High Speed Rail
London to the West Midlands and Beyond
A Report to Government
by High Speed Two Limited

PART 7 of 11
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Chapter 1:
ICE 3 high speed train on the Frankfurt-Cologne high-speed rail line, Sebastian Terfloth;
Eurostar, Dave Bushell www.canbush.com/ppbfrontpage.htm;
Gümmenen viaduct over the river Sarine with TGV 9288, Berne, Switzerland, Chriusha;
Tunnelling, HS1 Ltd
AVE Tarragona-Madrid, Fototrenes
St. Pancras Station, HS1 Ltd

Chapter 5:
Matisa www.matisa.com/matisa_ang/matisa_produits.html
3.7 Options for an interchange station in the West Midlands

3.7.1 In section 3.5 we explained our recommendation against including an intermediate station on the route between the London and Birmingham conurbations. In short, while there may be some demand for such a station, the generation of benefits would be an inefficient use of capacity, and incur considerable time costs to through passengers from stopping trains which would otherwise be travelling at top speed. This reasoning has led us to adopt a general model of high speed rail which avoids intermediate stations – focusing instead on city-to-city journeys.

3.7.2 We know from international experience however that there can be a role for stations on the outskirts of cities (for example the satellite station at Paris Charles de Gaulle airport) in addition to central terminals. There are a number of reasons why such stations can be attractive:

• An interchange station can extend the benefits of high speed rail by broadening the overall market.

• The time and energy penalties of stopping a train tend to be less on the way into or out of the city (where line speeds are typically lower) than at an intermediate station in the middle of the route, where the highest speeds will be achieved.

• Journey times are slowed disproportionately in urban areas, because of the reduced speeds demanded by tunnelling, environmental mitigation or tighter curves. For example on HS2, around 20% of the overall London to Birmingham journey time is consumed over the last 15% of the line’s length. As a result the journey time savings that can be achieved from peripheral stations can be quite pronounced.

• For the passenger market it serves, a satellite station avoids the need to travel into the centre merely to catch the high speed train out.

• The location of such stations can often be more easily optimised to enable efficient interchange between other transport modes.

3.7.3 So as well as considering an intermediate station between London and the West Midlands, we also investigated the merits of an interchange station within the West Midlands.

Options considered

3.7.4 Given that an interchange station was required neither by our remit, nor for railway operational reasons, we concluded that such a station would only be included in the preferred scheme if could be shown to increase the scheme’s overall welfare. Accordingly, the process to determine the optimal location for a Birmingham interchange station was led by demand. In deriving our options several high level criteria were applied:

• The station should ideally be located so as to maximise demand for trips to London and encourage additional benefits by attracting people from existing car journeys.
• The site should provide good opportunities for interchange between other modes of public transport and private cars – including space for generous provision of car parking.

• The area chosen should broaden the market for high speed rail by seeking to avoid too much of an ‘overlap’ with the market for a city centre station.

3.7.5 Ten locations, identified as having potentially strong links to the strategic road network and close to the initial lines of route, were subject to an initial review, as depicted in Figure 3.7a. Included among these were several sites outside Birmingham city centre which had been ruled out as terminal station options (see section 3.6).
3.7.6 The exercise of selecting the optimal interchange station was carried out in parallel with the sifting of other options. As a result, some interchange options became superseded by decisions made elsewhere about the line of route through the West Midlands. Where such issues arose, efforts were made to verify that the scale of the potential benefits arising from the station did not contradict these decisions.

3.7.7 After consultation with members of the West Midlands Working Group we took the decision not to pursue the following interchange options:

- **1. Walsall/Bescot; 4. Wolverhampton; 9. East Sutton Coldfield; 10. Shenstone.** Locations to the north east and north west of Birmingham, while densely populated, offered relatively poor demand prospects for an interchange station serving London. Today, these locations yield between just 25-35% of the highway trips that originate from a catchment area near the existing Birmingham International station. Options 1 & 4 also fell away with the decision not to continue with routes to the west of the city, while options 9 & 10 offered poor connections southwards to most of the east of Birmingham catchment.

