GREENGAUGE21

High Speed Rail: Investing in Britain's Future
Greengauge 21 Consultation Supplementary Response

Executive Summary

Greengauge 21 fully supports the development of a high-speed rail network for Britain and welcomes the Government proposals published for consultation in February 2010. This report sets out ways in which the value of HS2 – already substantial – could be increased further. We focus solely on the HS2 scheme for a new high-speed railway line between London and the West Midlands, rather than on the wider Y-shaped network.

Taking the published alignment for HS2 as a given, Greengauge 21 has identified ways in which the benefits of HS2 can be significantly enhanced, and how major cost savings can be made.

The better case for HS2 is delivered through a number of measures. The service patterns planned for HS2 can be improved and better use made of the important connection to HS1 that is now a feature of the scheme. At the other end of the new line, many of the benefits of the proposed second stage 'Y' network can be delivered earlier through providing a low-cost strategic connection to the East Midlands when HS2 is built.

Better Connections

The HS2 scheme incorporates a good connection to the existing railway network, the West Coast Main Line (WCML), to allow through services to operate from Manchester, Liverpool and Glasgow from the start of high-speed rail operation in 2026. We contend that this connection should be used to support the operation over HS2 of services from Edinburgh as well as Glasgow.

Greengauge 21 believes that the specification of HS2 should also include a connection to the existing Birmingham to Derby railway and onwards to the Midland Main Line (MML). This would allow high-speed services to operate from the East Midlands, Sheffield, Leeds and Newcastle, further widening the benefits from the first stage of HS2. A connection of this sort would add relatively modestly to the scheme cost but bring very substantial benefits including a transformation of Sheffield/Derby – London journey times and capacity relief to the southern section of the MML as well as to the WCML (offering wider benefits to the East Midlands cities of Nottingham and Leicester as well as to the Northamptonshire commuting towns).

In effect, some of the benefits of the proposed 'Y' network can be delivered earlier through provision of a modest cost strategic connection to the East Midlands. The risk of unbalanced regional benefits, with the eastern side of the country not served until a later stage, would be effectively mitigated.

Saving Costs

While Euston station is the right location for the London HS2 terminal, there may be ways of mitigating some of the impacts of HS2 at Euston beyond the current Government proposals.

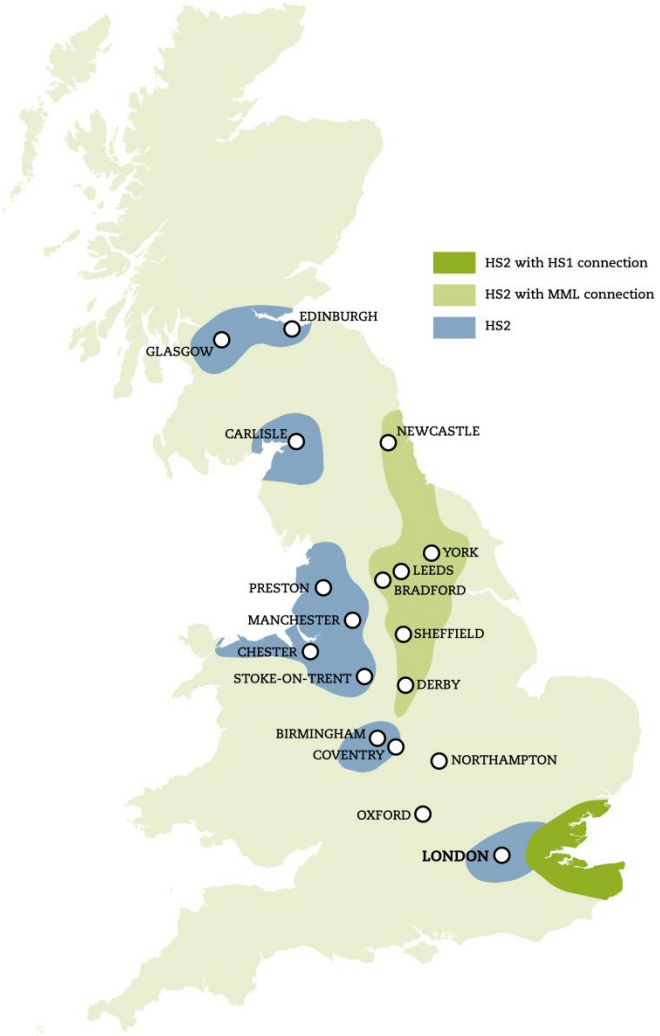
Specifically, the incorporation of the West Coast Main Line 'slow lines' services into Crossrail (as identified by Network Rail in its Route Utilisation Strategy programme) though the provision of a short new connection would relieve the London Underground network at Euston more substantially

than would be achieved through the Old Oak Common interchange station. The use of cross-linked 'regional express' networks such as Crossrail is a tried and tested mechanism to free up terminal capacity for HSR at reasonable cost. It has been used in Paris, for example, through the creation of its RER network, for its TGV terminals.

This could reduce the scale of works needed at Euston and the timescale for their implementation and is likely to improve the overall value for money case. It would also allow more readily for the regeneration of the Old Oak area with a Crossrail station but without the need for a major space-consuming new interchange.

Overall impact

The end result of the proposed modifications would be a broadening of the beneficiaries of HS2 – spanning not just London, the Midlands, the North West and Scotland, but also covering the North East, Yorkshire, the East Midlands, Essex and Kent, as set out below.



The diagram illustrates, in blue, the areas that will benefit directly from HS2 as currently proposed by HS2 Ltd – that is, London, the West Midlands, the North West and central Scotland. This report illustrates how the benefits can be spread far wider, to East London and Kent (highlighted in dark green), and to the East Midlands, Yorkshire and the North East (highlighted in light green).

Preliminary estimates suggest that benefits could be increased by at least a third, and costs savings could exceed £1bn.

1. Introduction

Greengauge 21's Position Statement in April 2011 addressed the seven questions posed by Government in 'High Speed Rail: Investing in Britain's Future' and we have not changed our views set out in the Statement.

However, we believe that the value to be derived from HS2 – already substantial – could be increased further, and in this note we set out matters to which the Secretary of State for Transport may like to give some further attention.

This supplementary response is concerned with HS2, rather than the wider Y-shaped network and should be considered as an addendum to our earlier response to Question 5 of the consultation:

Question 5: The route between London and the West Midlands

Do you agree that the Government's proposed route, including the approach proposed for mitigating its impacts, is the best option for a new high speed rail line between London and the West Midlands?

