability of services, both by reducing the number of major disruptive incidents and by improving background levels of punctuality and reliability.

12.1.3 The table below summarises the wider economic impact of changes to services and infrastructure.

Table 23. Wider Economic Impact of Services

	2021 TIMETABLE CHANGE	HS2	HS2 PLUS YORK – NEWCASTLE INVESTMENT	HS2 PLUS YORK – EDINBURGH INVESTMENT
TOTAL GVA PA	£174m	£454m	£493m	£541m
Difference from 2021 Changes	-	£280	£320	£367m
Difference from HS2	-	-	£40	£87m

12.1.4 It can be seen that the impact on the economy is substantial, with the best-case generating approaching £600m per annum of GVA. Inevitably there will be a cost associated with developing and delivering these options, and the table below presents indicative BCRs comparing capital costs with wider economic impacts discounted over the life of each option. It should be noted that these figures underestimate the full impact of these developments, as there are a number of complementary services using this infrastructure that have not been considered in this analysis; for example, north of York there may be benefits associated with Northern Powerhouse Rail services, whilst south of York there will be benefits arising from the reuse of released capacity.

12.1.5 The table below summarises the BCRs for the interventions, with the exception of HS2 where it is difficult to disentangle the East Coast specific costs and benefits of HS2 from other costs and benefits of HS2.

Table 24. Wider Economic Impact and Capital Cost Appraisal

	2021 TIMETABLE CHANGE	HS2 PLUS YORK – NEWCASTLE INVESTMENT	HS2 PLUS YORK – EDINBURGH INVESTMENT
Capital Costs (2010 values)	£0.49bn	£1.67bn	£2.84bn
Wider Economic Impacts Discounted to 2010	£1.35bn	£2.12bn	£2.99bn
Benefit Cost Ratio	**2.73**	**1.26**	**1.05**

12.1.6 The table shows that the forthcoming changes to the timetable represents excellent value for money in terms of their impact on the wider economy over the period to the scheduled start of HS2 services in 2034. Whilst it is not possible to assess the East Coast impact of HS2 in isolation using this methodology, it is possible to assess the incremental impacts of investment north of York to support HS2. This shows that the additional investments will represent value for money over a 60 year period form 2034, even without considering the benefits to non-East Coast services.

12.1.7 In terms of reliability, we have found that investment in reliability improvements also have the potential to generate substantial benefits for example major incidents cost the economy around £46m per annum whilst reducing the number of delays over 10 minutes by half would generate around £62m of addition GVA per annum.

12.1.8 Going beyond forthcoming timetable changes and transformational investments in HS2 there are further opportunities to develop the ECML to support the economy of the East Coast corridor through the reuse of capacity and extension of services to new destinations. Investments made now wll bring benefits over many years through improved reliability and flexibility in planning over and above the benefits from UK-wide projects such as HS2.

12.1.9 The main messages emerging from this work are:

- The investments being delivered now to serve the 2021 timetable change will deliver value-for-money support for growth in the economy
- There is a good case for complementary investment in the route north of York to support both HS2 and NPR services.
- There is a need to grasp the opportunity of released capacity from HS2 to redefine the role of the ECML south of Doncaster
- There is agood case for incremental investment in smaller schemes to improve reliability; these will also willsupport long-term growth through providing the capacity and flexibility to develop new and improved services in the longer term.

