

The Case for High Speed Rail to the Three Cities

A report for *emda*

Ove ARUP and Partners Ltd

November 2009

This work, with the exception of logos, photographs and images and any other content marked with a separate copyright notice, is licensed under a [Creative Commons Attribution 2.0 UK: England & Wales License](#)

The use of logos in the work is licensed for use only on non-derivative copies. Under this licence you are free to copy this work and to make derivative works as long as you give the original author credit.

The copyright is owned by Nottingham Trent University.



This document forms part of the *emda* Knowledge Bank

East Midlands
Development Agency

**The Case for High
Speed Rail to the Three
Cities**

Final Report

FINAL

ARUP

East Midlands
Development Agency

**The Case for High
Speed Rail to the Three
Cities**

Final Report

November 2009

Ove Arup & Partners Ltd
Admiral House, Rose Wharf, 78 East Street, Leeds LS9 8EE
Tel +44 (0)113 2428498 Fax +44 (0)113 2428573
www.arup.com

This report takes into account the particular instructions and requirements of our client.
It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party

Job number 211226-00

Job title	The Case for High Speed Rail to the Three Cities	Job number	211226-00
-----------	--	------------	-----------

Document title	Final Report	File reference	
----------------	--------------	----------------	--

Document ref

Revision	Date	Filename	Draft Report FB.doc		
Draft 1	13/11/09	Description	First draft		
			Prepared by	Checked by	Approved by
		Name	Team	Tom Bridges	Tom Bridges
		Signature			
Draft 2	23/11/09	Filename	Draft Report 23 11 09.doc		
		Description			
			Prepared by	Checked by	Approved by
		Name	Team	Tom Bridges	Tom Bridges
		Signature			
Final	30/11/09	Filename	Final Report 30 11 09ISSUE.doc		
		Description			
			Prepared by	Checked by	Approved by
		Name	Team	Tom Bridges	Tom Bridges
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			

Issue Document Verification with Document

Contents

	Page	
1	Introduction and Summary of Conclusions	1
	1.1 Introduction	1
	1.2 Main Conclusions	1
	1.3 UK High Speed Rail context	2
2	High Speed Rail: a project to Deliver National Economic Transformation, The Three Cities Context	3
	2.1 The Three Cities	3
	2.2 Economic Restructuring	3
	2.3 Linking into the London “Mega City” Region	4
	2.4 Strengthening the Economic Contribution of the City Regions of the Midlands and the North of England	6
	2.5 Delivering the Region’s Growth Aspirations and Alleviating Deprivation	6
	2.6 The Potential Role of High Speed Rail	7
3	The Wider Economic Benefits of a High Speed Rail Link Serving the Three Cities	8
	3.1 The Economic Case for High Speed Rail to the Three Cities	8
	3.2 Evaluation Methods	8
	3.3 Rationale for High Speed Rail	9
	3.4 The UK High Speed Rail Agenda	9
	3.5 Evaluating the Impacts	10
	3.6 Wider Economic Benefits	11
	3.7 Estimate of the Wider Economic impacts of High Speed Rail	11
	3.8 Wider Impacts and Issues	14
4	The Case for Improvements to the Midland Main Line	18
	4.1 Introduction	18
	4.2 Travel Markets and the Existing Service Pattern	18
	4.3 Options to Enhance Existing Routes	20
	4.4 Wider Economic Benefits of Midland Main Line Upgrade	22
	4.5 Conclusions	23
5	Developing a Coherent 20 to 30 Year Rail Strategy for the Three Cities	25
	5.1 Introduction	25
	5.2 The Case for Upgrades to Existing Lines	25
	5.3 Interfaces Between a Possible High Speed and the Conventional Rail Networks	26
	5.4 Delivery Risks and Timescales	27
	5.5 Station Location	28
	5.6 Issues in Relation to Alignment of Wider Policies	28
	5.7 Conclusions	29

1 Introduction and Summary of Conclusions

1.1 Introduction

This report has been commissioned by the East Midlands Development Agency (emda) to provide evidence on the case for the Three Cities of the East Midlands, Derby, Leicester and Nottingham to be part of a UK high speed rail network. This report outlines the economic benefits of the introduction of a high speed rail link serving the Three Cities, coupled with upgrades to the existing lines, to form a coherent strategy for the rail network over the next 20 to 30 years.

The focus of the work has been to consider the wider economic and policy case for high speed rail to serve the Three Cities, not to undertake a detailed assessment of route options. The work has comprised a high-level assessment of the possible journey time savings between main cities. This has been based on outline scenarios for the upgrade and electrification of the existing Midland Main Line route, as well as for new high speed rail routes. A high level quantification of the wider economic benefits has been undertaken. A workshop was held with stakeholders from the Three Cities and the region to discuss strategic policy issues.

1.2 Main Conclusions

- High speed rail should be considered as part of a coherent strategy for the development of the wider rail network over the next 20-30 years – the development of high speed rail lines and the upgrade of existing rail routes are not mutually exclusive options, and it will be important for the Three Cities and other parts of the East Midlands to secure upgrades to the existing Midland Main Line to improve connectivity and address capacity constraints in the short to medium term.
- In addition to substantial standard transport user benefits and a strong Benefit to Cost Ratio, it is estimated that enhancements to the Midland Main Line could deliver an additional £15 million to £19 million in annual productivity gains, which is equivalent to £0.5 billion to £0.7 billion over a typical 60 year appraisal period, discounted to 2002 prices. Over half of these benefits would be to the Three Cities, and the rest to other places on the route, including North Northamptonshire, and Sheffield.
- For locations that will not have a station on the high speed network (a characteristic of high speed rail is that it stops infrequently) there would also be important benefits resulting from the new high speed line providing capacity relief for existing rail routes. This includes the Midland Main Line, as well as the East Coast and West Coast Mainline that also serve parts of the East Midlands. These benefits would be increased through upgrades to these existing lines.
- High speed rail should be developed as a project to deliver national economic transformation, helping improve the connectivity of main urban centres in the midlands and the north with the key economic zone of London, as well as strengthening links between city regions to create a stronger non-London economic zone as part of an approach to develop a more diverse and better distributed UK economy.
- There is a positive and strong economic case for a high speed rail link serving the Three Cities, based on the size and scale of the three housing market areas of Nottingham, Derby and Leicester which combined have a population of 2.2 million and around 1 million jobs. A new high speed line to the Three Cities would deliver substantial standard transport benefits. In addition to standard transport benefits, the enhanced connectivity provided by a high speed line to the Three Cities could deliver annual productivity gains of around £51 million (within a sensitivity range of £40 million to £53 million depending upon assumptions and options) to the Three Cities, and other cities along the route, including London. These benefits would be worth £1.9 billion (within a

sensitivity range of £1.4bn to £2.0bn) over a typical 60 year appraisal period and discounted to 2002 prices. This estimate is based on using existing methods for assessing Wider Economic Benefits, which are best suited to quantifying the benefits of commuter rail routes, and may not capture all of the transformational benefits of long-distance high speed routes related to business competitiveness and supply-chains.

- In addition to considering how to deliver improvements to long distance routes, it will also be important to ensure that local, commuter connections are also enhanced to support the economy of the Three Cities. To ensure that the maximum benefits are accrued from the creation of a high speed line it is vital to ensure that there is good sub-regional and local connectivity across the Three Cities to the main rail stations.
- Whilst the first phase of the national high speed network looks very likely to be from London to the West Midlands, in the development of a longer term strategy options need to be kept open to ensure that the network can serve the East Midlands, Yorkshire and the North East.
- The choice of High Speed Rail station location in the Three Cities is an important issue. An out-of-centre parkway station would generate faster train journey times than a city centre location, although it would not necessarily access the location where people, particularly business travellers, want to travel to and from. Whilst such a location would be accessible by car and could have ample parking it would have major dis-benefits for non cars users. A parkway station would not link o the economy of a specific city in the manner that a city centre location would. Bringing people directly into a city centre there are greater opportunities to achieve economic benefits in a way that goes beyond facilitating commuter flows to London.

1.3 UK High Speed Rail context

High Speed Rail refers to passenger trains that operate at speeds up to 400km/h, mainly on dedicated alignments, although in many cases with the ability to also travel at slower speeds on shared alignments. With the exception of High Speed 1 between London and the Channel Tunnel, the maximum speed on UK rail routes is just 200km/h. The first UK High Speed Rail corridor (HS1) was opened on time and on budget in 2007, transforming journey times between London and Paris / Brussels. With intermediate high speed stations at Stratford and Ebbsfleet and domestic services on routes to and from north and east Kent, the scheme is also facilitating the regeneration of the Thames Gateway and Kent coast.

A new rail route between London, the midlands and north of England will be needed to address forecast capacity constraints on existing main north-south rail lines. There is evidence that a new high speed route would have a stronger business case than a slower conventional rail route

The Government has been considering the case for a high speed rail network across the UK. High Speed Two (HS2) Ltd is a company established by the Government earlier in 2009 to examine the potential benefits and costs of high speed rail. HS2 Ltd's primary objective is to identify a preferred route between London and the West Midlands and produce a detailed business case for this. A secondary objective is to advise more broadly on potential further UK high speed rail route options. HS2 Ltd is expected to report by the end of 2009. This report provides information to support the response to HS2 from the East Midlands region.

2 High Speed Rail: a project to Deliver National Economic Transformation, The Three Cities Context

2.1 The Three Cities

The Three Cities area has a population of over 2.2 million, which has grown by 5% since 1997. This is the main concentration of population in the East Midlands region, which is projected to be England's fastest growing region in terms of population.