- **2. Heartlands.** An interchange station at Heartlands would not significantly increase the overall market for HS2, overlapping instead with the city centre catchment area. In addition the increase in traffic accessing the station in a built up area would put critical additional pressure on the already congested road network.

- **8. Earlswood.** This option to the south of Birmingham was withdrawn as decisions were taken on the viability of HS2’s line of route and access into the city.

**Selecting a preferred option**

3.7.8 Following the initial review, four options remained for demand modelling, which together were compliant with the shortlisted routes into Birmingham:

- **5. Water Orton** – which could be located on a Water Orton/inner delta route, near the convergence of the M42, M6 and M6 Toll. The location of this station on the delta junction and amongst the junctions of several major motorways was expected to be very difficult to construct and also very costly.

- **3. & 6. Birmingham International** – two options located near Birmingham International Airport and station, and the NEC, to be compatible with the two HS2 routes under consideration in that area. For demand modelling purposes these options were treated as one.

- **7. Solihull** – a site near the existing Widney Manor station which would be compatible with a line of route accessing Birmingham via the Solihull corridor.
3.7.9 Each station was modelled on an indicative Day One scenario for HS2 operations, which assumed a certain service level and journey time. On this indicative basis, there was very little variation between the three in terms of benefits generated, the range between the highest (Water Orton) delivering approximately 2% more benefits than the lowest (Solihull). The benefits of a station at Birmingham International were also thought to be underestimated given the potential to release greater connectivity benefits with improved links to the airport and existing station. These links were not modelled in this indicative scenario.

3.7.10 At this stage we were able to conclude that an option in the Solihull area should not be pursued, given that its status as the lowest performing option in terms of benefits was congruent with the parallel decision not to carry out further work on the Solihull corridor.

3.7.11 While at this stage the options were not fully designed and costed, we were also confident that the additional cost of a station at Water Orton, given the difficulty of construction, would outweigh any marginal increase in benefits the modelling had shown, which in any event we would expect to disappear if an interchange station in the Birmingham International area was well connected to the airport and classic rail station. Accordingly, a station option in the Birmingham International area was identified as the best option to consider as part of the overall scheme.

**Birmingham Interchange**

3.7.12 Figure 3.7b shows the location and layout of the proposed Birmingham Interchange station below. The station would be built on the preferred line of route approximately 2km from the existing Birmingham International station and 1km from junction 6 of the M42. The line of route would be four-tracked on the approach to the Interchange, opening out into six tracks at the station, with four platform faces for the stopping tracks, and the two through lines running down the middle. From the station, the four track alignment would continue until the beginning of the delta junction where the outer lines would, via a grade separated junction, leave the main alignment to serve Birmingham.

3.7.13 A high capacity, high frequency airport-style people mover would be needed to create efficient connections between the airport, NEC and classic rail station. The station site, as well as a possible configuration for the people mover route, is indicated in Figure 3.7b.
Chapter 3: Determining the Preferred Scheme

3.7.14 In order to provide high capacity road access to the station and to accommodate increased traffic caused by background growth and additional HS2-related journeys, substantial works would be required to the highways in the area, in particular at Junction 6 of the M42. These aspects are considered further in the Route Engineering Study Final Report. The proposal includes a 7,000 space car park just to the east of the station, to accommodate road access demand from the station catchment area.

3.7.15 The cost of constructing the Birmingham Interchange station is forecast to be £465m. This includes the cost of a rapid transit people mover connecting the station with the airport, NEC complex and existing station. Provision for extensive highways alterations is also included, as are all contractor costs. This cost excludes location-specific construction risks, ancillary items, environmental mitigation, land / TOC compensation, project costs and any routewide or programme level risks which are included in the overall scheme costs.
3.7.16 The indicative train service specification for Day One operation on HS2 is described in section 3.1 and the HS2 Technical Appendix. It envisages that all HS2 services between London and Birmingham would call at the interchange station. This notional specification also assumes none of the classic-compatible services using the WCML north of Lichfield would call at the interchange station (effectively mirroring the existing WCML fast services). However, with a wider network of high speed lines, it may be desirable for long distance high speed trains to call at the interchange station, providing connectivity with Birmingham.

