High Speed Rail
London to the West Midlands and Beyond

HS2 Technical Appendix

December 2009

Further copies of this report can be obtained from www.hs2.org.uk.

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Unless specified, all maps, tables, diagrams and graphs in this report are a product of HS2 and its consultants.

Contents

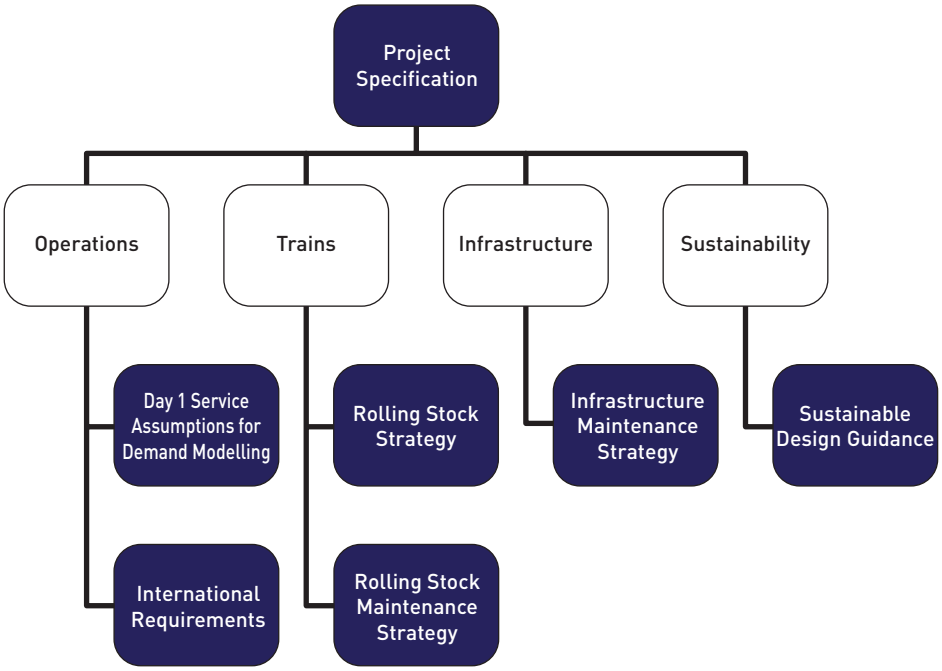
List of Acronyms

DfT	Department for Transport
HS	High Speed
TSIs	Technical Specifications for Interoperability

1. Introduction

1.1. Hierarchy of technical documents

1.1.1. The overarching HS2 technical specification is the Project Specification. It is supported by a number of other documents as shown below which provide additional detail on particular topic areas:



1.1.2. The above documents have been reviewed through their development cycle by a range of external parties; particularly the HS2 Technical Challenge Group and Appraisal of Sustainability Reference Group and they are contained within the appendices to this paper. The suite of technical documents has informed the development of HS2 options and the associated business case. Contents of each of the documents are summarised below.

2. Technical appendix content

2.1. Project Specification

2.1.1. This document identifies the key technical, operational and sustainable design requirements that need to be defined and subsequently met by HS2. At this early project phase, this specification is intentionally not comprehensive in all areas; there has been a focus on the requirements pertinent to enabling achievement of the HS2 project deliverables by 31 December 2009, as defined in the exchange of letters between Sir David Rowlands and Lord Adonis.[1]

1 "Objectives and remit for HS2" letter from Sir David Rowlands, Chairman of HS2 to Lord Adonis dated 13.02.09 and subsequent response from Lord Adonis dated 09.03.09

2.1.2. A key driver within the specification is compliance with the European Union Technical Specifications for Interoperability (TSIs) which mandate the specifications which must be met by all new high speed lines and their connections to the classic rail network. Compliance with TSIs is intrinsic to HS2's ability to expedite technical approval and ultimate acceptance into use.