The Three Cities and their travel to work areas are the location for over 1 million jobs. The area is the economic powerhouse of the East Midlands region and its largest concentration of high value sectors, with over 60% of the region's financial services jobs and 57% of its business services sector. The Three Cities contain 45% of the region's businesses and each city has developed specialisms in different sectors of the economy. By employees, Leicester Housing Market Area (HMA) is the largest with 435,900 jobs, meanwhile Nottingham HMA contains 382,200 and Derby HMA has 205,800. The three districts of Derby, Leicester and Nottingham alone, irrespective of the other authorities within the Three Cities are all within the top 30 districts by employees in Great Britain.

Within the Three Cities area there are a wider range of places contributing to the success of this functional economic area. The sub-regional centres of Coalville, Hinckley, Hucknall, Ilkeston, Loughborough, Mansfield-Ashfield, Market Harborough, Melton Mowbray, and Newark in addition to other smaller market towns and villages play a part in facilitating the Three Cities' economy. The urban areas of Nottingham, Leicester and Derby drive the regional economy, and they are important hubs for employment, services and transport for the wider Three Cities area, which includes several smaller settlements.

Transport plays a key part in facilitating the economic success of the Three Cities. It enables the operation of labour markets by facilitating commuting flows to the main business centres. As well as linking the Three Cities together, the rail network in particular provides economically vital links to other parts of the region including Northamptonshire, as well as strategic links to London. Rail also provides connectivity to other City Regions such as Manchester, Birmingham, Leeds and Sheffield. This provides an opportunity to create a more powerful economic zone outside of the South East. However, the majority of these inter-urban regional rail links are slow, slower than many other core city connections in England. For example, the service between Nottingham, Sheffield and Leeds operates at an average speed of 36mph, the Nottingham – Manchester service at 43mph, and the Nottingham - Birmingham service at 44mph. These moderately short distances entail relatively significant journey times, limiting the agglomeration between the cities.

2.2 Economic Restructuring

The Three Cities have experienced significant change in recent decades in the shape and nature of their economic base as a result of the transition away from manufacturing employment. This has occurred in the context of changes in national economic geography and structure. Over the course of the last decade alone 1.2 million jobs have been lost in manufacturing in England and the continued vulnerability of this sector is illustrated through the severity of effects that have been felt as a consequence of the recession. Economic restructuring has left London as the main driver of the national economy through its dominance in the finance and business services and other knowledge based sectors. London has become the banking centre of the world and Europe's main business centre.

Building upon the opportunities presented by economic transformation the Three Cities have experienced economic growth over the course of the last 15 years, excluding recent financial conditions. The city of Nottingham's success is reflected by GVA per head being 32% above the national average and is even more significant in light of the fact that the regional average is 89% of the national average. Nottingham has a strong knowledge

economy and has been designated a Science City which is based on its expertise in science and technology. The city of Derby also has high GVA at 26% of the national average and has the highest proportion of people in employment per head in high technology industries. Derby has the fourth highest annual employment growth rate of all cities in the country, at 2.4%, (1995-2005). Leicester has traditionally had a considerable base in manufacturing. In recent years the economy has diversified. Following the opening of the Highcross shopping centre the city has been ranked by Venuescore as 11th most significant retail centre nationally. In 2004 Leicester had 1 job for each person in the resident working age group. This compares to the regional average of 0.8, reflecting the number of employment opportunities on offer in Leicester.

The rural characteristics of the region mean that much of the travel to work area for the Three Cities is made up of smaller settlements. Whilst the economy of the Three Cities has grown, the cities have faced challenges in attracting and retaining highly skilled people and their families. As a result there have been significant increases in commuting from outside the cities, with more people now travelling greater distances to access employment. This places greater pressures on the transport network to enable these patterns of movement and these levels of economic growth.

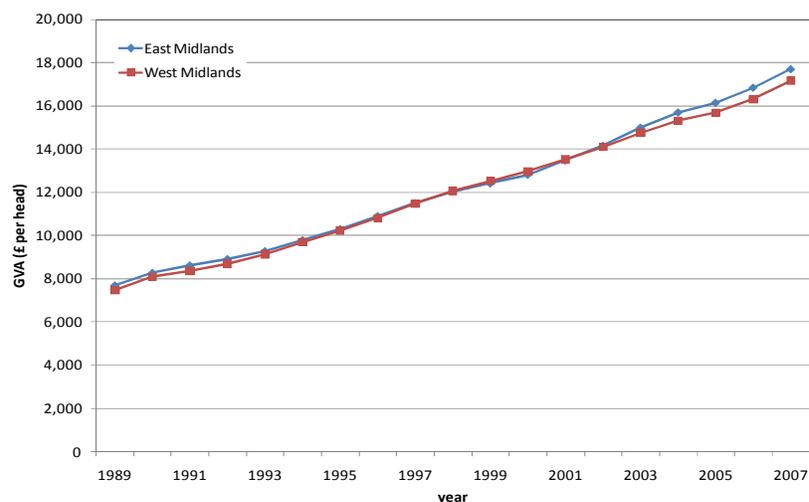
Investment in these cities and in the infrastructure that enables their growth is of central importance to ensure that they retain and enhance their position driving growth in the East Midlands. This will have a subsequent impact on the positions and success of the region and ultimately help close the gap that exists between the South East and other parts of the country.

2.3 Linking into the London “Mega City” Region

Creating strong and fast links to the national economic hub of London and international gateways such as Heathrow are vital to the success and prosperity of the Three Cities, and consequently the East Midlands Region. GVA in the East Midlands is the highest of all regions outside of the Greater South East and strengthening links to London could offer the potential to close this gap further and improve the financial prosperity of the region.

Over the last 5 years, the East Midlands has pulled away from the West Midlands in terms of relative productivity. This is shown in the figure below.

Figure 2.1: Change in GVA per head in the East and West Midlands



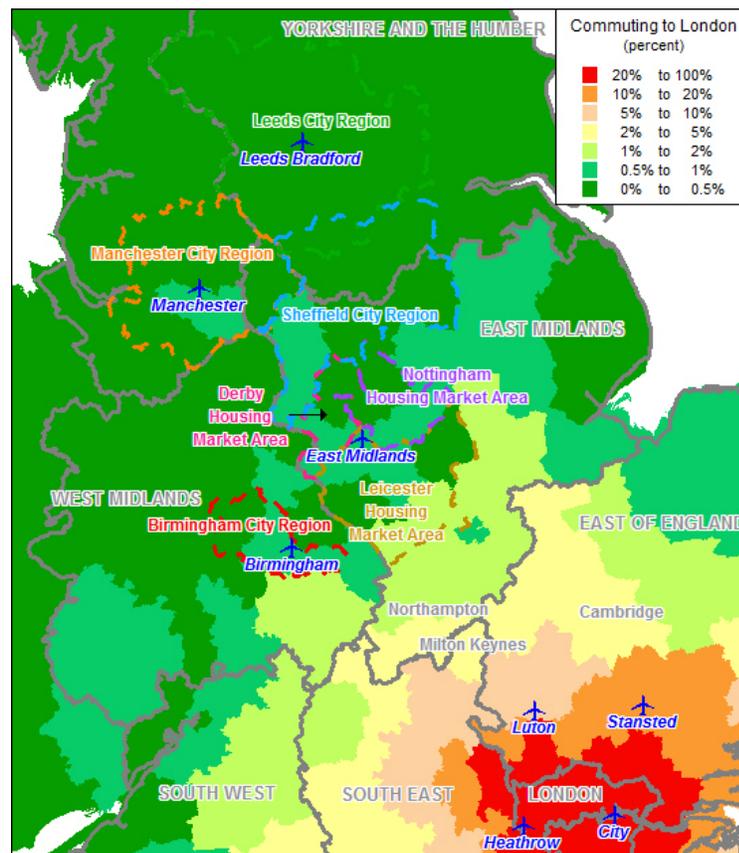
Source: ONS Regional GVA, December 2008 release

Transport links have become even more significant in recent years due to the economic transformation that has occurred through the growth of the knowledge economy, which is reliant on international global networks of international trade. The relative proximity of the

Three Cities to London, especially Leicester, means that there is the potential to bring them within the economic sphere of influence of London. As the map below shows, parts of the East Midlands region south of Leicester HMA can in some respects be considered part of the Greater South East mega-region already with higher levels of commuting to London than the rest of the region. This includes Northamptonshire which is part of the Milton Keynes South Midlands growth area. Evidence has illustrated that increased commuting to London is associated with increased prosperity, as it connects people with more and better paid jobs.

The benefits to the Three Cities of improved access to London are far wider than those that stem from increased commuting. London is at the heart of a growing “mega city” region with a population of 18.6 million¹, and stretching as far as Swindon, Northampton, Peterborough, and Bournemouth. The driver for the economy of this mega city region is the concentration of activity in central London in the key “world city” sectors of financial and business services, government and corporate headquarters, creative and cultural, tourism, and major public services such as education and healthcare. As these sectors have grown, more routine activities have been displaced into other smaller centres within the same polycentric “mega-city region”. For example, in centres in outer London and beyond (particularly those with good access by rail), business services sectors such law and accountancy show strong growth. Smaller firms locate and thrive in centres where rents and salaries are lower, successfully catering both for local demand but also for a London clientele. By improving transport links it may be possible for the Three Cities to become part of this functional economic area, strengthening their economic base.