3.7.17 When modelled as part of the preferred Day One scheme, we found that a station in the Birmingham Interchange area would add around £970m in terms of benefits (in present value terms), and the Benefit-Cost Ratio of the station is estimated at 2.9. A Birmingham Interchange station in this location could be expected to account for close to half the 54,000 daily passengers to and from Birmingham.

3.7.18 The station and the track configuration either side has been designed to mitigate the capacity and journey time impact on through trains. A Birmingham-bound train would leave the main line north, decelerating into the Interchange station on one of two additional tracks either side of the main lines. The four tracking alignment continues after the station until the delta junction at Water Orton where the line peels off towards Birmingham. This means that the Birmingham-bound trains never rejoin the main route north which, with an accelerating train rejoining the line, would reduce its overall capacity and speed.

**Sustainability**

3.7.19 An interchange station at this location – inside one of the West Midlands Regional Spatial Strategy’s Major Urban Areas – with effective links to the airport and classic railway station as well as the NEC complex, would be well aligned with the regional development objectives of the West Midlands partners.

3.7.20 The proposed station lies within the existing green belt, albeit close to the M42 motorway and airport/NEC development. Besides landscape impacts, the principal sustainability consideration is the potential pollution from increased traffic. Here the low population density means that any physical health risks arising from deterioration in air quality would be negligible. The station is forecast to generate an additional 1,700 car trips in the morning 3 hour peak in the region (over and above the car trips which would otherwise have been made to the existing station at Birmingham International), which would have an impact on the scheme’s overall carbon emissions, although this is offset by the modal shift that the station would encourage.
Summary and key recommendations

3.7.21 We recommend that the Birmingham Interchange station is included in the preferred scheme for HS2. It would serve a significant catchment area, handling around half of the HS2 West Midlands passengers and in the longer term it could provide a Birmingham connection for high speed services between London and cities further north.

3.7.22 The station also provides good connections with Birmingham International Airport, the NEC, and the existing station at Birmingham International [which could itself receive an enhanced suburban service through capacity released on the WCML].

3.7.23 If work is to be taken forward on the Birmingham Interchange station, we recommend that consideration should be given to the development, jointly with the Highways Agency and local authorities, of a strategy for highway works in the area, consistent with background traffic growth and the plans for an interchange station.
3.8 International rail connections

3.8.1 We were asked to review options for linking with HS1. This section sets out the different ways of making the connection; it sets out the results of our demand analysis to show how many people would be likely to use an international service and explains what additional space would be required to transform a domestic station into one that offered international services. The conclusions of these three strands frame the incremental costs and benefits of adding a connection to HS1.

Options for linking HS1 to HS2

3.8.2 We reviewed a number of possible ways of connecting a new high speed line with HS1.

- **A new high speed connection.** A dedicated tunnel from Old Oak Common to near the London tunnel portal for HS1 in East London would allow high speed trains to join HS1. Vibration, re-radiated noise and ground settlement risks would need to be addressed for the shallower sections of tunnel and affected properties may be numerous.

- **A new classic speed link to HS1.** A new classic speed link could allow trains to join HS1 at conventional speeds. This link could either be a single or a dual track. A short tunnel containing one or two GC gauge tracks could be built from Old Oak Common to the WCML, emerging to the south of Queen’s Park. A short section of the WCML would require upgrading to GC gauge, including enlarging the relevant bores of the Primrose Hill tunnel. A new junction would be required to link onto the North London Line which would need to be widened to GC gauge too. The connection onto HS1 would be at Camden Road East Junction. This link would take approximately 10 minutes. The limited operation requirements of HS2 services are highly unlikely to cause any permanent effects upon property and resources. Changes to the local network and services would be required. Both the Grade II* listed Primrose Hill Tunnel Portals and Camden Roundhouse, as well as three Grade II listed buildings would be within 50m of the track – they could have limited impacts. The Grade II Camden Road station would need to be modified but this change should only affect the operation of the platforms.