We take the published alignment for HS2 as a given and have no comment to make on it. Rather, we have identified ways in which the benefits of HS2 can be significantly enhanced and how major cost savings can be made. The remainder of this report covers:

Section 2: how to develop an operating pattern for HS2 that makes best use of the new infrastructure and delivers widespread benefits;

Section 3: how to develop cost-effective connections in London to allow passengers to access HS2 services easily;

Section 4: providing connections to the East Midlands, Yorkshire and the North East in the first stage of HS2;

Section 5: how to exploit the full potential of the HS2 – HS1 link;

Section 6: conclusions, bringing together the key points we believe should be considered by the Secretary of State in setting out firm proposals for HS2.

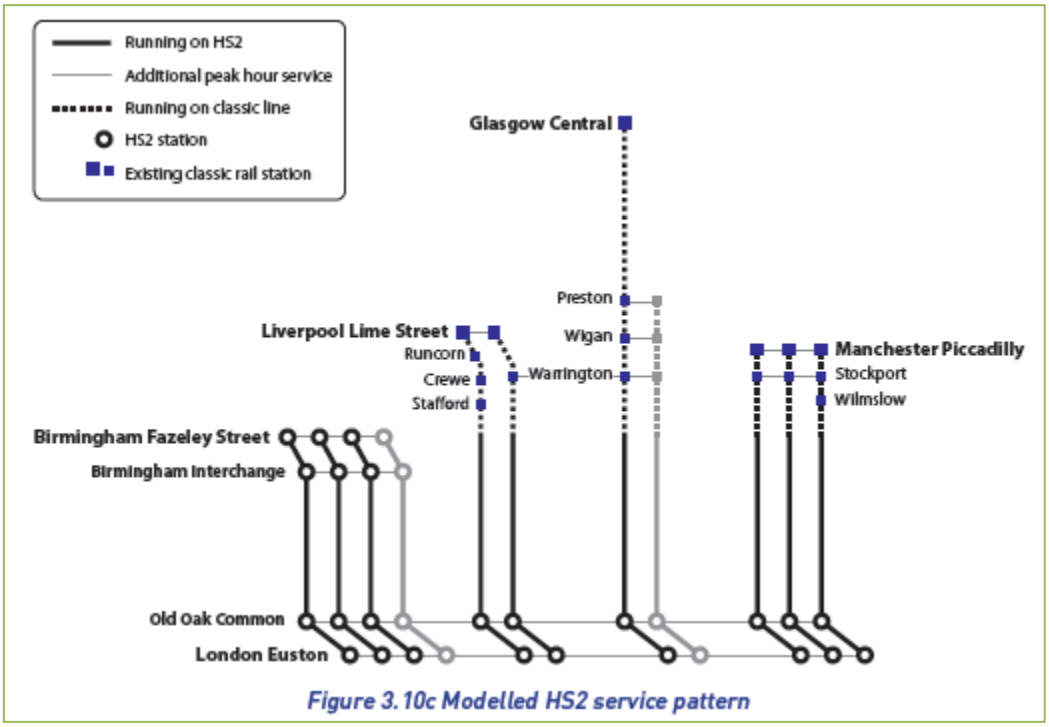
The work that supports these conclusions has been developed over the last two years, as set out in the *Fast Forward* report (September 2009) and *High Speed Two Interfaces* (July 2010), both available at www.greengauge21.net.

2. HS2 Operating Pattern

While Consultation Question 5 is only concerned with HS2 infrastructure, the use to which the infrastructure is planned to be used is a relevant matter, since it determines the benefits that flow from the investment. It may also be the case that changes to the planned operation of services over HS2 would change the detailed infrastructure arrangements, for instance at stations.

HS2 Ltd's assumptions on the operating pattern for the new high-speed services are illustrated in Figure 2.1. There are three services per hour from London Euston to Birmingham throughout the day (with a fourth added in the peaks); three to Manchester, two to Liverpool and one every hour to Glasgow – with extra services in the peak hour to Preston and to Birmingham.

Figure 2.1 Modelled HS2 service pattern



Source: High Speed Two Limited, *High Speed Rail – London to the West Midlands and beyond*, December 2009.

No Edinburgh service is shown in Figure 2.1, yet the fastest journey time between London and Edinburgh would be via HS2 rather than the East Coast Main Line (ECML). The standard Edinburgh journey time via the ECML is now 4h25. The journey time via HS2 would be below 4 hours, offering just as much benefit as would accrue to Glasgow passengers – and Edinburgh is a bigger travel market. An hourly Edinburgh service and the benefits it would bring – which will extend to some further attraction of air travellers to HS2 – should be added in to the plans.

A further feature of the assumed service plan shown in Figure 2.1 is that only Birmingham terminating trains are assumed to call at Birmingham Interchange. This station call will be used for either setting down or picking up long-distance passengers, but not both, since there is little merit in collecting passengers for a high-speed journey as short as that between the two planned Birmingham HSR stations. On the other hand a station call at Birmingham Interchange, made by selected trains travelling to/from the north rather than Birmingham city centre, would be of value to travellers both northwards and southwards at this station. Birmingham Interchange serves the

National Exhibition Centre, Birmingham Airport and many important businesses in the surrounding area as well as a wide residential catchment. The benefits for this catchment for those travelling northwards to/from these places are being precluded by the current service plan assumptions. There would be net benefits from re-allocating the stops at Birmingham Interchange to some of the services operating further north rather than Birmingham city centre.

There are other more detailed matters that can be refined in due course, but which will have the effect in the meanwhile of suppressing the apparent benefits of HS2. Having all Manchester trains stop at Stockport, for example, (and all Glasgow trains stop at Wigan and none at Carlisle) is unlikely to maximise value. The potential for some Preston trains to start/finish at Blackpool is another opportunity.

The HS2 service assumptions should be revised to include a service to Edinburgh.

The assumed usage of Birmingham Interchange (only by services to/from central Birmingham) should be reviewed. More value would be obtained if calls at this station were included in some of the services to the North West/Scotland instead.

HS2 service patterns north of Birmingham should be refined in due course to ensure that maximum value is obtained by balancing fast journey times and appropriate station stops at intermediate stations.