Figure 2.2 Commuting patterns to London



Source: Census 2001 commuting data from NOMIS

Digital Map Data © Collins Bartholomew Ltd (2009) & Crown Copyright © Overview Mapping (2009)

¹ Arup (2005) Regional Futures: England's Regions in 2030

2.4 Strengthening the Economic Contribution of the City Regions of the Midlands and the North of England

There is potential to strength links between the Three Cities and other city regions in the midlands, the north, and the east of England. This could support the creation of a more dynamic and integrated economic zone outside of London that helps to re-shape the nature of the national economy. Current rail journey times and frequencies between some main cities are poor. The service between Derby and Leicester is in particular need of timetabling improvements to provide a more regular service.

In terms of more strategic routes there is a need to improve links to the M11 Growth Corridor and specifically Cambridge and Stansted and Yorkshire. For example, the average speed of the hourly direct rail service between Nottingham, Sheffield and Leeds is only 36mph, leading to a total journey time of almost two hours. Slow journey times between Leicester and Birmingham of almost an hour make this relatively short distance a significant and unattractive journey or commute by rail. Poor connections that feature a slow, infrequent and the lack of a direct service from Derby and Nottingham to Cambridge and Stansted limit the economic integration of these places. Strengthening the links between these places could enable people living in one of the Three Cities to commute to main business hubs in other adjacent city regions and support business travel, expanding the range of job and business opportunities available.

The prospect of high speed rail provides and opportunity to rethink the approach to economic development and the spatial distribution of different sectors across England. By adopting a strategic approach it may be possible to spread the benefits of growth and expansion more evenly, to help reduce the gap between the South East and the rest of the country. This should focus upon enhancing the strengths of locations such as the Three Cities, to create a strong economic zone outside of London that can compete on an international scale and work holistically with the economy of the UK as a whole. This could be based on a wider range of knowledge based services, including financial and business services in addition to advanced manufacturing and technology, health and education.

2.5 Delivering the Region's Growth Aspirations and Alleviating Deprivation

The East Midlands is projected to be the fastest growing region in England. In order to provide for this level of population growth there is significant housing growth planned. The East Midlands Regional Plan sets out a requirement for at least 324,100 homes to be built in the region between 2006 and 2026. There are a further additional 128,200 homes planned in Northamptonshire as part of the Milton Keynes South Midlands (MKSM) Growth Area; the largest growth zone in the country, with several key 'Growth Towns' located on the Midland Main Line. There are also a number of designated First Round and Second Round New Growth Points across the region. The 3 Cities and 3 Counties (6 C's) Growth Point is the largest of these and will accommodate 81,500 homes (included in the RSS total) by 2016. Delivering this planned level of housing growth will require general improvements to the region's infrastructure and will also necessitate new sources of employment.

In delivering high speed rail there is also significant potential to help alleviate the persistent pockets of deprivation that exist specifically within the Three Cities, and in other parts of the region. Nottingham City, for example, has the highest deprivation score in the region and includes some of the most deprived communities in England. By connecting people to more and better jobs it may be possible to address some of these areas and further enhance economic prosperity and quality of life across the whole of the Three Cities.

2.6 The Potential Role of High Speed Rail

Through the adoption of a joined up approach and by strengthening the connections between the Three Cities and Leeds, Manchester and Sheffield City Regions there exists the potential to create a more integrated economy that builds upon the diverse range of strengths of different city regions.

There is an opportunity to bring parts of the Three Cities within a relatively feasible daily commute of London with fastest journey times by high speed rail of 62 minutes. Whilst this would still not fall within the significant one hour of London marker it does make it a more feasible option for commuters. Furthermore it would make the Three Cities more economically connected to London, with potential to become part of the mega city region. Faster connections to Heathrow and rail connections to the continent by High Speed One would significantly enhance the economic competitiveness of city region outside London and the South East.

High speed rail could more widely offer the opportunity to create a more competitive economy comprising the city regions in the East Midlands and the north of England. Through the adoption of an approach that recognises and builds upon the different strengths within these city regions, facilitated by strong rail connections, it may be possible to create a stronger and more dynamic economy. Expanding and integrating the economies of these city regions could be achieved through new high speed rail connections in key locations, and by faster conventional rail services on existing routes making use of capacity freed up by the new high speed network. This should provide benefits to the Growth Towns of North Northamptonshire in terms of additional capacity and improved journey times to key centres in the East Midlands, and London.

High speed rail offers significant opportunities to facilitate the development of a stronger economic zone outside of London that would be driven by the city regions of the midlands and the north of England, as well as supporting and strengthening the economy of London and the South East.

3 The Wider Economic Benefits of a High Speed Rail Link Serving the Three Cities

3.1 The Economic Case for High Speed Rail to the Three Cities

Developing a high speed route to the Three Cities represents a strong economic case and would enhance the economic prosperity of the East Midlands region as a whole. It could:

- according to previous work², deliver substantial standard transport benefits of £29 billion and a positive Benefit to Cost ratio of 2.5 for the East Coast route;
- help transform the economy of the Three Cities by delivering a step change in journey times and capacity on rail routes to London, and to other key city regions;
- enhance and strengthen the role of the Three Cities as the key drivers of the regional economy and as a location for over one million jobs and 2.2 million people;
- improve transport connections from the region to London, addressing capacity constraints, improving line speeds;
- address the problems of poor rail links between main centres in the region and with key centres in adjacent regions including Yorkshire, the East of England and the West Midlands. Poor connectivity limits the ability of businesses to access markets and people to access jobs in adjacent city regions, limiting economic agglomeration benefits. This needs to include strategic links to Cambridge for example which currently does not have a direct service to Derby and Nottingham and line speeds to Leicester are slow;
- help to deliver the ambitious growth aspirations for the Three Cities and the Region more widely to realise the population projections, which estimate that the region will be the fastest growing in the country;
- improve links to key international gateways; and
- improve connections between the Three Cities themselves to support business clustering and the development of key sectors of the economy. This will expand the labour market and facilitate movement between the Three Cities and thus fundamentally positively impact upon the performance of the region as a whole.

3.2 Evaluation Methods

Whilst many reports have been published on the potential benefits of high speed rail, none have concluded comprehensively on the rationale for the investment or the correct evaluation methods. For example, an unresolved issue remains that the proposed high speed line through the West Midlands which reduces travel times to London to less than one hour could result in Birmingham becoming a commuter suburb of London and effectively being integrated into the Greater South East. This scenario and its effect on the economies of the Midlands and the North has not been assessed comprehensively by policy makers.

Similarly, whilst studies have considered the potential benefits of lines to the North West or Yorkshire or both, none have attempted to assess the potential detrimental effect a line going to one but not the other could have upon the future economic development of the north.

A conclusion from this project is that a strong economic case does exist for further high speed rail in the UK – using the DfT guidance on pure agglomeration and European examples highlights that it could result in real and significant benefits. However gaps in the analysis still exist which should be filled prior to deciding on route preferences.

² Atkins work on High Speed Rail for the Strategic Rail Authority, updated in 2008

3.3 Rationale for High Speed Rail

There are many reasons why the UK might want to build high speed rail across parts of the country and indeed eventually a complete UK network. However in making the case for high speed rail, different objectives are often confused and evaluation methods which value one aspect are compared against goals which have not yet been valued. It is therefore important to set out why high speed rail is needed and the intended benefits.

- **Congested existing transport network** – the UK rail network is already congested and parts are forecast to reach capacity in the near future. Even just on this basis, the case for a new rail network, at high speed, is strong.
- **Contribute towards environmental goals** – there has been and continues to be a desire to reduce our impact upon the environment. This requires more sustainable patterns of activity. High speed rail can contribute to these goals. Whilst not the main aim of high speed rail, moving demand away from domestic flights and towards rail would help in achieving these goals. However there are further considerations for potentially meeting environmental objectives from the delivery of high speed rail. These include whether the route serves Heathrow and the disbenefits losing local airports might have upon northern regions.
- **Transform economic geography** – much focus of the case for high speed rail is that it is needed for economic growth. However, economic growth encompasses many things. There is growth in city centres which is facilitated by transport which enables commuters to access those centres; there is growth in cities which is encouraged by linking between productive cities and fostering better business connectivity. There is also the goal to share growth more evenly across the UK, reducing the north-south divide and attracting investment across the UK. These goals are certainly not mutually exclusive but equally it is not clear that they are entirely complementary. Understanding which of these high speed rail is trying to achieve is of crucial importance for defining its route and phasing.
- **We are behind the rest of continental Europe** – parts of Europe have significant high speed rail services and most have plans to increase these networks in the future. In this respect, the UK is behind the rest of Europe. However this is not reason enough; the network needs to be planned thoroughly and all possible disbenefits as well as benefits taken into consideration in the planning process.

3.4 The UK High Speed Rail Agenda

3.4.1 High Speed One

The UK currently has just one high speed line, which links London with Paris via the Channel Tunnel Rail link. This is a multi-purpose route as it both serves international routes and domestic ones. The domestic services are to Stratford, Ebbsfleet, Ashford and Folkestone. With the exception of Folkestone, the travel times between these places are under 45 minutes once the domestic services are fully operational. This makes commuting between them via public transport considerably more attractive than previously. This attribute of the one and only existing high speed rail line is therefore rather distinctive from the proposed high speed rail lines linking the rest of the country.

3.4.2 High Speed Two

High Speed Two (HS2) Ltd is a company which was established by the Government earlier in 2009 to examine the potential benefits and costs of high speed rail. HS2 Ltd's primary objective is to identify a preferred route between London and the West Midlands and produce a detailed business case for this. Its secondary objective is to advise more broadly on potential further UK high speed rail route options, with UK regions invited to submit supplementary evidence. HS2 Ltd is expected to report by the end of 2009.