- **An improved interchange between Euston and St Pancras.** It currently takes around 10 minutes to walk between the concourse of our London station, Euston, and the HS1 station at St Pancras International. It would be possible to develop a ‘people mover’ between Euston and St Pancras. We have not developed a design nor assessed its suitability but envisage that a light rail service would be able to offer a fast and frequent way of transferring people between Euston and St Pancras International.

3.8.3 If a rail link was to be built, we recommend that it be dual track at conventional speed. We have estimated the cost of this link at £810m. This includes all contractor costs but excludes location-specific construction risks, ancillary items, environmental mitigation, land / TOC compensation, project overheads and any route-wide or programme level risks which are included in the overall scheme costs. (These would take the cost to over £1bn).
3.8.4 The single rail line link would cost less than the dual track but would not offer the same resilience capability nor the same opportunity for future growth in demand along the line. We estimated the cost of the high speed connection to be at least £3.5bn, albeit at a lesser level of detail. Figure 3.8a illustrates the dual track conventional speed link. It would be very difficult to return to the Old Oak Common site, once the Day One services were running, to build the tunnel element of the link as it would effectively be in the centre of the live railway. Thus the tunnel – which accounts for a significant element of the cost – would need to be built at the outset if it was to be built at all.

![Figure 3.8a Possible rail connection with HS1](image)

**Passenger demand**

3.8.5 International rail services running from HS2 to HS1 would be competing with short haul air services to the Continent. Journey time is a key predictor of the likely rail mode share, as shown in Figure 3.8b. International experience suggests that if the journey time between cities could be brought down to less than three hours then more than half of the air market would transfer to rail. It currently takes 2 hours 15 minutes to reach Paris from St Pancras and approximately 2 hours to Brussels. These times are well within the time that competes well against air and are reflected in the significant share of the market that rail has captured.
3.8.6 Using data from other countries, we have analysed high speed rail’s market share over a range of different journey times. This work demonstrates a clear relationship between journey time and market share as shown by the curve in Figure 3.8b. A Birmingham to Paris high speed rail journey would be expected to attract around half of the existing market. Rail journeys from north of Birmingham or to beyond Paris would attract a rapidly decreasing share of the market as journeys would increasingly take over three hours.

<table>
<thead>
<tr>
<th>Annual Air Passengers 2033 (inbound &amp; outbound)</th>
<th>Paris CDG</th>
<th>Amsterdam</th>
<th>Brussels</th>
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</thead>
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<tr>
<td>Birmingham</td>
<td>439,000</td>
<td>432,000</td>
<td>284,000</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>416,000</td>
<td>429,000</td>
<td>77,000</td>
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<tr>
<td>Glasgow</td>
<td>10,000</td>
<td>434,000</td>
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<td>Heathrow</td>
<td>1,478,000</td>
<td>2,851,000</td>
<td>1,066,000</td>
</tr>
<tr>
<td>Manchester</td>
<td>880,000</td>
<td>589,000</td>
<td>308,000</td>
</tr>
</tbody>
</table>

3.8.7 Figure 3.8c shows the forecast air passenger market from various UK airports to Paris, Amsterdam and Brussels in 2033 based on data from DfT’s air passenger forecasts. This translates into 600 passengers being expected to fly between Birmingham and Paris in each direction every day.
3.8.8 To understand how HS2 might attract international passengers to transfer from air to rail potential we tested a number of scenarios. For the first scenario, we investigated the impact of running fast non-stop dedicated services from Birmingham straight to the continent. We estimate this kind of service would attract 600-1,250 passengers to and from Paris and 450-950 passengers to and from Brussels in each direction per day in 2033. Even if the existence of a high speed service generated significant additional international travel, demand is unlikely to be enough to offer a reasonably frequent service. In the long term, assuming the HS2 core route is operating at full capacity, trains travelling non-stop to the continent would also reduce the number of domestic trains going to London, where the majority of passengers want to go; and security requirements dictate that we could not mix domestic and international passengers on the same train.