2.1.3. Particular requirements relating to the safety of high speed lines have been considered.

2.1.4. It is also recognised that two different types of high speed rolling stock will be operating along HS2:

- High speed captive services between London - Birmingham using readily available, interoperable, larger gauge trains
- Services running between London and destinations north of the West Midlands, using smaller, modified high speed rolling stock to enable compatibility with the UK classic network

2.1.5. The key topics covered within sections of the Project Specification are shown below:

Section	Cost
Operational	Hours of operation; capacity; operational capability; freight; futureproofing
Rolling Stock	HS captive rolling stock requirements; HS classic compatible rolling stock requirements; classic network compatibility issues
Infrastructure	Line of route footprint; track; civils; control-command and signalling; electrification and power; stations; level crossings; interfaces with the classic network
Performance	Asset reliability and maintainability
Sustainable Design	Sustainable design guidance covering mitigation principles and status impact indicators.

2.2. Day 1 Train Service Assumptions for Demand Modelling

2.2.1. The purpose of this paper is to assist the demand modelling process, by providing a viable (but not timetable-validated) set of train service assumptions for the HS2 route which could operate from the day of its opening. It also seeks to address to some extent the potential use of capacity that is released on existing routes. The outputs from this process inform the generation of the business case and aspects of the Appraisal of Sustainability including socio-economic and climate change.

2.3. International Requirements

2.3.1. HS2 is required to consider provision of station facilities to segregate international passenger flows. The guiding principles and emergent requirements for such provision are described in this document following consultation with the DfT's Transportation Security and Contingencies team and the UK Border Agency.

2.4. Rolling Stock Strategy

2.4.1. The strategy clarifies the need for a mixed fleet approach and considers the usage, sizing and specification of the captive and classic compatible fleets. Capacity and compatibility of these sets are reviewed against existing mainline stock. Fleet cost derivation is described and the potential high-level environmental impacts of the high speed trains (energy and noise) are identified.

2.5. Rolling Stock Maintenance Strategy

2.5.1. This strategy outlines how both types of high speed stock will be maintained, stabled and serviced. A high-level rolling stock maintenance depot specification is included; this has been applied to identify a candidate depot location for the HS2 preferred route package and to estimate a cost for provision of the depot. In developing the strategy, the experience of several rolling stock suppliers/ maintainers has been sought and the HS1 Eurostar experience has been highly instructive.

2.6. Infrastructure Maintenance Strategy

2.6.1. HS2's infrastructure maintenance strategy has been developed through consideration of existing global best practice. The strategy describes the HS2 high-level approach to optimisation of inspection, monitoring and maintenance activities to eliminate the risk of operational failure. Key infrastructure maintenance depot requirements have been defined so that a potential main depot location can be identified for the HS2 preferred route package.

2.7. Sustainable Design Guidance

2.7.1. HS2 needs to be closely linked with national objectives for sustainable development by supporting and reflecting stated priorities enshrined in the *UK Sustainable Development Strategy: Securing the Future (2005).* The sustainable design guidance has therefore been prepared to aid the HS2 design team in this regard. Guidance is provided on nine sustainable design aims, potential sustainability constraints and opportunities to be considered in the optioneering and development of HS2 options and the hierarchy of mitigation measures available in the event of potentially adverse impacts arising.

Appendix 1

Project Specification

Version 3.0

Contents

List of Acronyms

EMC	Electromagnetic Compatibility
EPS	Enhanced Permissible Speed
ERTMS/ ETCS	European Rail Traffic Management System/European Train Control System
FMECA	Failure Modes, Effects and Criticality Analysis
GSM-R	Global System for Mobile communications – Railways
IEP	Intercity Express Programme
Kph	Kilometres per hour
OHLE	Overhead Line Equipment
Tph	Trains per hour
TSI	Technical Specifications for Interoperability

1 Introduction

This document identifies the key technical, operational and sustainability requirements that need to be defined and subsequently met by High Speed 2. The Project Specification is sufficiently developed to define the requirements necessary to achieve the HS2 remit as defined in the exchange of letters between Sir David Rowlands and Lord Adonis.[1]

1.1 Technical Specifications for Interoperability

The EU Technical Specifications for Interoperability (TSIs) mandate the specifications which must be met by all new high speed lines and their connections to the classic rail network. As a result, many requirements identified herein are taken directly from the relevant TSIs. In designing and developing HS2, the following hierarchy has been followed - TSIs have taken precedence but in areas not thus defined, current UK legislation and national standards have been applied and thereafter either anticipated or current accepted "good practice" adopted. The business advantages of creating a TSI compliant high speed are set out in section 2.3 of the main report.