3. London connections

The plans for HS2 include two substantial stations in London. A rebuilt Euston station will have 10 platforms for new high-speed services and 14 for existing rail services (reduced from today's 18). This station is already connected into the Underground and bus networks and provides for ready onward access to central London by taxi or on foot or cycle.

There is also proposed to be a very substantial station – with up to 15 platforms – at Old Oak Common in inner West London. Access to/from this station is restricted to the Great Western Main Line into Paddington. There is no connection to any London Underground line or to the bus network and it would also be difficult to provide access for private transport. The Old Oak Common interchange design was developed in response to the remit set HS2 Ltd by the last Government in January 2009.

Given the levels of cost involved, it is critical that the station solutions adopted for HS2 both deliver value for money and allow passengers to access HS2 services effectively without overloading London's transport network.

Potential use of the HS1 connection

The addition of the HS1 connection adds to the projected capital costs of HS2 but also provides opportunities. While Greengauge 21's analysis suggests this link represents good value for money[1], this is not the case in HS2 Ltd's analysis.[2] Incorporation of the HS1 connection creates the as yet unrealised opportunity for further well-located hub stations for HS2 services in London and the South East to widen access to the high-speed rail network without adding to project costs. In short, the costs of the HS1 connection have been added to the project without adequate consideration of its benefits.

One option is to operate services from HS2 over the planned new connection and into St Pancras. The track needed for this already exists, although HS1 Ltd would need to re-work platform utilisation at the international platforms at St Pancras. The advantage of this idea is that it would allow selected services over HS2 to offer a simple in-station transfer at St Pancras to international services on HS1.[3] Such a proposal would offer substantially more benefit (and less cost) than, for example, the limited frequency proposals identified by HS2 Ltd with a transfer for HS2–HS1 passengers at Old Oak, and would save the cost of creating a separate international passenger facility at that location.

However, it is possible to develop much greater value from the HS1 connection than this. The key is the future use of the international station at Stratford, which comes largely as a free good – the high-speed platforms and tracks have been built, although there is a need for final fit-out. The works at this site for the 2012 Olympic Games mean that that this station will now be much better connected to Crossrail (and to the Central Line, the Jubilee Line, the DLR and the national rail network of services at Stratford). A connection with Crossrail was one of the aims of the proposed HS2 Old Oak Common interchange. Stratford has this facility ready-built and it also has the

[1] The HS1 connection is estimated to have a benefit:cost ratio of 5:1. Source: Greengauge 21, *Fast Forward*, September 2009.

[2] High Speed Two Limited, *High Speed Rail – London to the West Midlands and Beyond, Supplementary Report,* September 2010.

[3] Graham Thompson, *Think about the* link, RAIL magazine issue 662, p38.

advantage of a set of other wider network connections that are lacking at Old Oak Common. The issues around the HS1 connection are discussed further in section 5 below.

Old Oak Common interchange

The London and South East Route Utilisation Strategy (L&SE RUS)[4] also looks at Crossrail and at the question of improving connectivity to Heathrow Airport. Its preferred solution to the capacity problems identified on the Great Western involves the Heathrow Express service being incorporated into Crossrail and using the (slower) relief lines between Airport Junction and Paddington, at least during peak periods. This will significantly extend the journey times to the Airport currently achieved by Heathrow Express, but there is the advantage that service frequencies would be increased and wider direct connectivity established. If a station call at new interchange at Old Oak Common is also added in, journey times to central London from Heathrow would be extended further still.

The HS2 Ltd reports suggest that Old Oak Common interchange is crucial to HS2 – not to its originally intended purpose, to provide access to Heathrow – but to relocate the transfer point for a substantial number of HS2 passengers who would otherwise create intense pressure on Euston station and its London Underground network. However, Old Oak Common interchange imposes time penalties on both GWML and HS2 passengers, and costs around £750m excluding property costs and risk. Network Rail's L&SE RUS report contains a quite separate suggestion as to how to tackle this problem in a very different way.

Crossrail

In the latest RUS plans, instead of Crossrail operating with most of its services turning back at Westbourne Park or Old Oak Common, as originally planned, Crossrail services on the Great Western Main Line would be extended (to Reading) and expanded (from 10 trains/hour to 16 trains/hour) to serve Heathrow and Reading. This diminishes the availability of trains that could be extended to start form Old Oak rather than Paddington (there would be only 8 trains/hour available, not the 14 trains/hour assumed in the HS2 plans).

However, the Route Utilisation Strategy published in July 28th 2011 contains a proposition of even greater significance to HS2. The idea is that services that use the slow pair of tracks on the West Coast Main Lines currently terminating at Euston should instead be connected to Crossrail in the Willesden/Old Oak area. These services would operate onwards over a WCML branch of Crossrail out as far as Milton Keynes. Just as Crossrail has on its eastern side, there would be two balanced limbs – the Great Western Main Line (Heathrow/Reading) and the West Coast Main Line (Milton Keynes). Stations such as Tring and Berkhamsted in the Chilterns would become stations on the (extended) Crossrail network.[5]

The draft RUS had emphasised the

> "desirability of optimising the usage of Crossrail tunnels, focusing on avoiding the need for services to terminate from the east in sidings at Westbourne Park (later at the proposed High Speed Rail station at Old Oak Common). This approach received a high degree of

[4] Network Rail, *London and South East: Route Utilisation Strategy*, July 28th 2011.

[5] The full list of stations that would be added to the Crossrail network would be: Wembley Central, Harrow & Wealdstone, Bushey, Watford Junction, Kings Langley, Apsley, Hemel Hempstead, Berkhamsted, Tring, Cheddington, Leighton Buzzard, Bletchley and Milton Keynes.

support from stakeholders and is considered to have potential to provide a high level of benefit at relatively low capital cost for major schemes of this nature.

"The emerging scenario is of a 24 trains per hour peak Crossrail service (16 off-peak), all running to/from locations west of Paddington. This would create a relatively simple service pattern, based on the following peak service level:

10tph semi-fast to (or via) Heathrow Airport

6tph semi-fast on the GWML

8tph via a new route to the WCML slow lines.