3.8.9 For the second scenario, we investigated the impact of starting some HS1 trains from Old Oak Common rather than St. Pancras to Paris and Brussels. This would enable passengers from all destinations that used HS2 on Day One, for example Manchester, Liverpool, Preston and Glasgow to change at Old Oak Common onto a service to the continent. Old Oak Common would have the convenience of an easy cross platform interchange, with similar time taken for check-in as a direct service. We have estimated this as being equivalent to an additional 10 minutes of journey time compared to a direct train. This would mean that there would be less demand from each city, but as more places would have access to Old Oak Common the overall demand would be higher, attracting 1,400-3,150 passengers a day to and from Paris and 700-1,500 passengers to and from Brussels in each direction per day. In this we may have understated demand from non-HS2 users, particularly from West London and the Thames Valley, who might find Old Oak Common easier to access than St Pancras. Such services could be expected to attract some of the market that would otherwise have flown from Heathrow, as well as some who would otherwise have travelled from St. Pancras.

3.8.10 A different approach to allowing access between HS2 and HS1 would be for people to walk, or take a bus from Euston to St Pancras to board a HS1 train. This would be far less convenient than the two other scenarios with passengers incurring a much longer interchange time penalty to walk to St Pancras, often with luggage. However it is likely that there would be more frequent HS1 services to the continent from St. Pancras than from Old Oak Common, which would help compensate. We have estimated the interchange at Euston to be equivalent to at least 40 minutes of journey time. This scenario would attract 1,000-2,400 passengers from HS2 to and from Paris and 500-1,200 to and from Brussels per day. A light-rail link or people mover from Euston to St Pancras would further reduce the interchange penalty (to 20 minutes) and increase the demand closer to the levels of an interchange at Old Oak Common.

3.8.11 The benefits of these options are limited due to the small number of passengers. With fast direct international services from Birmingham, we estimate that HS2 would generate benefits of, at most, £200-450m. This is unlikely to cover the capital costs (including risk and optimism bias) of a direct link to HS1. Once operating costs are included the BCR is likely to fall significantly below 1. The strongest case is likely to be a connection with a people mover at Euston, which could add around £250-600m of benefits to all HS2 users at much lower cost.
3.8.12 This analysis therefore suggests that:

- Running direct services to Paris or Brussels via a connection to HS1 would bring Birmingham within three hours and attract a significant market share, but the market would not be big enough to fill a 400 metre train a day in 2033. Direct services to destinations north of Birmingham would attract a smaller market share but are competing in a slightly bigger market and might fill another train per day.

- A station at Old Oak Common has the advantage of allowing international passengers to use frequent domestic services from a wider range of cities to access HS2 trains and it does not require extra train paths on HS2. Although an interchange at Old Oak Common is much easier for passengers than a walk between Euston and St. Pancras, it still less attractive than a direct service. The total demand from high speed lines for international services from Old Oak Common would be small and unlikely to justify the expense of the HS1 link.

- Interchanging between Euston and St. Pancras is more difficult than a cross platform interchange at Old Oak Common, although this is compensated for to some extent by the higher HS1 service frequencies available from St. Pancras. A people mover between Euston and St. Pancras would improve the ease of interchange between these stations. Under any scenario, however, the number of international passengers on HS2 is likely to be fairly limited.

3.8.13 The business case for running international services on HS2 would be improved if HS2 was part of a wider high speed network to other parts of the UK. However, in the absence of significant changes in aviation policy (or a much more dramatic airline response than we would expect), demand is likely to be less than double the demand for an Old Oak Common station on the basis of HS2 alone. This is unlikely to justify the cost of investment in an international station north of London.

**Station requirements**

3.8.14 We investigated the additional requirements of offering international services from a station. As an example, it would be possible to build an additional floor on top of Old Oak Common to provide for security and border control facilities.