1.2 Safety

HS2 seeks to deliver a safe and reliable railway system throughout its design, construction, operation and maintenance. Measures to protect high speed trains from risk or disruption though interference and trespass have been based on the experience gained in operation of HS1. Designing generally to internationally accepted practice and established European specifications, modified where necessary to control UK-specific risks, is anticipated to enable HS2 to match the exemplary safety record of high speed rail elsewhere. HS2's primary aim will be to prevent safety risk materialising, through design and then to mitigate residual risks as far as is reasonably practicable.

Key safety risks and mitigation measures have been identified as shown below; measures are being translated into HS2 requirements within this specification:

- Collision risk (other train/structure) - train control systems and structures specification/use of grade separated junctions.
- Derailment risk (obstruction on line/track design/track quality) - no level crossings; appropriate derailment containment measures; appropriate pedestrian fencing/vehicular barriers; review of access points and associated maintenance strategy; track specification and maintenance.

1 "Objectives and remit for HS2" letter from David Rowlands, Chairman of HS2 to Lord Adonis dated 13.02.09 and subsequent response from Lord Adonis dated 09.03.09

- Risks to passengers on trains - avoidance of collision and derailment risks as above; train crashworthiness and fire hardness; assessment of luggage handling measures and seatbelts; appropriate step-free access.

- Mixed traffic - HS2 will have no simultaneous operation of high speed passenger and conventional freight trains.
- Safety in tunnels - specific measures for individual tunnels depending upon design and in line with the TSI relating to safety in railway tunnels.
- Safety of maintenance staff - separation of maintenance activity from train operations; automation of inspection and maintenance activities.
- Adverse weather conditions e.g. flooding, storms, crosswinds - appropriate measures to be considered during development of the line of route.
- Stations (evacuation/personal security/trains passing) - specific measures for individual stations depending upon design; assessment of platform screen doors; provision of platforms off high speed through lines.
- Security - appropriate anti-trespass and anti-vandalism measures; security measures at rolling stock depot/stabling facilities and stations.

The safe operation of the overall HS2 system will only be delivered by consideration of 'soft' as well as 'hard' factors. In due course, soft factors e.g. the selection education and training of operations and maintenance staff will also need to be considered fully.

1.3 HS2 services

The core HS2 route between London - West Midlands will be used by two types of service from Day 1:

- High speed captive services operating between London - Birmingham using standard European TSI compliant high speed trains. These are referred to as "captive" trains.
- Services running between London and destinations north of the West Midlands, using specially designed and manufactured high speed rolling stock capable of traversing the UK classic rail network. These are referred to as "classic-compatible" trains.

The following sections covering operational, rolling stock and performance requirements reflect this as needed.

2 Operational Requirements

2.1 Operating Hours

05.00 - 23.59 Monday - Saturday
08.00 - 23.59 Sunday

2.2 Maintenance/Engineering Hours

00.00 - 05.00 Monday - Saturday
00.00 - 08.00 Sunday

The operation of high-speed services and maintenance/engineering activities on any track shall be segregated. Where work can be fully enclosed then it may be permissible on one track with adjacent tracks open subject to appropriate restriction of speed on the open tracks and available timetable capacity.

2.3 Train Service Specification

2.3.1 Passenger Capacity

The project shall assume a train capacity of 550 people per 200m high speed service. For captive train services only, two 200m trains may be coupled together to give a capacity of 1100 people.

2.3.2 Line Capacity

For services from Day One, the project shall assume a maximum utilisation of up to 14 high speed train paths per hour (tph) during the high peak periods and a typical utilisation of 10 tph during the day, so allowing for the relative reliability of dedicated high speed services and those running on to the classic network and existing documented train control system and train braking capability.

The project shall assume an ultimate capacity of 18 tph based on a longer term high speed network with services largely segregated from the classic network and anticipated improvements in train control systems and train braking technology.

2.3.3 Station Capacity

Longer term passenger demand shall be assessed in terms of numbers entering, leaving and interchanging and shall be used to develop the station design and safety case.

Design of any station for international traffic shall make provision to segregate international outbound and inbound passengers from UK domestic passengers and carry out security and customs procedures required by UK Borders Agency.