"The WCML extension option appears to have a good business case and the RUS therefore now recommends detailed development. The benefits would complement HS2 and the two schemes have synergies, including in the Old Oak Common area through which the necessary Crossrail alignment would run."[6]

As the Network Rail report explains, so-called Option K1 Crossrail extension onto the WCML slow lines is recommended for detailed investigation, for several reasons:

(i) to provide direct trains from this corridor to the West End, City of London and locations such as Canary Wharf, avoiding the need to change onto the London Underground system at London Euston

(ii) to free up capacity on the London Underground system, both at Euston station and on the Northern and Victoria lines

(iii) to improve access to Heathrow Airport, by providing the WCML corridor with access to Heathrow Airport with a single change at Old Oak Common (which, we would add, alternatively could be provided at Paddington)

(iv) to improve access to orbital routes from the WCML, with potential for a single change at Old Oak Common (but this would appear to depend on connections to the North and West London Lines which is not provided by any of the plans developed to date)

(v) to enable full benefit to be made of the Central London Crossrail tunnels, with 24tph arriving from key corridors to the west and none needing to start at Old Oak Common/Westbourne Park.

The case for this option, Network Rail advise is strengthened by HS2 proceeding. The option would reduce the number of trains and passengers needing to be accommodated at London Euston during HS2 construction works, and in the longer term.[7]

This option requires a new chord to connect the GWML slow lines with the WCML slow lines in the Old Oak Common area. According to Network Rail, a number of potential route alignments for such a connection exist through the Old Oak Common site:

[6] *Op cit* p21

[7] *Ibid* p22

> "These would pass through, or interact significantly with, the proposed new HS2 station site. Therefore a robust infrastructure solution is only likely to be achievable if the design of this link is considered in conjunction with planning for the proposed HS2 station at this location… If HS2 goes ahead this link would potentially reduce the amount of work required to the London Underground network in the Euston area to accommodate HS2 passengers.

Network Rail's analysis suggests that:

> "over 75 per cent of existing passengers on the affected services would benefit from significant time savings to their existing destination or origin in London, with this option providing direct new routes from WCML stations to the West End, the City of London and the Docklands.
>
> "Fewer than 15 per cent of existing passengers would face increased journey times. This time penalty, which would largely affect passengers travelling to and from the Euston station area itself, would be relatively small. Moreover, if HS2 goes ahead, other changes to WCML services may provide additional calls at, or faster journeys from, outer suburban stations at the south end of the WCML, thereby removing this impact.
>
> "Passengers using the feeder public transport network in the Euston station area would benefit from reduced crowding. This benefit would manifest itself through lower wait times and less crowded tube trains and buses.
>
> "Post HS2, The Old Oak Common area would be further enhanced as a strategic transport hub, with an additional new route available via Watford Junction. The diversion of most slow line services via Crossrail would facilitate many new connection opportunities from stations at the south end of the WCML. This would include access to Heathrow Airport (with a single change at Paddington or Old Oak Common, post HS2) and access to the Thameslink network (with a single change at Farringdon)."[8]

Network Rail estimates the cost to the WCML Crossrail connection at between £436 m and £489m, or roughly half the cost of the Old Oak Common interchange, and its benefits, without the disadvantage of the off-setting journey time extensions on both Great Western Main Line and HS2 services that Old Oak Common entails, would be much greater.

Network Rail's Route Utilisation Strategy provides an estimate of a benefit:cost ratio for the WCML – Crossrail link of between 2.2:1 and 2.6:1. This proposition both saves cost and adds to the overall value of the HS2 investment. It also provides a suitable answer to who have suggested that very major expenditure on additional transport capacity at Euston would be needed if HS2 proceeds (at least in its later stages, when extended into the 'Y' formation).

The London Borough of Hammersmith and Fulham has supported the creation of the Old Oak Common interchange because of its regeneration potential. There is a large tract of railway land, much of it now out of use. But this is the site of the planned Crossrail depot on which construction has started. This facility, together with the HS2 Ltd plans at Old Oak Common, in combination has the effect of removing much of the developable land needed to regenerate the area.

A better approach to regeneration in this area would be to provide a surface station on the Crossrail link to the West Coast Main Line, and this can be done with far less land-take. In this

[8] *Ibid* p150

way, the locale would find itself on the Crossrail network, without the loss of developable land that the HS2 interchange station entails.

In short, Old Oak Common should be considered for a Crossrail station, but it would not be needed for HS2. This could be a major cost saving for HS2 and needs careful consideration. While this means less connectivity from the Thames Valley to HS2, instead there would be connectivity of a more local nature, between the Thames Valley and a new set of more local destinations across the Chilterns to Milton Keynes achieved instead via Paddington, rather than an interchange at Old Oak.

As regards the connection between HS2 and Crossrail, this could be provided at Stratford to which some HS2 services should be extended. Indeed, the combination of a 'decongested' Euston and Stratford would in practice deliver faster access from HS2 to the West End, Westminster, the City and the financial districts in Docklands than a combination of Old Oak Common and Euston. Clearly this depends in part on developing a suitable service plan so that Stratford has a regular set of connections to the Midlands and the North using the new HS2 – HS1 connection (as discussed in section 5).

In summary, a connection from the WCML into Crossrail rather than the development of Old Oak Common interchange would improve the business case for HS2, add value to Crossrail, remove the journey time penalty and disruption to services on the Great Western Main Line, increase the scope for regeneration at Old Oak Common, mitigate fully the passenger dispersion challenge arising at Euston and simplify the task of rebuilding Euston.

While the WCML – Crossrail connection is not yet committed, neither is the work needed to extend the Crossrail proposals (including additional rolling stock) to make the proposed Old Oak Common HS2 interchange work. A sensible and more consistent approach for HS2 might be that the WCML connection to Crossrail is provided in the period between 2017 and 2021, after Crossrail as now authorised is built, and before the main, and potentially scaled-down, works for HS2 at Euston commence.

Access to Heathrow Airport

The original purpose of Old Oak Common interchange in the HS2 plans was to provide a connection between high-speed rail and Heathrow. It was built into HS2 Ltd's remit from the outset (although other locations on the Great Western Main Line were also to be examined). HS2 Ltd's analysis showed that few passengers would be attracted to use the interchange to access the airport. Now the decision has been made to provide for future direct HSR services to Heathrow, the original function of a station at Old Oak Common has been lost, except on an interim basis.

Greengauge 21 has published proposals for serving Heathrow Airport[9]. A key conclusion of our work was that Heathrow needs to be located on a nexus of inter-connected rail lines, some of which would be high-speed and this concept is reflected in HS2 Ltd's plan to provide the spurs for future connection to Heathrow as a part of HS2:

> "…leave[s] open the opportunity to extend services from the Midlands and the North by HS2 beyond Heathrow to the south and west should plans for a wider national high-speed network be developed".[10]

[9] Greengauge 21, *The Heathrow Opportunity*, February 2010.