3.8.15 This station would then serve as the collecting point for passengers from all services using HS2 to access trains to the continent – as in scenario two above. A similar addition could be possible at the Birmingham Interchange in the longer term network. Building this additional floor would create significant disruption if done once the rail station was already in use. We would therefore recommend that if a connection was envisaged in the future the station should be built to accommodate international facilities from Day One. Therefore we recommend that a decision about whether to build a rail link from HS1 to HS2 ought to be taken at the same time as the decision as to whether to proceed with HS2 London to Birmingham.
Summary and key recommendations

3.8.16 The passenger market wishing to use a link between HS1 and HS2 would be relatively small. However, we recognise the uncertainty in aviation policy in the long term and the difficulty in forecasting the airlines’ reaction to a rail link, both of which could significantly change the future size of the market.

3.8.17 If a direct rail link were to be provided between HS1 and HS2, we recommend that this should be a dual track railway run at conventional speed between Old Oak Common and HS1 at the Camden Road East Junction. Allowing for risk, this would cost over £1bn.

3.8.18 We recommend that trains should start their journeys to the continent at Old Oak Common, having picked up passengers from a number of domestic services from around the country. A decision about a rail connection between HS1 and HS2, and whether Old Oak Common should be built as an international station needs to be taken early in the process so that, if needed, the tunnel and station could be built from Day One to avoid significant disruption in the future.

3.8.19 Regardless of whether a HS1 rail link is taken forward, we recommend that further thought be given in particular to the costs and benefits of a people mover between Euston and St Pancras/King’s Cross. This could also benefit those passengers using Euston who would wish to access the services offered at King’s Cross or St Pancras, such as the East Coast Main Line, Piccadilly Line, Thameslink, or Midland Main Line.
3.9 Freight

Introduction

3.9.1 This section discusses the potential use of HS2, either in its initial form or as possibly subsequently extended, for freight services. It looks at how other European countries manage freight on their high speed networks and describes the impact of the possible uses of freight on the design and operation of HS2. It concludes with our recommendations for a freight policy.

Potential freight traffic on HS2

3.9.2 HS2 could theoretically be used to carry a number of different types of freight. These include:

- European or international containerised or swap body traffic conveying general merchandise (for example, consumer electrical goods, automotive parts or perishable foodstuffs) travelling at a notional maximum speed of between 120kph and 160kph.

- ‘Piggy-back’ trailer-on-train or ‘Rolling Road’ lorry-on-train traffic, travelling at a notional maximum speed of 120kph.

- Other freight up to the current GB network limit of 25.5 tonne axle weight travelling at a notional maximum speed of 100kph.

- High speed ‘air freight’ postal or small-packet traffic, travelling at full line speed in specially-built high speed trains.

3.9.3 In France, currently only high speed trains conveying ‘air freight’ postal or small-packet traffic are permitted on high speed lines. However the new high-speed line linking Perpignan (France) and Barcelona (Spain) will be capable of conveying freight traffic. In Italy active provision has been made for most types of freight where surplus capacity exists. However, the track access premium for this facility has so far meant that no freight operator has found it economic to use it.

3.9.4 In Germany most freight traffic is permitted on all or parts of the initial Hannover – Wurzburg high speed line, which was the first high speed line opened in Germany. A succession of freight trains uses the line each evening after the end of high speed passenger services, timetabled to fit around the maintenance activities. The Hannover – Wurzburg route did not incur significant additional capital cost specifically for freight provision, as the geography of the area enabled the line to be kept within gradient limits accessible to freight. At the time of building, few additional measures for noise and vibration were required although there has been progressive addition of noise barriers in the two decades since route opening. Freight traffic is also permitted on the Stuttgart – Mannheim and Karlsruhe – Basel high speed sections, and is also being accommodated on future high speed lines currently under construction. Freight traffic is excluded from the Frankfurt – Cologne and Ingolstadt – Nuremberg lines. German advice is that maintenance costs through provision of freight running are significantly higher through rail and track formation wear, but are covered by freight access charges. High speed lines in Asia are not used by freight trains.
3.9.5 ‘Piggy-back’ trailer-on-train or ‘Rolling Road’ lorry-on-train transport is generally used where a physical barrier to continuous road freight operation exists – for example on transalpine and Channel Tunnel services. The payload of these trains is substantially lower than that of standard intermodal (container or swapbody) trains, leading to between double and treble the transport costs per payload tonne. Conveyance of entire vehicles by rail also poses a fire safety risk, particularly in long tunnels.