3.4.3 Greengauge

Greengauge is a public interest group set up to further the debate on high speed rail. It has recently reported on the case for a UK wide high speed rail network. This network was centred on the need for two alignments: one to the eastern side of the Pennines and the other to the west. The report concluded that high speed rail is needed to address two challenges – enhancing economic competitiveness across the UK, and improving the environmental sustainability of our transport system. The economic competitiveness element of their work rests on relieving future capacity constraints. It concludes that transformational journey times would alter business and residential location decisions, allowing more balanced growth across the country. This report used existing guidance in estimating economic impacts.

3.4.4 Arup and Volterra work for Leeds and Sheffield City Regions

Arup and Volterra undertook analysis which considered the case for high speed rail to Yorkshire. This used existing guidance in order to quantify benefits but also qualitatively discussed the wider unanswered questions for evaluating high speed rail.

3.4.5 Northern Way

The Northern Way's North-South Connections report considered the case for high speed rail to the north, via the midlands. This report concluded that there were strong cases for routes to serve both the western and eastern corridors. In fact, whilst the results were of a broadly similar magnitude for each corridor, the eastern alignment was proven to reap greater rewards. That report found that a western corridor would produce annual productivity gains to the South East, West Midlands and North West of £51m and the eastern corridor would produce gains to the East, East Midlands and Yorkshire of £53m, with further benefits also accruing to the North East, Scotland and London.

3.5 Evaluating the Impacts

Traditional transport appraisal techniques are widely accepted and are standard industry practise. These methods value the benefits of things such as capacity relief, time savings, reliability, frequency, accidents etc. Guidance on Wider Economic Benefits (WEBs) was issued subsequently which estimates the impact of transport investment upon business productivity and labour markets. This guidance resulted from the work done to assess the case for Crossrail, a new east to west rail link in London. This guidance, although recently altered, is now also relatively standard for assessing the economic impacts of large-scale transport investments.

The existing guidance from DfT on WEBs is intended to quantify the potential economic impacts of transport improvements upon business productivity. This guidance emerged following a particular type of investment (Crossrail) that increased the accessibility to a single key business area and as a result the guidance focuses upon the benefits of relieving capacity constraints to productive city centres.

High speed rail links can and often do improve accessibility to key business areas. The principal function of high speed rail, however, is often a different one: to transform the future development of the country's economic geography. If the delivery of high speed rail is accompanied by planning policies to support sustainable economic development, Examples from continental Europe and High Speed One (see section 3.8) suggest that it can have very positive impacts. The potential transformational impact of transport investment is not yet captured by current guidance.

The key limitation of existing techniques is that they assume as inputs the residents and jobs of the system. With these assumptions made, the models are often restricted in their ability to allow people to choose to live or companies to choose to locate elsewhere due to improved transport links. This can force implicitly a large degree of intransigence into the modelled system and means that these models are not fit for the purpose of estimating the

impacts of investment in wholly new transport links upon location decisions and the interconnectivity of towns, cities and regions.

In this work the existing guidance has been used to estimate high level quantitative estimates of the benefits of HSR but also qualitatively discuss the wider issues which are as yet unaddressed by the current methods of evaluation.

3.6 Wider Economic Benefits

Guidance from the Department for Transport on Wider Economic Benefits (WEBs) is intended to quantify the potential economic impacts of transport improvements upon business productivity.

One aspect of this methodology, 'pure agglomeration', estimates the increase in productivity for existing workers as a result of a higher density of workers being closer together. This is the element which has been used most widely in studies to date to assess the potential benefits of High Speed Rail.

The WEBs guidance emerged following a particular type of investment (Crossrail) that increased the accessibility to a single key business area (London) and as a result the approach is most appropriate for assessing the benefits of relieving (commuting) capacity constraints into productive city centres.

High speed rail links can and often do improve accessibility to key business areas and it is envisaged that the domestic services on HS1 will be used significantly for commuting into London, making the WEBs methodology very appropriate for assessing the benefits of that high speed line. However it is important to consider the ranges of travel times being effected by HSR before applying this methodology and interpreting the results.

It is generally accepted that journey times of under an hour begin to appeal as commuter routes, journey times up to 2-3 hours allow businesses to carry out face to face day meetings on a semi-regular basis and journey times of over 3 hours are associated with less frequent business travel, for which air travel begins to compete. Some commuting already exists from the southern parts of the region, and the potential for this activity to increase and become more popular should be a consideration for those assessing the case for high speed rail serving the midlands. However, in the context of the East Midlands, it is primarily the central bracket which high speed rail will impact upon – making it more practical to conduct day meetings between businesses in the East Midlands and London.

The 'pure agglomeration' element of the WEBs methodology captures this impact to a reasonable extent. It evaluates the productivity benefits of business centres becoming 'effectively' denser – that is to say that if there are 10 jobs in place A and 20 jobs in place B and they are 30 minutes apart, both places A and B become effectively denser by reducing the travel time between them as they have more ready access to the other place's labour market and business services.

For this study the 'pure agglomeration' method to assess the relative benefits to the Three Cities and wider East Midlands of options for high speed rail has been used. In summary, the analysis shows that high speed options could lead to annual productivity benefits to the East Midlands of between £20m-£30m with similar magnitudes of benefits also accruing to London.

3.7 Estimate of the Wider Economic impacts of High Speed Rail

3.7.1 Scenarios for assessment

For the purposes of this project an assessment was undertaken on the wider economic impacts of the High Speed North East (HS-NE) route proposed by Greengauge21. This would be a second dedicated high speed line (in addition to Greengauge 21's proposed High Speed North West to the West Midlands and North West) from London to the North

East via Cambridge, Nottingham, Sheffield, and Leeds. The options for a station location for Nottingham would either be the existing city centre Nottingham Midland station, or a new parkway station at Toton, to the west of Nottingham. The wider economic benefits of both options have been assessed. The following three scenarios were evaluated against the current situation:

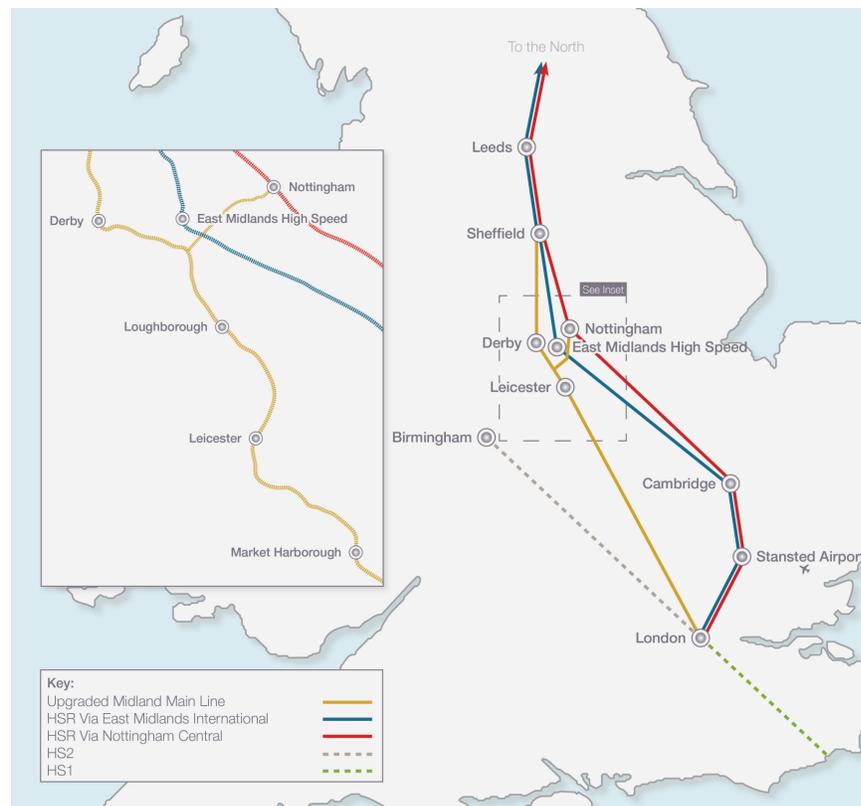
- High speed route via Nottingham;
- High speed route via a new station (possibly Toton); and
- Enhanced MML via electrification and line-speed improvements (see Chapter 4)

Journey time savings were estimated based on benchmarks from other routes and discussion with local transport experts, and used standard DfT guidance on productivity, elasticities and discounting to evaluate these options.

Greengauge identifies the need for a new parkway station at Toton instead of using the current East Midlands Parkway station. However, it is unclear from this report why this new station is needed especially given the proximity of the current East Midlands Parkway station to East Midlands Airport and the upgrades planned for the A453.

The journey time assumptions stemming from these scenarios are set out in Table 3.2

Figure 3.1. High Speed Route Scenarios



Based on these route scenarios, the journey time savings that would accrue from High Speed Rail were estimated. These are set out in Table 3.2 overleaf.

Table 3.2. Estimated Journey Times Savings from High Speed North East

	London	Sheffield	Leeds	Cambridge	Stansted
Estimated future journey times from Toton (via HSNE)	62	30	55	44	52
Estimated future journey times from Nottingham Central (via HSNE)	69	28	53	43	52
Current journey times (from Nottingham)	104	53	107	130	168
Estimated maximum journey time saving (from Nottingham)	35	25	54	87	116

Note: *italics* = 1 change required. Time shows total journey time inc. wait time. Source: Arup estimate.

3.7.2 Findings

The tables below summarise the estimated annual productivity benefits and the Net Present Value (NPV) over a typical 60 year appraisal period, discounted to 2002 prices, to the Three Cities, London and other cities against a Do Nothing scenario. In order that the benefits can be compared against one another without being confused by discounting factors, it has been assumed that the improvements all occur at the same future point in time and assessed them all against the existing situation. Within the analysis wherever there are judgements to be made, conservative assumptions have been made. The figures set out in the table are the wider productivity benefits from the different options, which would be in addition to the standard transport user benefits which would also be significant.