2.3.4 Passenger Service frequency

Day 1 service assumptions to be used for demand modelling for the core HS2 route are shown below:

Service From	To	Journey Time (mins)	Off-Peak Pattern (tph)	Peak Pattern (tph)
London	Birmingham	49	3	4
London	Manchester	100/104*	3	3
London	Liverpool	110	2	2
London	Preston	108	0	1
London	Glasgow(via Preston)	240	1	1

*dependent on route 100 minutes via Stoke, 104 minutes via Crewe

2.3.5 Stations to be served

The HS2 stations to be served from Day 1 are detailed below:

Station to be served	
London Terminus	Service growth beyond Day 1 to be considered in developing station footprint due to high likelihood of subsequent extreme access constraints.
Outer London/Heathrow/Crossrail Interchange	Assumed all HS2 services will stop here
Birmingham Interchange	Not all services will stop here, platform faces shall be located to avoid blockage of the main line
Birmingham Terminus	Service growth beyond Day 1 to be considered in developing station footprint

2.3.6 Platforming of Trains

The project shall make provision for accommodating two 200m train units coupled together.
The project shall provide a sufficient number of platform faces at terminal stations served on the basis of a minimum of one platform face per two trains per hour.
Assess the requirement and demand for an intermediate/interchange station in the West Midlands.
All HS2 station platforms shall be equipped to permit joining and splitting trains within the platform.

2.3.7 Crossovers

For the purpose of estimating costs, the project shall assume provision of open-route crossovers for operational flexibility and engineering access requirements nominally at every 20km along the route, where crossovers are not already provided for other reasons.
The need for recess loops for operational flexibility and engineering access requirements is to be determined.
Connections to the classic network shall be determined by service business need or infrastructure maintenance practicality.

2.3.8 Depots and Stabling

The project shall assume the provision of one main rolling stock maintenance depot to service rolling stock required for the operation of HS captive and classic-compatible strain fleets on Day One.
The main depot (to point of stabling) shall be no more than 10 minutes journey time from the HS2 route.
The project shall determine the requirement for additional rolling stock stabling and servicing facilities necessary to support HS captive and classic-compatible trains for the Day One service.
The project shall assume the provision of one main infrastructure maintenance depot mid-route for HS2 infrastructure. This depot shall be capable of stabling on track plant and all necessary spares to enable all maintenance activities to be undertaken.
The project shall determine the requirement for any additional out based maintenance and on track plant stabling facilities.

2.4 Freight Capability

The project shall evaluate the potential costs and benefits associated with providing freight capability on the high speed route.

The project shall design the route horizontal and vertical geometry plus civil engineering support structures to values which do not preclude conventional freight service operation over HS2 should the business requirement materialise.

No active or passive provision shall be made for freight specific junctions additional to those required for passenger operation, maintenance and stabling.

No additional requirements shall be added to the design of safety in tunnels to permit conveyance of dangerous goods.

2.5 Future proofing

The project shall evaluate the potential for future proofing through comparison of the cost of providing future capability now versus future retrofitting.

The project shall evaluate the passive provision of four tracks.

3 Rolling Stock Characteristics

3.1 Captive High Speed Passenger Rolling Stock Parameters

Definition of the parameters shown below is being informed by development of an HS2 reference train.

High speed captive rolling stock parameters shall be defined to satisfy the requirements provided below:

a) Dynamic reference contour - TSI vehicle gauge GC

b) Train length - maximum train length 400m (two 200m units running coupled together)

c) Maximum average acceleration - as defined in the HS2 reference train acceleration data

d) Maximum speed for the Day One service - 360 kph

e) Braking Deceleration - as defined in the HS2 reference train braking deceleration data

f)	Axle loads - maximum permissible axle weight of 17 tonnes
g)	Regenerative braking - in line with TSI requirement
h)	Tilt - not applicable
i)	Noise - in line with TSI requirement
j)	Passage through tunnels - train will be sealed and pressurised with time constant 10 seconds
k)	EMC - in line with TSI requirement
l)	Stepping arrangement - compatible with 760mm platform heights
m)	Accessibility for persons of reduced mobility - in line with TSI requirement