[10] High Speed Two Ltd, *op.cit.,* §1.1.10

The pressures on Euston station arising from HS2 passengers can be relieved by diverting WCML outer suburban services that currently serve Euston onto Crossrail, as proposed by Network Rail. This improves the overall value of the Crossrail core investment and would mean that stations to Milton Keynes, including several serving the Chilterns, would join the Crossrail network.

The changes needed at Euston to accommodate HS2 could then be implemented more quickly and at lower cost and with less disruption. It may be possible as well to reduce the new station footprint and reduce property acquisition costs.

The time penalties from stopping all GWML services at Old Oak Common impose disadvantages on existing rail passengers that can be avoided.

Proposals for a station on HS2 at Old Oak Common should be reviewed against the alternative of creating a WCML-Crossrail connection. It may be possible to improve journey times, cut costs, and improve the HS2 business case without Old Oak Common interchange. This would also free up development land for regeneration in the Old Oak Common area, which could be served by a much lower cost surface station on the new Crossrail – WCML interconnection.

4. Connections to East Midlands, Yorkshire & the North East

The connections planned for HS2 will clearly be able to support a wide range of services from the outset, but these have not all been fully identified to date. One of the options for greater network connectivity – a connection towards the Midland Main Line – was considered and rejected in the HS2 Ltd report published in March 2010. However, the revision to the alignment of HS2 at its northern end, the decision to seek powers for HS2 at this stage with those for the Y-limbs following later and the incorporation of the connection to HS1 are some of the factors that mean the case for this connection is now stronger and needs to be revisited.

A connection to the Midland Main Line

The addition of a MML connection would permit the operation of services to and from the north east of the country as well as the north west from the outset. As HS2 Ltd noted at the time, this would bring a journey time improvement of around 30 minutes for London journeys from Derby and Sheffield.[11] This can be achieved with the construction of a short chord. One possibility for the connection is illustrated in Figure 4.1.

Figure 4.1 HS2 connection to East Midlands

[11] High Speed Two Limited, *High Speed Rail – London to the West Midlands and beyond*, December 2009. §3.10.13

The idea was rejected at the time because it would require local investment in the line between Lichfield and Derby which it was said would become redundant when the eastern limb of the 'Y' shaped network is built, and because "while the MML may well be electrified in the coming years, a putative connection to HS2 would be entirely reliant on the timing of this and related electrification works proceeding".[12]

Rationale for reconsidering the case

There are five reasons why the decision reached earlier on the MML connection should be re-considered.

First, it is no longer the intention to proceed – as was envisaged in the March 2010 Government report[13] – with a single Parliamentary Bill for the construction of the full Y-shaped network; the northern limbs, which might be progressed under separate Parliamentary Bills are now to follow later, with opening of the routes to Manchester and Leeds projected for 2032/3. The value of any local investment needed south of Derby would therefore have a lengthier useful life than originally assumed by HS2 Ltd. This addresses the first of HS2 Ltd's reasons for not including this connection noted above.

Second, while there is still no commitment to the electrification of the MML, the Coalition Government has affirmed its positive position on electrification in general. Other electrification schemes that were in the offing have been progressed through the stringent October 2010 Spending Review. Moreover, while HS2 Ltd's remit may have precluded it from considering MML electrification as an associated investment, there is no reason why it could not be progressed as an essential part of the HS2 project if that is what Government wishes. The investment would need to take place sometime in the period 2016 – 2026. This fits well with likely plans to replace diesel HST trains. Network Rail has established that there is a good business case for MML electrification (even without the additional benefits that would be brought with the HS2 connection). This addresses the second of the two reasons given by HS2 Ltd: it may be beyond HS2 Ltd's remit, but it is within the Secretary of State's.

Third, the route of the HS2 alignment in the Lichfield area has been substantially revised in such a way that a connection to the existing railway northwards to Derby and the MML is made easier to fashion. The line onwards from Wichnor Junction to Derby was upgraded for 200km/h operation in 2002, but would need to be electrified.

The fourth reason is more complex. There is now a second route exit at the southern end of the HS2 line (the connection to HS1) which did not feature in HS2 Ltd's 2009 plans. That changes the case for operating services over a new electrified connection to locations beyond Sheffield (where the journey time advantage of using HS2 rather than existing routes to access central London effectively runs out). These further locations include Leeds, York and Newcastle. Indeed, for services operated over the HS2 – HS1 connection, there could be scope usefully to have them serve not just York and Newcastle, but also Edinburgh using the East Coast Main Line. These locations would get no journey time advantage to central London from a service that used HS2, but the connection between HS2 and HS1 means that they could, from the outset, benefit from a service to Stratford International and beyond to the major cities in Europe. This, of course, strengthens further the reason to consider making a link to the MML a key part of the HS2 scheme from the outset. It goes hand in hand with the link to HS1 – but at very much less capital cost.

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[12] *Ibid.* §3.10.14

[13] Cm 7827 *High Speed Rail*, HMSO, March 2010

Fifth, Centro has published plans for an enhanced commuter service in the Birmingham – Tamworth corridor which is congested and serves a major new Park and Ride facility at Coleshill.[14] The provision of the new HSR connection –as is illustrated in Figure 4.1 – allows for the operation of longer distance services between Birmingham and Derby/Sheffield and beyond on a parallel route, potentially freeing up line capacity for an enhanced commuter service in this area of high demand growth.

Stakeholders in the north have consistently supported high-speed rail because of the economic advantages it offers them. For them, HS2 offers improved connectivity in several ways including (a) with Central London (b) with the European cities – becoming part of the European HSR network and (c) in due course, direct access to the nation's one international hub airport (Heathrow). They have also urged that high-speed rail is developed in a way that avoids 'lop-sided' advantage to one side of the country or the other. The proposal for a MML connection is a highly effective way of offering benefits from the construction of HS2 to regions to the east of the Pennines, without waiting for the development of the full Y-network.

Consequential benefits to classic services on MML

The Midland Main Line can be connected to HS2 quite straightforwardly. The evidence is that the HSR services that could operate over such a link would be well used[15] and this would enhance the overall business case for HS2, even though it entails electrification of the MML.[16] The HS2 line would have sufficient capacity for these services (and for the international services considered in Section 5). It is currently assumed that nine trains per hour would operate through the day, with two extra in the peaks, and the capacity of HS2 will initially be 15-16 trains per hour.