Table 3.3: Annual Productivity Gains of (£m, 2002 prices), Additional to Standard Transport User Benefits, for Scenarios for High Speed Rail

Area	HSNE to Nottingham City Centre	HSNE to Toton
Derby HMA	0 (0 – 0.1)	8.2 (7.6 - 9.6)
Leicester HMA	0.2 (0.2 - 0.2)	0.6 (0.6 - 0.7)
Nottingham and Nottingham Outer HMA	28 (21.9 - 28)	16.6 (13.8 - 16.6)
London	18.9 (18 - 20.8)	17.3 (16.2 - 19.1)
Sheffield	2.1 (1.7 - 2.2)	0.9 (0.8 - 1)
Leeds	1.3 (1.2 - 1.3)	1.1 (1 – 1.1)
Cambridge	0.5 (0.3 - 0.5)	0.5 (0.3 - 0.5)
Stansted	0.1 (0.1 - 0.2)	0.1 (0.1 - 0.3)
Three Cities (inc. Nottingham Outer HMA)	28.3 (22.2 - 28.3)	25.4 (21.9 - 26.9)
Total	51.2 (43.4 - 53.4)	45.3 (40.2 - 48.8)

Note: Central results shown first with sensitivity ranges in brackets

There is also a positive and strong economic case for a high speed rail link serving the Three Cities. The enhanced connectivity provided by a high speed line to the Three Cities could deliver annual productivity gains of around £40-£53 million, which amounts to £1.9

billion (within a sensitivity range of £1.4bn to £2.0bn) when evaluated over a typical 60 year appraisal period and discounted to 2002 prices. Similarly, over half of these benefits would accrue to the Three Cities.

Table 3.4: 60 Year Net Present Value (£m, 2002 prices) of Scenarios for High Speed Rail

	60yr NPV (£m, 2002 prices)	
	HSNE to Nottingham City Centre	HSNE to Toton
Total	1,872 (1,588 – 1,952)	1,656 (1,470 – 1,783)
Three Cities (inc. Nottingham Outer HMA)	1,036 (810 – 1036)	929 (802 – 984)

Note: Central results shown first with sensitivity ranges in brackets

The analysis has considered the journey time savings from all districts within the Nottingham, Derby and Leicester housing market areas and also two additional neighbouring East Midlands districts to each other and destinations of London, Sheffield, Leeds, Cambridge and Stansted. Analysis has also been undertaken to assess the benefits to the other cities from these options. The figures reported for these locations are only partial however as they value the benefits of improvements in travel times to the East Midlands but the travel times are kept constant between the other destinations.

Of the high speed options, the Nottingham Central alignment route results in the highest overall benefits but the Toton Alignment route results in a more widely distributed set of benefits across the three areas. This result is reasonably accurate for the Three Cities areas which are of primary interest here, but the overall benefits from either of the high speed routes are likely to be higher than this because the magnitude of the results presented are partially due to the geography over which the evaluation has been carried out– the route of Eastern Alignment would also result in larger benefits to Leeds and Sheffield City Regions, for example, which is only partially considered here.

The previous work which is most comparable to the analysis discussed in this report is the SDG North-South Connections study for the Northern Way which estimated that an entire northern network (West, East and trans-Pennine routes) would result in productivity benefits to the north of £10bn (60yr NPV). Of this, just under half, or £4.8bn, was due to the eastern route. And of this, around 19 per cent was attributed to the East Midlands. This is equivalent to annual productivity gains in the East Midlands of £24.5m or a 60yr NPV of £0.9bn. This is very comparable to estimates of the benefits to the Three Cities area, suggesting that the methods used are reasonably consistent.

3.8 Wider Impacts and Issues

3.8.1 Overview

Whilst this method goes some way to quantifying the benefits of high speed rail, it does not explicitly capture the potential transformational impacts which high speed rail could have upon the future development of the country's economic geography. If the delivery of high speed rail is accompanied by planning policies to support sustainable economic development, European examples suggest that it can have very positive impacts.

For example, the French cities of Lille and Lyon show (qualitatively) that high speed rail can have very beneficial impacts upon the economic development of a city. However this does not just happen automatically. These examples underline the importance of aligning economic development strategies with transport strategies. Lille for example was supported

by planning policies which enabled significant development to occur near the high speed station and various other regeneration strategies.

Accentuating existing trends and strengths is nearly always easier than completely redefining a place. Building upon the already strong assets of Nottingham, Derby and Leicester as the economic centres of the East Midlands economy, and improving the links both northbound with the Sheffield and Leeds and southbound with Cambridge and London should offer a very positive potential for future economic growth.

3.8.2 Example of High Speed One

The table below summarises the Economic impacts of High Speed One estimated in a recent evaluation by Volterra.

Table 3.5: Impacts of High Speed One

Impacts	£bn
Transport benefits	3.8
Wider Economic benefits	3.8
Regeneration benefits	10.0
Total benefits (PV over 60yrs)	17.6

The transport benefits were primarily time savings and the wider economic benefits (WEBs) were split almost evenly between move-to-more-productive-jobs and pure agglomeration benefits. As with all transport evaluations, it should be noted that WEBs are completely additional to standard transport user benefits, hence the addition of the benefits in the table above. It should also be noted that the domestic services are expected to be used significantly for commuting purposes, making the incentives, drivers and benefits of the scheme quite different in some ways from other proposed high speed rail lines.

HS1 is also credited with significant regeneration impacts. It has enabled the delivery of three major development schemes in Ebbsfleet, Stratford and Kings Cross. Those schemes will significantly impact on three regeneration areas with plans for over 15,000 homes and 70,000 jobs resulting in quantifiable residential spending and output.

3.8.3 Examples from Continental Europe

These examples highlight the need to align city and regional economic development objectives with investment in infrastructure. High speed rail on its own will not deliver transformational change but these examples suggest that alongside strategic plans for other investment and planning policies which support growth it can have very beneficial effects.

The importance of joined up planning and strategic fore-thinking is highlighted by examples where high speed rail has not had the beneficial impacts envisaged. For example Tours did not benefit significantly. Commentators suggest this might be because the economy which was there before did not fit well with HSR (it was mainly tourism). Many smaller places which are stopped at infrequently appear to have been limited in success too (Le Creusot for example).

This implies a need to balance transport provision with good local services so that surrounding smaller towns do not lose out. There is some evidence that success in some cities (benefiting from HSR) could result in economic losses in neighbouring centres (e.g. Lyon v Dijon). This could be mitigated by good regional transport links.

Very little quantification has been carried out in this area although the following projects were evaluated ex-post:

- TGV Sud-Est (Paris-Lyon) – Bonnafous (1987);
- AVE (Madrid-Seville) – de Rus and Inglada (1997); and

- Japanese Shinkansen – Banister and Berechman (2000).

The ex-post evaluations show increases in commercial activity, and hence land values around some, but by no means all, high speed rail stations. For example between 1983 and 1990, there was a 43% increase in office space around Lyon Part-Dieu station; whilst in Japan land values in commercial areas rose by 67% with a Shinkansen station (Nakamura and Ueda, 1989). However, it is recognised that these measures may reflect displacement of activity from elsewhere and should not be interpreted as being indicative of net growth.

Lyon

Due to physical constraints around the existing station, a major new station to accommodate TGV services was built adjacent to an emerging commercial district. Since the start of these services, further development around the commercial area has followed:

- Businesses relocated to the commercial district, and office accommodation became more valuable;
- The scale of business and commercial relocation has created its own momentum in attracting further such activities;
- The urban public transport system has been developed to enable access to the area (and the TGV station) from surrounding areas; and
- Hotels have been built in an area formerly lacking them; suggesting that the TGV service has also expanded tourist travel to what was already an important tourist destination – it is suggested that this may also indicate that visitors value hotels close to their place of arrival.

Lille

Historically, Lille had been heavily reliant on industry, being at the heart of a key industrial region. The city benefitted from incorporating the plans for high speed rail into a wider long term vision to transform the city as a whole. In 2004, Lille gained the position of European City of Culture.

- A new through station strictly for TGV services (Lille Europe) was built on a former barracks site near to the original station. Most of the rest of this site was used for a major commercial centre with offices, hotels and a large modern retail centre. The remainder was made into a public park, replacing former open space used to build the new approach lines to Lille Europe. The whole area is adjacent to the old city centre and has formed an extension of it.
- Further programmes have led to substantial new building of offices, public housing and a very large conference and events hall in areas adjacent to Lille Europe. This forms part of a continuing strategy of development for the area. Further expansion is now in hand (at the time of writing) to take in redevelopment of a closed railway goods yard and other disused land beyond the conference hall.
- Reorganisation of the local universities has included locating some faculties in former cotton mills in older areas, thus creating local employment and businesses in these areas. These older areas have also benefited from regeneration programmes. In turn some of the traditional university buildings have been taken over by larger businesses, often for regional head offices.
- Complementary programmes of regeneration have been undertaken in other parts of the conurbation, notably in the former cotton towns of Roubaix and Tourcoing. These have seen disused public and industrial buildings modernised for reuse as offices, leisure and community centres, and specialist education. Notable is the Euroteleport complex at Roubaix, adjacent to a modern retail centre designed to enhance the

traditional city centre. In parallel, housing areas in these towns have seen programmes of improvement and new building.