3.2 Classic Compatible High Speed Passenger Rolling Stock Parameters

Classic-compatible high speed rolling stock parameters shall be defined to satisfy the requirements provided below whilst operating on the High Speed Network:

a)	Dynamic reference contour - UK1 Gauge (i.e. suitable gauge to enable this stock to call at stations on the classic network without substantial station platform modifications)
b)	Train length - maximum train length 200m
c)	Maximum average acceleration - as defined in the HS2 reference train acceleration data
d)	Maximum speed for the Day One service - 360 kph
e)	Braking Deceleration -as defined in the HS2 reference train braking deceleration data
f)	Axle loads - maximum permissible axle weight of 17 tonnes
g)	Regenerative braking - in line with TSI requirement

h)	Tilt - not applicable

i)	Noise - in line with TSI requirement

j)	Passage through tunnels - train will be sealed and pressurised with time constant 10 seconds

k)	EMC - in line with TSI requirement but also compatible with legacy systems on classic routes, including those adjacent to HS2 lines.

l)	Stepping arrangements - provision to enable passengers to safely alight or board at platforms of TSI or UK standard design (e.g. platform heights of 760mm and 915mm respectively)

m)	Accessibility for persons of reduced mobility - in line with TSI requirement

Classic compatible high speed rolling stock parameters shall be defined to satisfy the requirements provided below whilst operating on the Classic network.

3.3 Compatibility with Classic network

Additional features which require consideration to enable trains running off the high speed network on to the classic network include the following:

- Train Protection Warning System/Automatic Warning System
- Areas of Enhanced Permissible Speed (use of EPS and gauge considerations)
- OHLE power sufficiency
- Platform gauge, heights and lengths
- Route Availability
- Pantograph compatibility
- Position and length of neutral sections (relative to position of train pantograph)
- Wheel and rail profile interface
- Signal sighting
- GSM-R standard
- Selective Door Operation
- Compatibility of magnetic brakes

4 Infrastructure Requirements

4.1 Line of Route Footprint

The project shall assume a 14m two track ballast shoulder - ballast shoulder trace.

The project shall assume a two track fence to fence width of 25m for an at-grade railway and a width of 60m for a four-track railway.

The project shall assume an allowance of 25m of no vegetation on each side of the route, resulting in a total footprint for a two-track line of route of 75m width and 110m width for a four track railway.

Where space is restricted, the minimum two-track fence to fence width may be reduced from 25m to 15m. This reduction shall only be accepted exceptionally for short distances where no other solution is viable. The corridor width of 25m should be retained to allow for the inclusion of access tracks etc.

4.2 Track

The project shall assume the minimum number of tracks to be two.

The project shall assume a maximum line speed of 400 kph where topographical, train performance and sustainability issues permit.

The line shall be designed to permit trains to maintain consistent high speeds.

The project shall assume that the track category will be 1 as defined in the TSI.

The project shall assume use of ballasted track except in tunnels where slab track shall be assumed.

The distance between rails for design purposes shall be 1435mm.

At the design stage, the spacing between track centres shall be a minimum of 4.5m. Track spacing shall be validated against the HS2 infrastructure maintenance strategy and its effectiveness as an anti-collision measure in the event of derailment.

The project shall assume an absolute maximum cant of 180mm. The project should only design to these limits in exceptional circumstances.

The project shall limit cant deficiency rules as shown in the TSI. The project shall not exceed normal maxima (i.e. 100mm for speeds up to 300 kph inclusive and 80mm for over 300 kph) and shall not routinely design to the limit.
The minimum radius of curvature shall be determined on the basis of line speed, cant and cant deficiency applied.
Transitions between straight and curves or successive curves shall be established in the form of a clothoid.
The maximum vertical acceleration experienced due to the effect of vertical curvature shall normally be 2.25% of g. Under exceptional circumstances, this can be increased to 4.25% of g.
Vertical and horizontal curves shall not be overlapped nor their transitions.
The maximum vertical curve radius shall be 40,000m.
The length of a vertical curve and the length between two vertical curves shall not be less than Lm = V/2.5, where Lm = minimum length of curve in metres and V is velocity in kph. The minimum length of curve shall be 100m.
Vertical curves shall be provided if change in gradient exceeds 1mm/m.
The rising and falling gradients of the new high speed line shall be limited to a maximum of 35 ‰ (for exceptional use and for a maximum length of no more than 6000m); normally gradients should be no more than 25%.
The project shall assume swing nose crossings will be installed on all turnouts on the high speed line.
The project shall assume turnout speeds of 230 kph maximum. High speed crossovers shall only be installed on straight track sections and on consistent/flat gradients.
The project shall assume the minimum entry/exit speed at platform ends to be 80kph at complex terminal locations.