3.9.6 We were specifically asked to identify what the additional costs would be of ensuring that the infrastructure used for HS2 would not rule out the ability for freight to use in the future – for example by not making the gradient too steep. We have found that for the London to West Midlands route those costs would be negligible.

A freight policy for HS2

3.9.7 Running lower speed freight trains on the line at the same time as high speed passenger services would have a severe impact upon the route capacity – a single 120kph freight train travelling from London to the WCML via HS2 would consume up to 15 high speed train paths. This would be both unaffordable for the freight operators (in terms of pricing per train path) and unsupportable for the passenger operators (in terms of disruption to regular-interval train services). As a consequence, we do not regard the prospect of conventional freight trains using HS2 during the normal hours of passenger operation as feasible.

3.9.8 The only freight traffic which could be considered during the normal hours of passenger train operation would be ‘air freight’ postal or small-packet traffic travelling in non-passenger high speed trains. No special provision would be needed for such trains, which have identical engineering and operation specification to high speed passenger trains. Any decision to operate such traffic in the future would be a commercial one. The only potential additional feature in the initial HS2 route could be a junction layout to provide access to a handling terminal, possibly near Birmingham Airport or Heathrow Airport. Crucially, though, there would be no further capacity loss (other than the use of one train path) caused by the operation of such a high speed ‘air freight’ service.

3.9.9 All other freight using HS2 would need to be accommodated alongside essential overnight maintenance activities, or mixed with late evening or early morning passenger services, as in Germany. The potential for international freight would have to be considered in the light of operational and timetabling constraints on the passage of freight through the Channel Tunnel and on HS1; as on HS2, it is very difficult to create a viable timetable path for a freight train on HS1 during the hours of Eurostar and Javelin passenger train operation, so freight services are practically limited to overnight operation only. The maintenance regime of the Channel Tunnel is such that one tunnel section is closed overnight on most nights, reducing the availability because of single-line operation on the remaining open tunnel section. Taking into account the constraints in pathing freight through the Channel Tunnel and that few of those paths are at times which would permit uninterrupted running onwards along HS1 to HS2, we would see little prospect of usage by European gauge trains of HS2 from Day One. However, in the longer term, with a possible extension of HS2 further north and depending on how track access charges are set, a limited amount of European gauge perishable traffic could be justified.
3.9.10 On this basis we concluded that the infrastructure design should not preclude the operation of freight trains but neither should it include any freight-specific provisions. This meant that:

- The route, and civil engineering support structures, has been designed so as not to preclude conventional freight services operating over HS2.

- We have not included any active or passive provision for freight specific junctions additional to the connections required for passenger operation, maintenance and stabling and the connections to the infrastructure maintenance depot.

- We have included no additional requirements required for safety in tunnels to permit future conveyance of dangerous goods, in line with the policy adopted for HS1.

- We have included no additional mitigation for freight using the line at night.

3.9.11 More detail on the design requirements for freight can be found in the Project Specification. We assessed noise and vibration, and mitigated through design and protection, on the basis of a passenger-only railway for the anticipated operational hours with overnight, route only maintenance outside those times. Any future specific proposal to operate freight services would therefore need to include further assessment. This should include whether its impact could be contained within environmental limits set through the HS2 design and approval process; or whether additional measures would be required to be included as part of that proposal and subject to a separate approval process.

**Summary and key recommendations**

3.9.12 For high speed freight [such as air mail in high-speed trains], no special provision would be needed. Any decision to operate such traffic in the future would be a commercial one.

3.9.13 For other types of freight, running slower speed freight trains at the same time as passenger services would severely impact on capacity. We recommend that the infrastructure design should not preclude its use but no other provision should be made. This does not impact upon the opportunity to use the released capacity on the WCML for freight, which is discussed in section 3.10.