As far as the East Midlands is concerned, the direct benefit accrues to Derby, which would be just one hour from London compared with today's best time of 1h 31min. But the East Midlands has three major centres, Derby, Leicester and Nottingham, to be considered. Switching the fast Sheffield/Derby services off the MML and onto HS2 opens up the opportunity to benefit Nottingham and Leicester too.

Currently, Nottingham has two trains/hour from the capital, but they operate with a 15 min/45 minute service interval, one running fast, the other slow. Leicester has four trains/hour but in effect, this is only a half hourly service, because, again, a pair of these trains makes intermediate station calls and is much slower.

Without the need to fit in fast Sheffield services over the MML, it would be possible to provide Nottingham with two fast services to the capital each hour, calling (say) only at Leicester. In this way, each of Derby, Nottingham and Sheffield would gain fast half-hourly services to London, either via HS2 or using capacity freed up on MML.

Leicester would also gain, but less directly. The case for MML electrification – required for the operation of services as described over HS2 – entails electrifying the route from Bedford north to Sheffield and to the existing electrified main lines in Yorkshire. This would bring new rolling stock and faster services to Leicester as well as to other MML destinations.

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[14] Centro, *How HS2 will transform the West Midlands,* October 2010.

[15] Greengauge 21, *Fast Forward – a High-Speed Rail Strategy for Britain*, September 2009.

[16] Based on Network Rail's assessment that MML electrification would deliver a positive financial return. Source: *Network RUS Electrification*, Network Rail, October 2009.

This way each of the three major cities of the East Midlands would benefit from the creation of HS2 with a link to the MML and MML electrification:

- Derby, with a direct HS2 service;
- Nottingham with a doubling of the frequency of the fast service to the capital; and
- Leicester with a 15 minute interval fast service to St Pancras.

The case for connecting HS2 to the East Midlands in the first phase should be reconsidered, because:

- **Construction of the eastern limb of the Y network is not planned to follow until 6-7 years after the first phase of HS2**
- **There is a good case for the necessary electrification of the Midland Main Line which is a pre-requisite for the proposed connection**
- **Modifications to the HS2 alignment during 2010 make a connection easier and cheaper to achieve**
- **The now committed connection from HS2 to HS1 opens new destinations in London, Kent and Europe that could valuably be linked from Yorkshire and the North East**
- **The new connection could free up line capacity for local commuting services in the West Midlands.**

A connection to the Midland Main Line could therefore be a very effective way of bringing some of the benefits of the Y-network to the first stage of HS2.

Direct high-speed services could be provided on HS2 from Derby and Sheffield to London Euston, offering journey time savings of 30 minutes over current timings.

Services on the MML from Nottingham and Leicester to London St Pancras could be significantly improved, so that the three large East Midland cities all gain from this investment.

5. The potential of the HS2 – HS1 link

Current proposals

The revised HS2 alignment details released by the Secretary of State on December 20th 2010 included the provision of a direct link between HS2 and HS1. This is to be achieved by a purpose-built single-track connection from Old Oak Common to Primrose Hill and then by operation over an upgraded existing line to Camden Road and thence on to an existing connection into HS1. The planned operating capacity of the HS1 connection is reckoned to be three trains/hour in each direction.

It is not yet clear how the proposed HS2 – HS1 link is planned to be used. While the Government consultation refers to 'direct high speed services from across Britain to European destinations',[17] HS2 Ltd did not establish a business case for this.[18] Rather, the HS2 – HS1 services identified by HS2 Ltd appear to be a limited frequency international service operating to and from Old Oak Common Interchange, where a further platform is proposed. The advantages of direct through travel from the Midlands and the North, which would have much greater market appeal, are therefore not captured in the business case. There is also a critical assumption made in respect of the treatment of border controls on an extended international HSR network of services. HS2 Ltd has assumed that it is necessary to segregate entire trains for international-only travel. As a consequence of these planning assumptions, the commercial value of HS2 – HS1 services may not be fully exploited.

While HS2 Ltd has confined itself to considering a limited frequency international service from Old Oak Common over the HS2 – HS1 link, Greengauge 21 would argue that the starting point would be the operation of direct through services between continental European cities and British cities in the Midlands, the North and even Scotland. There are several service options that would yield substantial benefits that have not yet been considered, and which would enhance the case for direct international services over the HS2 – HS1 link. These are:

1. Calling at Stratford International;
2. Combining the carriage of domestic and international passengers;
3. Services from HS1 to the East Midlands, Yorkshire and the North;
4. Joining and dividing trains at Birmingham Interchange; and
5. Connecting Heathrow to Europe, once further sections of the national HSR network are built.

In combination, these options could provide services from Europe, Kent and East London to the Midlands, North and Scotland on both sides of the country, and they would do so in an efficient and cost-effective way.

Stratford International

Making use of the existing stations on HS1 offers the scope for additional benefits beyond those considered by HS2 Ltd, and offers the potential to improve connectivity from the Midlands and the North to East London and Kent.

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[17] Department for Transport, *High Speed Rail: Investing in Britain's Future*, February 2011, p. 17.

[18] High Speed Two Limited, *op.cit. Supplementary Report*.

Specifically, Stratford International station – which has already been built, and which remains currently unused by international trains (it needs a final fit-out to be brought into operation) – is located adjacent to major Olympic and retail development rather than the industrial wasteland the area once was. It serves the East London tech city, the Prime Minister's vision for an area stretching from Shoreditch and Old Street to the Olympic Park to become a world-leading technology city to rival Silicon Valley.[19]

Stratford has much quicker connections to the financial district at Canary Wharf than either of the planned HS2 stations at Euston or Old Oak Common. It also has excellent connections to a wider catchment of north-east London, Docklands/Thames Gateway, Essex and beyond. The HS2 – HS1 link therefore offers the potential to operate direct high-speed services from the North West and the West Midlands direct to Stratford, providing easy access to East London and good connections to Essex.

Stratford International is not however suitable as a terminus and trains from HS2 would need to operate onwards at least to Ebbsfleet where there is another important catchment – Kent. Direct high-speed services could therefore also link Kent to the Midlands and the North.