4.3 Civils

The minimum gauge of the infrastructure shall comply with the reference kinematic profile GC.

Structures shall be designed in accordance with the loading requirements of the TSI, allowing for 25.5 tonne axles to be carried. High speed train axle loads of 17 tonnes shall be used for life cycle and fatigue calculations.

Surface and ground water drainage shall be provided so as to ensure that water levels do not rise to a level closer than 1.0 m below rail level. The route shall be designed to ensure the safe operation of trains during a 1 in 1000 year flood event.

When calculating the required tunnel cross-sectional areas, the following data should be assumed:

- Train cross-sectional area 12 sq m
- Sealed trains with time constant 10 seconds
- Train friction coefficient 0.003
- The criteria should be met for trains of 200m and 400m

The maximum pressure variation in tunnels as measured at any point on the outside of the train shall not be more than 10 kPa. In the case of two-track tunnels, this criterion shall be met for all possible timings of two trains entering the tunnel including worst cases that might occur only rarely.

The maximum pressure variation in tunnels as measured at any point inside the train shall not be more than 0.5kPa in any 1 second period and not more than 2.5kPa in any 10 second period. For two-track tunnels, these criteria must be met for at least 95% of possible timings of two trains entering the tunnel. For the remaining 5% of possible timings, it will be permitted to exceed these pressure limits by up to 40%.

For tunnels over 1km; the project shall comply with the TSI relating to 'safety in railway tunnels'.

The project shall seek to design switches and crossings away from structural piers and tunnel portals.

The project shall incorporate suitable measures to bar vehicular incursion on to the track from adjacent/overhead structures.

The project shall incorporate suitable security measures to prevent as far as reasonably practicable, the risk of trespass or vehicle intrusion.

The project shall determine the level of provision and nature of secure access points for maintenance.

4.4 Control-Command and Signalling Requirements

Class A unified command-control interfaces shall be used.

The project shall assume a minimum of Level 2 ERTMS/ETCS for the Day One service.

The project shall assume that bi-directional signalling is required throughout the length of the route.

The project shall assume provision of one main control-command centre for the HS2 route. Appropriate fallback provisions shall be determined by the project.

The project shall assess the additional functionality required to enable the ultimate line capacity to be achieved in the longer term.

Telecommunication requirements shall be GSM-R or as further developed and required by TSIs at the time of opening the line.

4.5 Electrification and Power

The project shall assume the provision of 25-0-25kV AC autotransformer fed overhead line equipment capable of supporting a minimum of 20 tph in each direction.

The contact wire height will be constant as defined in the TSI.

The AC energy supply shall be designed to permit the use of regenerative braking as a service brake able to exchange power seamlessly with other trains or with the primary network supplier.

The project shall confirm the high-level feasibility of National Grid supplies to any new high-speed line.

Provision shall be made for fixed lighting at junctions, tunnels and viaducts. Power supplies for the operation of portable maintenance equipment shall be provided along the route and at high value components.

4.6 Stations

The useful length of the platforms shall be at least 415m.
The project shall identify where longer platform lengths are required for operational purposes.
The height of platforms shall be 760mm.
The project shall assume a minimum platform width of 10m for the majority of the platform length to aid calculation of station footprints.
Platforms shall be straight to facilitate splitting and joining of trains.
HS2 stations shall be designed and built in accordance with the TSI for 'persons of reduced mobility'.
The project shall consider providing station facilities to segregate international passenger flows.
The project shall identify additional railway infrastructure required to enable levels of connectivity required by the HS2 business case.
The project shall document assumptions made regarding the provision of station facilities such as train servicing, ticketing, lifts, concourse and retail areas to inform the calculation of each HS2 station footprint.
Specific evacuation requirements for stations (including underground stations) shall be determined during the development phase.
The project shall provide an interchange between HS2, the Great Western Main Line and Crossrail with convenient access to Heathrow.
The project shall evaluate options for an intermediate parkway station between London and the West Midlands.