Cologne

In 1988 the Cologne city authorities decided that, with the planning of the Brussels–Cologne–Frankfurt high-speed corridors, the station should be rebuilt as part of a major redevelopment of the whole area around the Cologne Fairground. This redevelopment includes offices, hotels, retail and leisure centres, and housing, as well as redevelopment of the main Fair site venues. Commentators believe that combined with access by high-speed trains from much of Western Europe, this puts Cologne in a stronger position to host international events. The new station also acts as a key node on regional rail services and local transit. Furthermore, because the station is less than one kilometre from the centre of the city, and linked by bridges, it is able to complement the more traditional activities based there.

4 The Case for Improvements to the Midland Main Line

4.1 Introduction

This section sets out the case and economic benefits of upgrading and electrifying the Midland Main Line. The Midland Main Line connects Leicester, Nottingham, Derby and other key locations in the Three Cities (including Loughborough and East Midlands Parkway) with London St Pancras International. It is also the main route to Sheffield and forms part of the cross-country network. It provides access to London from key locations in the south of the East Midlands, such as Wellingborough, Kettering, Corby and Market Harborough.

4.2 Travel Markets and the Existing Service Pattern

4.2.1 Summary of Existing Strategic Travel Markets

This section provides an overview of the existing rail markets between the Three Cities and London (split by ticket type) via the Midland Main Line (MML), plus flows to Sheffield and Leeds. Grantham and Peterborough are also included for comparison, as they are located a similar distance from London on the East Coast Main Line (ECML).

Based on statistics collated by Network Rail, stations on the Midland Main Line (MML) have achieved a higher growth rate for trips to London, compared with the ECML or the Great Western Main Line (GWML). Midland Main Line train frequencies to / from London increased from 2 to 4 per hour in 1999, and this has helped to support the higher growth rate. The analysis of the data on existing travel patterns (the data is set out in Table 4.1) highlights a number of interesting trends.

- Leicester generates a higher trip rate per person to London compared with Derby and Nottingham, and this is consistent with the shorter distances to the capital. The season tickets account for about 20% of the total journeys to London.
- The trip rate per person for Nottingham needs to be treated with some caution compared with the results for Derby, given the relatively tight administrative boundaries. Nottingham station serves a largely geographic area, and this helps to explain the higher ratio. The percentage of season ticket trips to London from both Derby and Nottingham is very small, reflecting the additional journey times compared with Leicester that makes commuting very unattractive.
- The results for the ECML stations demonstrate some interesting comparisons. Although the population of Peterborough is significantly smaller, it generates about 25% more journeys than Leicester (both cities are a broadly similar distance from London). Furthermore, there are significantly more season ticket trips between Peterborough and London than Leicester. This reflects the advantages of the faster journey times via the ECML.
- The benefits of faster journey times via the ECML to London can also be demonstrated from Grantham. Grantham generates a significantly higher trip rate per person than the Three Cities (although recognising it does serve a large rural hinterland), including a large season ticket flow.

Table 4.1: Summary of Existing Travel Markets

District	Population ('000's)	Total Number of Journeys (pa, '000's)					
		London				Leeds	Sheffield
		Full	Season	Reduced	Total		
Derby Zone	234	170	43	464	677	64	202
Leicester Zone	280	312	336	1063	1,711	46	132
Nottingham Zone	292	200	30	830	1,060	47	184
Peterborough Zone	167	278	907	864	2,049	76	20
Grantham Zone	35	74	218	245	537	20	7

Source: MOIRA. Derby zone includes Ambergate, Belper, Burton, Cromford, Derby, Duffield, Long Eaton, Matlock, Matlock Bath, Peartree, Spondon, Whatstandwell, Willington

Leicester zone includes Barrow on Soar, East Midlands Parkway, Leicester, Loughborough, Market Harborough, Melton Mowbray, Narborough, Oakham, Sileby, South Wigston, Syston

Nottingham zone includes Nottingham

Peterborough zone includes Peterborough, Spalding, Stamford and Whittlesea

Grantham zone includes Grantham

4.2.2 Characteristics of Current Services

Services to London via the MML are significantly less attractive compared with other longer distance routes in the UK. Whilst the Derby to Sheffield section has recently benefited from line speed improvements permitting 125mph operation, other sections are restricted to just 100-110mph. Furthermore there are other parts of the route where line speeds are much lower, for example, 60 to 90mph near Market Harborough and Wellingborough. Some of the tunnels also have speed restrictions due to inadequate clearances. These characteristics contrast sharply with the ECML and GWML that have benefited from various infrastructure schemes to enable 125mph operation on significant parts of each route. Similarly, the MML received just 1% of the total investment in track and other infrastructure allocated to long distance routes between 1997 and 2009.

A comparison of the Nottingham to London journey times versus other flows offers a good illustration of the slow MML journey times. Some timings from Nottingham to London are similar to those from York, even though the distance via the ECML is around 50 miles further. The relatively slow speeds between the Three Cities area and London, compared with other examples, are illustrated in Table 4.2.

Table 4.2: Summary of Service Characteristics to London

Station	Distance (miles)	Journey Time (mins)	Speed (mph)
Derby via MML	129	93-109	71-83
Leicester via MML	99	72	83
Nottingham via MML	127	104-121	63-73
Leeds via ECML	186	135-145	77-83
York via ECML	189	120-130	87-95
Liverpool via WCML	194	128	91
Manchester via WCML	196	128	92

Source: National Rail Timetable

Although Nottingham benefits from 2tph to London, the second train is significantly slower than the first (typical journey times range from about 105 minutes for the “fast” trains to 120 minutes for the semi-fast trains). The deployment of the over 30 year old High Speed Trains on the Nottingham route with slower acceleration characteristics compared with the new Meridian trains limits the scope to deliver journey time improvements. Furthermore, there is significant commuting demand from selected MML stations closer to London, and the requirement to serve these intermediate stations leads to extended journey times, particularly during the peak periods.

4.2.3 Drivers of Change

Although the actual number of passengers using the MML is lower compared with other long distance routes, recent growth means the total number of trips is increasing fast, and overcrowding problems will increasingly occur on the busiest trains.

Network Rail has recently produced a range of growth forecasts as part of the Network Rail Scenarios and Long Distance Forecasts workstream³. Growth forecasts have been prepared for a number of routes between 2007 and 2036, including the MML corridor. The forecasts take account of the planned housing and employment growth, plus other demand drivers. Passenger numbers are expected to increase between 35 to 70% by 2036, equating to a 1-2% increase per annum. These growth rates are broadly similar to the outputs for other long distance routes to London, including the ECML that also includes important timetable changes. Additional capacity may therefore be required to address these problems.

4.3 Options to Enhance Existing Routes

4.3.1 Context

Sheffield, Chesterfield, Derby and Leicester have recently benefited from journey time reductions to London. The deployment of a standard pattern timetable on the Sheffield route, alongside the deployment of modern diesel *Meridian* trains on this route, has helped to reduce journey times by around 10-15 minutes. In contrast, the journey times between Nottingham and London have not been significantly improved, so there is an urgent requirement to deliver a package of improvements for this corridor.

4.3.2 Infrastructure Improvements

Stakeholders in the East Midlands, South Yorkshire and elsewhere have worked closely with Network Rail to identify the scope to deliver a package of journey time savings for the MML. A scheme to save about 6 minutes between London and Nottingham, with a further 2

³ Network Rail “Network Route Utilisation Strategy”, Scenarios and Long Distance Growth

minutes between Trent Junction and Sheffield to benefit MML passengers from Yorkshire, will be delivered during Control Period 4 (2009-14). The Office of Rail Regulation and Network Rail have agreed indicative scheme costs for these improvements, and the outturn costs are £69m.

It is vital these line speed improvements are delivered in a timely manner to help generate journey time benefits. The scale of journey time reductions relative to the scale of investment, suggests this proposal offers good value for money, particularly when compared with investment in other possible rail or wider transport schemes, for example, the M1 widening scheme, or the Swindon to Kemble improvements (particularly as the MML attracts about ten times more passengers).

Similar to previous trends, the level of investment allocated to the MML compared with other long distance routes remains relatively small. For example, the planned total investment in the GWML, ECML and WCML between 2009 and 2014 is up to eight times greater than the MML.

4.3.3 Timetable Changes

The requirement to serve intermediate stations south of Leicester restricts the scope to improve journey times. However, there is some scope to further reduce the timings of the “fast” Nottingham train. At present, this service includes a stop at Market Harborough, incurring a journey time penalty of 3 minutes. It is understood this stop has been included to avoid a timetabling conflict between Bedford and Luton that would otherwise incur a similar journey time penalty. If the package of line speed improvements described above were delivered, the current timetable conflicts with First Capital Connect services would be avoided, potentially offering a further journey time reduction of 3 minutes. Further timetabling work is needed to demonstrate these savings can be realised.

4.3.4 Electrification

The level of political support for electrification has increased significantly since the publication of the Rail White Paper in July 2007. Growing concern about climate change, coupled with the cost and security of energy is adding to these environmental pressures, has resulted in greater Government support for a programme of electrification.

Network Rail has recently published the results from initial assessments to examine the benefits and costs associated with electrification. The study suggested the electrification of the MML from Bedford to Sheffield, plus a spur to Nottingham had a very strong financial case, with the benefits of reduced operating costs and incremental revenue outweighing the capital costs. This outcome is relatively unusual, since wider societal benefits are included to make the economic case for transport investment.

Modern electric units offer better acceleration characteristics than diesel trains, and this is beneficial when accelerating back to line speed. Electrification of the MML could further reduce the journey times described above by up to 3 minutes between the Three Cities and London.