High-speed services from Stratford and Ebbsfleet to the Midlands and North would be expected to result in a different pattern of modal diversion than has been identified to date for HS2, increasing in particular the attraction of rail/high-speed rail to car users given the much easier cross-London links that would be provided. The proportion of modal switch would be higher and so too would be the carbon reduction brought about by HS2. The benefits mostly arise from the use of Stratford yet they appear to have been ignored in HS2 Ltd's consideration of the potential use of the HS1 link.[20]

Securely combining the carriage of international and domestic passengers

Making use of Stratford International station on services from HS2 destinations would be made much more effective if domestic and international passengers could be carried on the same train. In this way, a service between, say, Paris, Lille, Ebbsfleet, Stratford International, Birmingham Interchange and Manchester would carry not only passengers from Birmingham and Manchester to Paris, but also from Birmingham and Manchester to Stratford and Ebbsfleet.

The commercial viability of operation of such cross-London services would be strong, because of the rich mix of travel markets that could be accommodated – some international, some domestic – amounting to 15 station pairs. The value of the HS2 – HS1 connection is much greater than if judged on a narrow selected market such as Birmingham-Paris non-stop.

There are UK international trains operating already that carry both international and domestic passengers. Eurostar services that call at Calais-Fréthun achieve this without compromising Channel Tunnel safety or border security, by carrying passengers from Calais to Lille and Paris.

The UK is not a member of the Schengen Area that enables other European countries to operate cross-border services more easily and to mix domestic and international passengers. However, there are potential solutions available that would enable UK domestic passengers to be carried on the same trains as international passengers safely and securely.

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[19] Number10.gov.uk, *PM announces East London 'tech city'* , 4 November 2010

[20] High Speed Two Limited, *op.cit. Supplementary Report*, §2.2.10.

With the extension of services from St Pancras across the expanding HSR network in France, Belgium, the Netherlands and Germany, existing border control arrangements are likely to need revision. They are not well-suited to HSR services that call at a number of stations in Europe as is now planned by Deutsche Bahn.

One possible arrangement is that trains would be divided into domestic and international sections. This is easy enough to configure, with 2 x 200m trainsets, with appropriate arrangements put in place at platforms. Either side of the border, one 200m section of the train would be available for international passengers and the other would run empty across the border but carry domestic passengers on either side. There is no physical connection between the two 200m trainsets for passengers and the Channel Tunnel safety committee is currently examining a 2 x 200m operation (which is the European HSR standard) proposal from Deutsche Bahn.

While this may not be the best arrangement that can be devised, it could offer much greater benefits than the service assumptions that HS2 Ltd has used. It could also avoid the cost of separate platforms (but not separate entry/exit arrangements) at HSR stations.

Another approach would be a station call at Stratford where border controls could be applied, with other trains such as Eurostar passing on the through tracks, while formalities are underway.

Passenger and border security is an important issue, but it would be wrong to assume, as HS2 Ltd has done, that there will be no changes from the current arrangements in the next fifteen years and that these arrangements definitively preclude the carriage of a mix of domestic and international passengers.

Services to the East Midlands, Yorkshire and the North East

The MML connection opens up the opportunity to operate services to the East Midlands, Yorkshire and the North East from Europe, Kent and East London. All of the benefits described above from the provision of services through Stratford arise for the eastern side of the country too.

Dividing and joining international services

Best use of the HS2 capacity entails operation of 400m trains. As noted by HS2 Ltd in the context of a future Y-shaped network, there would be the opportunity to split trains at Birmingham Interchange to serve both sides of the country. With MML and HS1 connections from the outset, this opportunity could be grasped straight away in order to operate international (and potentially some domestic) trains efficiently to both the North East and the North West. Two 200m portions could be operated northwards, but only one path would be taken over the HS2 'stem' route.

The specification and costs of the HS1 link

A lower cost option for the HS1 – HS2 connection entails shorter tunnels and the use of the West Coast Main Line 'slow lines' between Queens Park and Primrose Hill. This alternative was ruled out by HS2 Ltd because it "severely restricted the West Coast Main Line slow line capacity due to a flat junction east of Primrose Hill".[21] However, this option costs less, has less impact on the surrounding area and provides greater capacity – and hence more benefit. And it may become more possible by the expedient of the diversion of the WCML slow line services into Crossrail as described in section 3.

[21] High Speed Two Limited, *op.cit, Supplementary Report*.

Longer term HSR network issues

When the connections to Heathrow are completed, it would be possible to operate direct services between key European cities and Heathrow, calling at Stratford. There is likely to be a substantial demand for this type of service and they too would bring about a major reduction in carbon emissions, and a likely reduction in short-haul flights.

Stratford is a critical location that addresses a wide range of challenges for HS2 but that has not yet been considered in the analysis to date.

The HS1 link will allow new connections to be made from the Midlands, the North and Scotland to Stratford in East London and stations in Kent, encouraging much greater mode shift from car travel. Combining domestic and international passenger services will enhance the economic viability of the through-HS1 services, providing that border controls can be managed. This could be achieved, for example, through the use of coupled 200m trainsets, one international, one domestic.

The provision of international services to the Midlands, the North and Scotland can be optimised by splitting and joining trains at Birmingham Interchange – particularly valuable if a connection to the MML for services to the East Midlands, Yorkshire and the North East is also provided.

The HS2 – HS1 connection might potentially be built at lower cost and provide more capacity if it is revised to take advantage of the proposed Crossrail incorporation of WCML slow line services.

In combination, these plans would allow direct high-speed rail services to be provided cost-effectively:

- **From the West Midlands, North West and Scotland to East London, Kent and Europe**
- **From the East Midlands, Yorkshire and North East to East London, Kent and Europe.**

6. Conclusions

In Greengauge 21's view, the HS2 scheme has not yet been optimised, and as a consequence, the scheme's benefits are underestimated and the project costs could be reduced.

We have identified some refinements to the HS2 scheme and one small but critical addition that we believe would increase its value significantly – and potentially reduce its cost and local impact.