4.7 Level Crossings (Road and Footpath)

Level crossings shall not be proposed for any part of the high speed route.

4.8 Other Facilities

The project shall meet the following requirements for actual or passive provision of new facilities:

- One main rolling stock depot delivering light and heavy maintenance for the high speed rolling stock within 10 minutes journey time of the HS2 route
- Additional rolling stock stabling facilities as required including provision at London end

The project shall meet the following requirements for actual or passive provision of new facilities:

- One main infrastructure maintenance depot mid-route
- Additional maintenance depot/stabling facilities as required

The project shall meet the following requirements for actual or passive provision of new facilities:

- One main control-command centre for the HS2 route and appropriate fallback facilities

4.9 Interfaces with the existing Rail Network

The project shall demonstrate the feasibility of connection with HS1.

The project shall identify any other proposed connections with the existing rail network and any infrastructure required to enable this interface.

5 Performance Requirements

5.1 Passenger Service Performance

Passenger service performance and service reliability shall be consistent with current, world wide, high speed line practices with a maximum delay per train no greater than 0.5 minutes on any section.

5.2 Asset Reliability & Maintainability

A full life cycle preventative approach to design, installation and maintenance shall be applied to eliminate operational failure.

A route FMECA shall be undertaken throughout all stages of the design, development and implementation to identify high risk/high value locations and to eliminate/mitigate the probability and severity of failure modes.

Infrastructure design shall optimise reliability, reduce the need for maintenance inspections, facilitate remote monitoring where possible and enable easy access for maintenance.

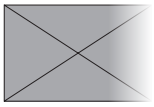
An asset database shall be developed through the design and construction cycle and shall be based upon a geodetic control system to locate and identify all asset components.

The monitoring and maintenance of fixed assets shall be undertaken without disruption to the operational railway.

High speed infrastructure recording and monitoring shall be undertaken in conjunction with the use of remote condition monitoring. Visual inspection shall be restricted to key assets and undertaken only when trains are not running.

Infrastructure condition degradation shall be detected through routine inspection and monitoring and rectified before causing infrastructure failure.

Achievement of the specified system punctuality/reliability will require infrastructure assets and configurations having high levels of Reliability & Maintainability (R&M). The specific numerical requirements are to be determined.



6 Sustainable Design

6.1 Design Principles

The project shall, through the design process, seek to avoid potential adverse impacts through the application of the sustainable design guidance.

6.2 Managing Energy

The project shall consider the energy efficiency of the operation of trains and rail infrastructure (commensurate with the detail of design), as well as the energy requirements of construction and materials, as a means of establishing low energy priorities within the scheme as a whole.

6.3 Managing Flood Risk

The project shall aim to ensure no increase in flood risk. This will be achieved by maintaining overall flood storage capacity (through, in order of priority, option selection that avoids flood plains, infrastructure design and flood compensation) and minimising disruption of flood flows.

6.4 Protecting Environmental Resources

The project shall seek to avoid direct or indirect harm to landscape, water and ecological resources, to mitigate adverse impacts where necessary, and to enhance such resources where practicable. Measures to achieve this will be commensurate with the sensitivity of the resource and will reflect the level of protection afforded such resources through relevant laws and policies.

The project shall assume that the route is for the use of electric trains with non polluting cargos. Diesel haulage shall be limited to engineering trains and recovery locomotives.

6.5 Protecting Historic Cultural Resources

The project shall seek to avoid direct or indirect harm to historic cultural resources, to mitigate adverse impacts where necessary, and to enhance such resources where practicable. Measures to achieve this will be commensurate with the sensitivity of the resource and will reflect the level of protection afforded such resources through relevant laws and policies.

6.6 Controlling Noise and Vibration

Where reasonably practicable, the operation of HS2 infrastructure shall seek to avoid significant adverse noise and vibration impacts (by reference to relevant guidance and precedence) to residents and other sensitive receptors near the route or proposed stations. Measures to mitigate potential impacts will be introduced, but where such impacts are unavoidable and cannot be appropriately mitigated, the project shall define circumstances under which residential properties shall be eligible for sound insulation.