4.3.5 Nottingham Station

The existing track layout and signalling capability serving the western approach to Nottingham station represents a major constraint, with trains frequently delayed. As a result, journey times towards Nottingham are extended to reflect these capacity constraints. About £10m has been allocated by Network Rail to help resolve these capacity conflicts, and this could help to reduce the amount of “pathing time” including in the timetable. It is estimated timings could be reduced by 1-2 minutes as a result of delivering this scheme.

4.3.6 Summary of Journey Time Improvements to London

Table 4.3 illustrates the possible reduction in journey times from Derby, Leicester and Nottingham to London, and presented as a range. Nottingham could benefit from the largest journey time reductions to London from the Three Cities area, and there is potential to

reduce the overall journey times down to around 90 minutes. This represents a long term aspiration, and might be achieved when the East Midlands Trains franchise is re-specified.

Table 4.3: Summary of Journey Time Reductions to London Thro

Description of Proposals	Derby (minutes)	Leicester (minutes)	Nottingham (minutes)
Line Speed Improvements	6	4	6
Timetable Changes (Market Harborough)	0	0	3
Electrification	2-3	1-2	2-3
Nottingham Station	0	0	1-2
Total Savings (mins)	8-9	5-6	12-14

Source: Arup estimate

4.3.7 Other Rail Corridors

It is clear that it will be important to deliver a package of improvements that would benefit rail services between London and the Three Cities. However, the scope to improve other links must also be considered, particularly as the relative performance of these routes from selected parts of the East Midlands is significantly worse compared with other examples. Nottingham is adversely affected by slow cross country connections, with speeds to Leeds, the North West, Lincoln and the West Midlands significantly slower than many other routes, for example, from Birmingham. Further work is needed to identify packages of improvements to address these limitations.

4.4 Wider Economic Benefits of Midland Main Line Upgrade

This section sets out the findings of the wider economic benefits analysis for upgrade of the Midland Main Line. The background and methodology to this approach is identical to that used for the analysis of the high speed options and is described in detail in Chapter 3.

Table 4.4: Annual Productivity Gains of (£m, 2002 prices), Additional to Standard Transport User Benefits, for Scenarios for Enhancements to Existing Routes

	Annual Productivity Gains (£m, 2002 prices)
	Midland Main Line
Sheffield CR	3.9 (3 - 3.9)
Derby HMA	1.9 (1.7 - 2.4)
Leicester HMA	0.9 (0.9 - 0.9)
Nottingham HMA	4.3 (3.5 - 4.3)
London	6.6 (6.1 - 7.3)
Total	17.7 (15.3 – 19.0)

Note: Central results shown first with sensitivity ranges in brackets

The analysis suggests that enhancements to the Midland Main Line could deliver between £15m and £19m in productivity benefits per annum, which equates to £0.5 billion to £0.7 billion in productivity gains when evaluated over a typical 60 year appraisal period and discounted to 2002 prices. Of this, over half accrues to the East Midlands, with all HMAs benefitting from productivity gains.

Table 4.5: 60 Year Net Present Value (£m, 2002 prices) of Scenarios for Enhancements to Existing Routes

	60yr NPV (£m, 2002 prices)
	MML upgrade and electrification
Total	600 (538 – 659)
Three Cities	351 (307 – 388)

Note: Central results shown first with sensitivity ranges in brackets

4.5 Conclusions

There is a strong case for electrifying and upgrading the Midland Main Line. It would increase capacity on the line meeting increasing passenger demand, lead to faster journey times, provide a lower carbon alternative to diesel trains, support the economic and population growth aspirations of the Three Cities and the Sheffield City Region, and offer value for money.

- The case for the upgrade of the Midland Main Line is based on the size and scale of the Sheffield City Region and the Three Cities of the East Midlands.** The Midland Main Line links three of the nine largest urban areas in England – Sheffield, Nottingham and Leicester – and Derby to the World City of London. The Three Cities of Derby, Leicester and Nottingham and the Sheffield City Region contains almost 4 million people and 2.5 million jobs. It also includes other important economic centres such as Chesterfield, Loughborough, Kettering, Wellingborough, Bedford and Luton.
- A faster and more reliable train service to London would boost the economies of the cities served by the Midland Main Line and help realise their economic potential.** With electrification and track improvements Leicester could be within an hour of St Pancras, Derby and Nottingham within 90 minutes and Sheffield well within two hours. This will make train travel a much more attractive option and help relieve congestion on the motorway network. It is estimated that the upgrade and electrification would be worth £15 million to £19 million per year in productivity gains, in addition to standard transport benefits, to the Three Cities, the Sheffield City Region and London.
- An improved Midland Main Line would support the delivery of plan led growth, in the East Midlands, England's fastest growing Region, and in the Sheffield City Region with high levels of expected growth.** The Midland Main Line serves the Milton Keynes South Midlands Growth Area, which alone will deliver 224,200 homes between 2001 and 2026. The line also serves the Three Cities and South Yorkshire Growth Point areas. With population projections estimating that the population of the East Midlands will grow by 25% making it the fastest growing region in the country, there is a need to deliver the infrastructure that will enable the delivery of this scale of plan led growth.
- An electrified Midland Main Line will form a key part of the national network for the 21st century.** As an important strategic connection between London, the Three

Cities and Sheffield City Region this route connects key urban centres. As the only main line to London that has not been or planned to be electrified it acts as the final component in the creation an effective national network. It will enhance the capacity for rail freight on the line serving intermodal sites, helping to relieve congestion on the motorway network. It will complement and could link Derby, Nottingham and Sheffield to the potential high speed rail route to the West Midlands. If this was to occur it would free up capacity on the existing line and therefore be of benefit to those places not directly served by the high speed link such as Leicester.

- **Electrification will reduce current route CO2 emissions by around 40%**, providing a lower carbon alternative and helping to deliver the challenging targets in the Government's Low Carbon Transition Plan.
- **Electrification will increase capacity, enabling more and longer trains and greater reliability.** This is essential to cater for planned growth and strong demand. Passenger numbers have already grown by 122% since 1997 – twice the rate of the ECML and GWML (quoted in the East Midlands Route Utilisation Strategy prepared by Network Rail for 1996/97 to 2007/08 for long distance MML journeys). Timetable improvements including extra services to Derby and Nottingham (and more recently Corby) have created scope to improve journey times.
- **The track is already electrified as far as Bedford** – this is half of the distance to Leicester and almost a third of the way to Sheffield. Further electrification would be better use of existing rail assets by helping to create strategic diversionary routes, for example from the East Coast Main Line freeing up capacity on this line. Additionally electrifying the line between Sheffield and Leeds would reduce journey times, increase the frequency of the fastest trains, reduce overcrowding and ultimately strengthen connectivity between the two city regions.
- **Electrification will save money.** Network Rail⁴ say that electrification of the Midland Main Line has a 'net industry cost saving rather than net cost over the appraisal period of 60 years'- effectively meaning that it has as an infinite benefit cost ratio.
- **The Midland Main Line is the slowest of the main lines to London** because it has had very little investment for decades. Whereas £9 billion has been recently invested in the West Coast Main Line to enable 125mph operation, only £69 million is allocated for improvements to the Midland Main Line during the next Control Period (2009-14) – up to 8 times less than West Coast Main Line. In fact, more investment is planned for car park upgrades on the West Coast Main Line compared with the entire Midland Main Line.
- **Electrification makes fundamental economic sense. It is an integral part of 'Delivering a Sustainable Transport Strategy'**, the latest government guidance on transport. This aims to ensure that the entire network facilitating economic growth, whilst reducing carbon emissions, promoting health and social inclusion and improving quality of life.

⁴ Network Rail Draft Electrification Route Utilisation Strategy, May 2009

5 Developing a Coherent 20 to 30 Year Rail Strategy for the Three Cities

5.1 Introduction

The opportunities for high speed rail to serve the Three Cities area must be developed as part of a wider coherent strategy, covering a 20-30 year period. This longer term strategy must focus towards addressing capacity constraints that currently affect existing routes, and address the interface between the high speed rail corridors and “classic” lines. However, in response to the likely timescales to deliver high speed rail, the future strategy must encompass a package of short to medium term enhancements too, helping to strengthen connectivity between major travel markets including London, Yorkshire and the North from the Three Cities. In particular it is important to emphasise:

- The case for upgrades to existing routes to address capacity constraints and provide improved connectivity in the short to medium term, given that high speed rail is a long term proposition (construction of a new route is unlikely to be completed for at least 20 years, possibly much longer for it to reach the East Midlands);
- The need to consider the interface between high speed services and lines and existing rail routes; and
- The importance of improved connectivity within city regions and between neighbouring city regions through conventional rail and light rail.

5.2 The Case for Upgrades to Existing Lines

It is clear that whilst the potential benefits of High Speed Rail to the Three Cities would be substantial and its impact would be transformational, there would be long timescales (20-30 years minimum) and significant costs and risks to delivery. The analysis shows that major benefits to the two city regions could be achieved through upgrades to existing lines.

Any High Speed Rail route will need to interface with existing lines (particularly as it is likely to be built in phases), it will impact on capacity on and demand for services on existing routes, and it will require local and regional transport networks to act as feeders.

Table 5.1 overleaf sets out some of the issues when considering the scope for High Speed Rail alongside upgrades to existing routes.

As set out in chapter 4, there is a strong case for a package of capacity and journey-time enhancements to the Midland Main Line (including electrification of the Midland Main Line). These benefits could be delivered in the short-to-medium term, far more quickly than High Speed Rail, and these interventions would be significantly more affordable and pose far fewer risks to delivery.