The key points we believe should be considered by the Secretary of State are:

in terms of infrastructure –

1. The addition of a short connection to permit the operation of services from HS2 onwards to the Midland Main Line as well as to the West Coast Main Line.
2. An extension of Crossrail to join the West Coast Main Line, rather than an extension of Crossrail to Old Oak Common. A station on Crossrail at Old Oak can be provided to serve the regeneration area.
3. Old Oak Common interchange assessed as an option rather than part of the central case for HS2.
4. The adoption of a lower cost and higher capacity connection to HS1 using the slow lines of the West Coast Main Line that will be freed up by the change at (2).
5. Development of the designs of the two Birmingham stations, and modification of Stratford International platforms, such that part-domestic/part-international trains can be securely managed.

in terms of service planning assumptions –

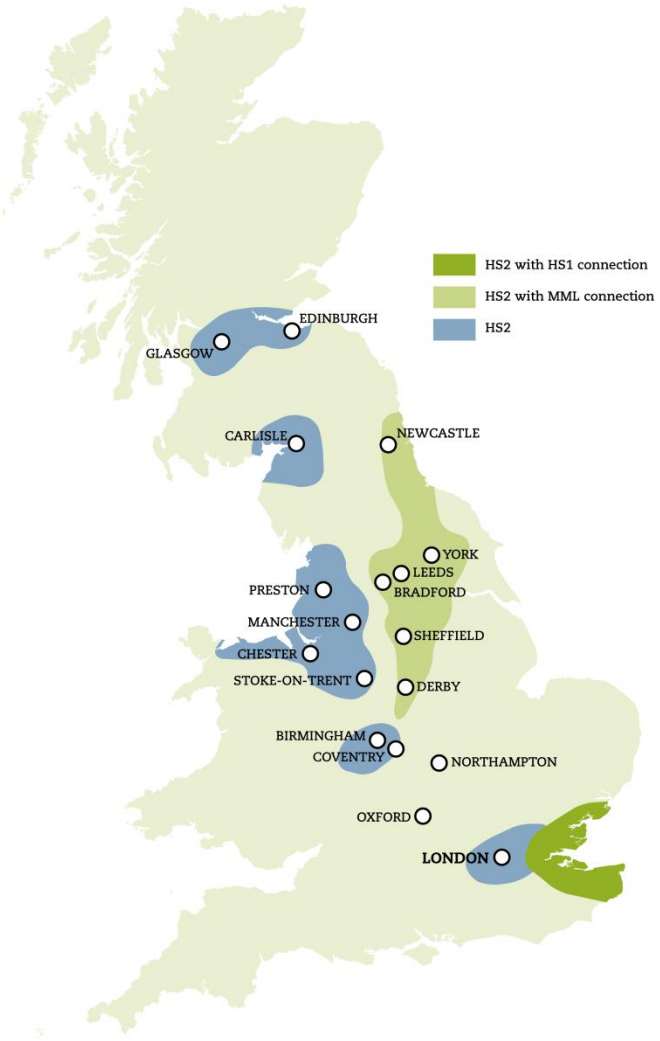
1. The addition of an hourly Edinburgh service via HS2.
2. The addition of HS2 services from Euston to Derby/Sheffield (two trains/hour) with one extended to Leeds and the other to York/Newcastle.
3. The addition of services from the Midlands and the North to Stratford and Europe, operating as securely combined regular hourly (or twice hourly) interval international/domestic trains.
4. The speed up of all HS2 services from the removal of the stops at Old Oak Common.
5. The transfer of Birmingham Interchange stops to selected through journeys further north, saving further on London – Birmingham journey times and on rolling stock requirements. Taken together with the change at (4), this would allow London – Birmingham city centre – city centre times of just 40 minutes, and this in turn permits better rolling stock utilisation.
6. The refinement of stopping patterns over the northern section of the West Coast Main Line to increase revenue potential.

Broadening the benefits of HS2

The connection to HS1 already included in the HS2 scheme, together with the incorporation of a (much lower cost) connection to access the MML, greatly broadens the catchment that could directly benefit from HS2 as is shown in Figure 6.1. Instead of just London, the West Midlands, the North West and central Scotland being direct beneficiaries, the inclusion of the HS1 and MML links

add benefits to the eastern side of the country: to Essex and Kent, the East Midlands, Yorkshire and the North East.

Figure 6.1 Catchments that will benefit from HS2



Improving Value for Money

The analysis here has identified the potential for a major cost saving to HS2 from the Network Rail proposal to connect the West Coast Main Line into Crossrail. This would have the effect of removing more passengers from the Euston area than the Old Oak Common interchange. The benefits of local regeneration in this part of West London could be protected – and even enhanced, because there would be more former railway land available for redevelopment.

It is difficult to assess the impacts of these proposals on the HS2 business case without using the suite of models that HS2 Ltd has developed. However, we can summarise the potential effects in broad terms as follows:

Element	Cost impact	Benefit enhancement[22]
Midland Main Line connection with services to East Midlands, Yorkshire, & the North East	c.£100m capex increase	Existing project benefits increased by 20-25%
Removal of Old Oak Common Interchange	Capital cost saving of c.£1bn	Journey time reductions of up to 9% on HS2 services and a similar level on Great Western
Addition of HS2 service to Edinburgh		Project benefits increased by about 10%
Addition of Stratford/European services and revision to the HS2-HS1 link	Capital cost saving of c.£100m	Significant uplift of project benefits
Stopping pattern changes		Further benefits

This summary excludes both the costs and the benefits of the proposed assumption of incorporation of West Coast Main Line services into Crossrail. This change would bring a number of stations in the Chilterns onto the Crossrail network. It would have a good business case, based on the Network Rail appraisals presented in Section 3. This should be considered as an alternative to extending Crossrail to a major new interchange at Old Oak Common.

The WCML - Crossrail proposal may seem unconnected to HS2, but in reality it is an example of an arrangement employed across Europe, for example at Gare du Nord and Gare de Lyon in Paris, to provide platform capacity for high-speed rail services in existing central city terminals. The device is to cross-link existing commuter services (which itself offers substantial benefits) and use the space freed up at the historic central terminating stations to accommodate the new HSR services. It is an opportunity that presents itself here in respect of Euston and the incorporation of West Coast Main Line commuter services into Crossrail at very low capital cost. It offers the additional prospect of significant cost savings in the construction of the HS2 facilities at Euston station.

The work presented here has not covered a further set of benefits that would be derived from refinement and development of service plans on the 'classic' network. The consequential benefits of the changes described here for Leicester and Nottingham and a wider set of benefits from service changes related to classic services on the West Coast Main Line – which is the subject of a separate Greengauge 21 report[23] – should also be taken into account in the appraisal of the case for HS2.

Greengauge 21

28th July 2011

[22] These are initial estimates only and reflect the proportional benefit achievable by a well utilised additional HS2 train path in the case of the MML and Edinburgh services.

[23] Greengauge 21, *Capturing the benefits of HS2 on existing lines,* February 2011.