APPENDIX A – STATIONS INCLUDED IN MODEL

STATION	ECMA AREA	STATION TYPE
London Euston	LONDON	LONDON
London Kings Cross	LONDON	LONDON
Huntingdon	South	CORE
Peterborough	South	CORE
Stevenage	South	CORE
Cambridge	South	ASSOCIATED
Doncaster	Central	CORE
Grantham	Central	CORE
Newark North Gate	Central	CORE
Retford	Central	CORE
Cleethorpes	Central	ASSOCIATED
Grimsby Town	Central	ASSOCIATED
Lincoln Central	Central	ASSOCIATED
Scunthorpe	Central	ASSOCIATED
Alnmouth	North	CORE
Darlington	North	CORE
Durham	North	CORE
Leeds	North	CORE
Morpeth	North	CORE
Newcastle	North	CORE
Wakefield Westgate	North	CORE
York	North	CORE
Bradford Yks BR	North	ASSOCIATED
Eaglescliffe	North	ASSOCIATED
Halifax	North	ASSOCIATED
Hartlepool	North	ASSOCIATED
Huddersfield	North	ASSOCIATED
Hull	North	ASSOCIATED
Keighley	North	ASSOCIATED
Malton	North	ASSOCIATED
Middlesbrough	North	ASSOCIATED
Northallerton	North	ASSOCIATED
Scarborough	North	ASSOCIATED
Selby	North	ASSOCIATED
Skipton	North	ASSOCIATED

STATION	ECMA AREA	STATION TYPE
Sunderland	North	ASSOCIATED
Thirsk	North	ASSOCIATED
Berwick-upon-Tweed	Scotland	CORE
Dunbar	Scotland	CORE
Edinburgh	Scotland	CORE
Aberdeen	Scotland	ASSOCIATED
Arbroath	Scotland	ASSOCIATED
Aviemore	Scotland	ASSOCIATED
Dunblane	Scotland	ASSOCIATED
Dundee	Scotland	ASSOCIATED
Dyce	Scotland	ASSOCIATED
Elgin	Scotland	ASSOCIATED
Falkirk BR	Scotland	ASSOCIATED
Forres	Scotland	ASSOCIATED
Gleneagles	Scotland	ASSOCIATED
Huntly	Scotland	ASSOCIATED
Inverness	Scotland	ASSOCIATED
Inverurie	Scotland	ASSOCIATED
Keith	Scotland	ASSOCIATED
Kingussie	Scotland	ASSOCIATED
Kirkcaldy	Scotland	ASSOCIATED
Leuchars	Scotland	ASSOCIATED
Montrose	Scotland	ASSOCIATED
Nairn	Scotland	ASSOCIATED
Pitlochry	Scotland	ASSOCIATED
Stirling	Scotland	ASSOCIATED
Stonehaven	Scotland	ASSOCIATED
Birmingham	HS2	HS2
Nottingham	HS2	HS2
Sheffield	HS2	HS2

APPENDIX B – FUTURE SCHEMES

The table below presents a list of potential intervention on the ECML that might hep to address either capacity or reliability and their current status.

SCHEME	ROLE	STATUS
King's Cross Remodelling	Capacity and Performance	On going
Werrington Jn Grade Separation	Freight & Passenger capacity	Under construction
Power Supply Upgrade	Allows operation of IET trains and additional services	Complete
Stevenage Turnback	Capacity for GTR	Completion by 2021
Darlington Station Upgrade	Capacity for local and long distance services	Target completion by 2023
Newcastle Platform Lengthening	Longer trains	By 2024
York Station Upgrade	Additional platform capacity and improved operation of existing platforms	Not committed
Doncaster Station Upgrade	Increased capacity and improved station operation	Not committed
Digital Railway	Introduction of ETCS between London and Peterborough to increase line capacity	Scheme under development
Welwyn Gap	Complete infrastructure intervention to provide four track between Digswell Jn and Woolmer Green Jn	Not committed
Huntingdon – Peterborough Four Tracking	Reinstate slow lines on both up and down lines between Peterborough and Huntingdon to increase capacity	Option pursued by Network Rail but not currently committed
Newark Flat Crossing	Removal of flat crossing would increase capacity and remove a speed restriction for ECML trains and increase capacity between Lincoln and Nottingham	Not committed

SCHEME	ROLE	STATUS
Leeds Station Capacity	Increased platform capacity at Leeds to provide capacity for local services and LNER services to Harrogate and Bradford	Under construction
Enhanced capacity and reduced journey times between York & Newcastle	Reduce journey times between Newcastle and York and increase capacity through a series of major interventions	Not committed
Reduced journey times between Newcastle and Edinburgh	Provide transformational reductions in journey times between Newcastle and Edinburgh with a major intervention	Not committed

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