Table 5.1 Issues to Consider in Comparing Benefits and Problems / Issues between High Speed Rail and Upgrades to Existing Routes

	New High Speed Rail	Upgrades of Existing Routes
Benefits	Step change in journey times, scope to transform connectivity	Incremental journey time reductions achieved
	Less disruption to existing network	Reduced land-take, and potential cost and time savings
	Releases capacity on existing network	More affordable, strong overlap with existing funding commitments, and offers scope for early wins
	Strong value for money on some corridors	Improved environmental performance from electrification
Problems / issues		Scope for new connections to existing routes (e.g. Leeds / Sheffield to ECML)
	Requires significant land-take	Impacts are incremental, not transformational
	Affordability - higher costs incurred	Smaller capacity increases on some routes
	Longer timescales due to planning processes and cost	Some disruption during construction
	May still need to use parts of existing conventional routes with implications for capacity for other services	
	Carbon emissions are greater than for electrified conventional rail	

5.3 Interfaces Between a Possible High Speed and the Conventional Rail Networks

5.3.1 Overview

A main issue with any high speed route will be compatibility with the current network, in terms of the capacity of the network and train characteristics. Many TGV services in France switch at various points from high speed to conventional rail routes. Many UK city centre stations are already operating at or near capacity, and many station approaches are constrained in terms of speed and capacity. However high speed services may use these routes to access city centres. While it can be expected that some of the current fast inter-urban services will be abstracted to new routes, their place may be taken by semi fast services primarily serving intermediate calling points not served by new high speed services. This would have implications for assessing track capacity. The compatibility of high speed rolling stock used on new routes may also be an issue.

On some corridors the approach to delivering a high speed route (or higher speed route) may be through upgrading and augmenting existing lines. For instance it may be possible to upgrade the East Coast Main Line to achieve train speeds of up to 140mph in places (the existing stock has 140mph capability, but upgraded signalling and track revisions would be required to enable trains to run at this speed). There is also scope to build new sections of line to bypass main capacity constraints and to contribute to faster journey times and possible dedicated high speed routes in the future. For example the proposed Stafford

bypass on the West Coast Main Line is an identified opportunity for a 50 km new line to avoid a congested area, with the opportunity to 'future proof' it for high speed (300kph) running capability. While this is a relatively short section the contribution this could make to a north-south long distance route has been considered.

5.3.2 The scope for a link from HS2 in the West Midlands to the existing lines serving Derby and Sheffield

Greenguage 21 has identified the possibility of a connection in the West Midlands (assumed to be in the Tamworth area) to the existing Cross-Country and Midland Main Line Route to Derby and Sheffield. This option would enable high speed services from London, and potentially Heathrow, to run through to Derby and Sheffield (running at approximately 125 mph on the existing lines). The existing line would need to be electrified to enable this. It is estimated that this would provide a 17 minute journey time saving from Derby. Greenguage 21 propose this would be an interim measure until HS-NE to the Three Cities and Yorkshire is completed, and is likely to be one proposal in the ongoing debate about High Speed Rail.

As an example, the main benefits of a service to Derby and Sheffield via HS2 to the West Midlands and then via classic lines would be:

- **Journey time savings.** A link to HS2 and electrification of the MML and could deliver journey time savings from London to Derby or potentially Nottingham, and Sheffield. These could amount to journey time savings to Derby in the region of 17 minutes. This would bring these places within an easier days travel to London for business travellers (but would not be within commuting distance);
- **Capacity relief on existing lines.** A link to HS2 and electrification of MML could free up capacity on the existing line to enable an additional one or two services per hour to London. This would make the capital more accessible and will be fundamental to meeting increasing demand for the services. This be of particular benefit to cities like Leicester and intermediate locations closer to London, including in Northamptonshire, where they are not directly connected to HS2 but would experience a greater frequency of service, enabling more people to access more productive jobs;
- **Enhancing image and profile.** Providing access to the high speed network and electrifying the Midland Main Line will enhance the profile and the image of the main towns and cities on the line, increasing their attractiveness as locations in which to do business and invest. As the only main line to London that is not already electrified, or that is planned to be electrified, there is a risk that the places along it will themselves be left behind;
- **Access to the international gateway of Heathrow.** A link to HS2 could provide a direct link to Heathrow and Crossrail. This could encourage modal shift from cars to rail on the route and enable global business travel; and
- **Establishing the principle of a high speed route to the East Midlands, Yorkshire and North East.** By linking up to HS2 there is a precedent set to extend the high speed network to the Three Cities, Sheffield City Region and beyond.

5.4 Delivery Risks and Timescales

A main finding of the work is that the options to upgrade to existing lines and possibility of a High Speed Rail link to the East Midlands are not mutually exclusive. Electrification and upgrades to the Midland Main Line would deliver substantial productivity benefits.

Greenguage21 suggest the North East route will be constructed after the North West corridor, but there may be insufficient line and terminus capacity remaining to support the alignment via the Three Cities. This would then necessitate the construction of a separate terminus and alignment. This could adversely affect the affordability of the scheme, thus representing a key risk.

The lengthy timescales to deliver high speed rail schemes forms a key risk, highlighting the importance of a complementary short to medium term strategy. HS1 took around 20 years to deliver from planning to completion, so high speed rail can only play a role in the longer term. However, there are potential risks this timescale could be further delayed, particularly given the likely phasing with other routes, and if the overarching fiscal environment is constrained during the project development.

5.5 Station Location

It should not be assumed automatically that new lines will be able to use existing city centre stations. The cost and practical difficulties of accessing city centre stations are likely to be substantial. Train formations may also be of a greater length than the existing stations can accommodate. It will be important to understand, at different locations, whether the key users of a high speed line would arrive at intermodal transfer stations (such as airports, parkway stations or new stations on intersecting conventional rail lines) or would be generated at city centre stations, which are the hub of commuter and regional network services. It will be important to consider these issues alongside the wider drivers for change. For instance, the possibility of major new settlements or growth nodes outside existing city centres could provide opportunities for new stations, and sites with development potential could, to some extent, offset construction costs of high speed stations.

However, it is also clear that city centres provide currently the main economic and service hubs in the Three Cities, and existing land-use policies are to support a pattern of development based on these centres. The public transport network feeds into city centres. There is also significant potential for development and intensification on brownfield sites in areas in proximity to Nottingham Midland station. Therefore, any stations in other locations could alter the spatial distribution of land-uses and economic development, and the implications of this would need to be considered carefully.

An important feature of High Speed One between London and the Channel Tunnel is the way that development potential around the stations was packaged as part of the funding of the new line, and the way that alignment of land use and regeneration policy is realising the potential to create new hubs of development at Kings Cross, Stratford, Ebbsfleet, and Ashford. Table 4.2 considers some of the issues affecting the choice of city centre or parkway stations.

Table 4.2 Issues in Relation to City Centre or Parkway Stations on High Speed Rail routes

City Centre	Parkway Stations
Strong connectivity with business and other public transport links	Used to serve intermediate catchments with ample parking
Expansion of existing stations is complex, expensive & disruptive	Reduces connectivity to wider public transport networks and business – journey time savings could be eroded as a result
Capacity implications for existing routes	Scope for new stations to be hubs for development and regeneration
Substantial costs involved	

5.6 Issues in Relation to Alignment of Wider Policies

It is clear that there is a strong economic case for improvements in the connectivity from the Three Cities to London and its international gateways, and also to Yorkshire and beyond. It is also clear that high speed rail, whilst potentially transformational in terms of connectivity

and the economy, is a long term proposition. There is a need to secure in the short to medium term upgrades to existing north-south lines, and better connectivity on existing rail routes between and within the city regions.

For the benefits of improved rail connectivity to be realised there needs to be a clear understanding of how rail can support the future economic and spatial development of the Three Cities. This needs to be informed by a strong understanding of how the area function in terms of the different roles of and linkages between places, and how the economic reach of the city regions can be expanded and merged with each other and with neighbouring concentrations of economic activity in the West Midlands, Sheffield City Region, and East of England.

It is also important that wider economic development, regeneration and land-use policies are aligned with strategies to improve the rail network. There is an opportunity to exploit the potential of main stations as focal points for development, urban intensification and as business and employment hubs. High Speed One in London and Kent provides an example in this respect: the route provides international connectivity, enhanced regional / commuting links, and four major hubs for regeneration, employment and housing growth.

The consideration of the development of a national high speed rail network needs to be based on an understanding of how key business, employment and growth locations such as the Three Cities can strengthen their economic contribution towards UK plc.

5.7 Conclusions

5.7.1 Short to Medium Term Strategy

A package of measures to improve connectivity between London and the Three Cities area is recommended for implementation within the next five years. These improvements should be delivered in a timely manner during the next Control Period, helping to strengthen connectivity, particularly between Nottingham and London. Stakeholders should continue to lobby for these measures, given the scale of journey time reductions and the relatively small investment required (less than £70m). The line speed and other improvements forms an integral part of the measures to improve the MML during the next five years, particularly as the investment accounts for a very small percentage of the overall total in longer distance routes. The proposals to improve connectivity to London should be accompanied by measures to strengthen linkages with other core destinations. The links from Nottingham are significantly slower compared with other cities, for example, Birmingham.

5.7.2 Longer Term Strategy

The publication of recent reports suggests there is a strong transport case for high speed rail serving the Three Cities area. This analysis, in conjunction with the calculation of wider economic benefits, indicates the benefit cost ratio of 2.5:1 would be strengthened by the inclusion of these wider economic benefits into the overall business case. Stakeholders in the Three Cities area, and the wider East Midlands, should continue to lobby for a high speed rail connection, recognising the transformational connectivity benefits that could be delivered.