Noise and vibration impact shall be assessed and mitigated through design and protection on the basis of a passenger only railway for the planned operational hours with overnight route only maintenance outside those times.

6.7 Minimising Property Impacts

The project shall seek to avoid or, where this is not practicable, to minimise demolition of properties and, in particular, to minimise residential land-take and demolition.

6.8 Protecting Communities

The project shall seek to maintain the health and amenity of residential communities potentially affected by the scheme. This shall include, where practicable, maintenance of access to services (such as health facilities, schools and places of worship) and shops, and maintenance of environmental conditions such that significant adverse effects on health and amenity are mitigated.

6.9 Optimising the Land Resource

The project shall seek, where practicable, to use land with planning designation appropriate to development for high speed rail and its infrastructure. The project shall seek to maintain and enhance land use, so long as this does not compromise.

Appendix 2

Day 1 Train Service Assumptions for Demand Modelling (including use of Released Capacity)

Version 4.5

Contents

List of Acronyms

HS	High Speed
tph	Trains per hour

1. Introduction

1.1. The purpose of this paper is to assist the demand modelling process, by providing a viable (but not timetable-validated) set of train service assumptions for the HS2 route which could operate from the day of its opening. It also seeks to address to some extent the potential use of capacity that is released on existing routes. The outputs from this process will inform the generation of the business case and certain aspects of the Appraisal of Sustainability including consideration of socio-economic and climate change impacts".

1.2. It should be understood that this set of train service assumptions ("the timetable specification") is for demand modelling purposes only, and does not in itself constitute a future train service specification for HS2 or any other group of services.

1.3. For the purposes of this exercise and for the avoidance of doubt, unless stated otherwise, this specification supersedes all existing Virgin West Coast and London Midland services to and from London Euston.

1.4. The stopping pattern of some services is influenced by the possibility of a longer-term wider high-speed network.

2. Infrastructure assumptions

2.1. The assumptions listed below are simply for the purpose of this exercise, and are without prejudice to the eventual configuration of the route.

2.2. The assumed HS2 route configuration for modelling is as follows:

London terminal station – Euston

2.3. The station is configured to provide minimum 10 x 415 metre platforms for the operation of HS2 services, with a grade-separated station throat. A further 14 platforms of variously 415, 320 and 260 metres length will be provided for other West Coast Main Line services. The Euston – Watford Junction DC services are excluded from this specification. Platform capacity will exist in the re-constructed Euston station to cater for this service group if required.

Old Oak Common station

2.4. Three island platforms (6 platform faces) designed such that trains can arrive on one side of the platform island whilst another train departs from the opposite side of the same island (in the same direction) without undue reduction of speed.

2.5. It is assumed that all HS2 services to/from Euston will stop at Old Oak Common station for 2 minutes.

2.6. Platforms will be provided on the Great Western Main Line on both the Fast Lines and Relief Lines, and it is assumed that all services (both First Great Western and Heathrow Express) will stop at Old Oak Common for 1½ or 2 minutes. This provides excellent connectivity between HS2, Crossrail, Heathrow and the Great Western Main Line to the West.

2.7. The journey time penalty for services on the Great Western Main Line should be assumed as 4 minutes for long-distance (fast line) services and 2 minutes for local (relief lines) services.

HS1 Connection

2.8. No international services are included in this specification, so the precise location and configuration of a link to HS1 makes no material difference to this exercise. Capacity exists on HS2 for through services to and from the Continent to operate from Day 1 if required, but these are excluded from this specification.

Heathrow station

2.9. It is assumed that there is NO station at Heathrow airport, or the immediate vicinity thereof.

2.10. The provision of a station at Heathrow Airport would significantly alter the journey times and service patterns, and would require a separate exercise to identify the overall (detrimental) effect on route capacity, fleet size and various other considerations including environmental impacts".

Intermediate station

2.11. It is assumed that there is no mid-route intermediate station (i.e. between Old Oak Common and Birmingham International).

Birmingham Interchange and Delta Junction

2.12. It is assumed that an interchange station of two island platforms (4 platform faces) with two independent non-stop through lines is constructed in the vicinity of the NEC. North of this point the railway is 4-tracked to a delta junction in the vicinity of Water Orton.

2.13. The delta junction is grade-separated, offering conflict-free movement of traffic London – Birmingham, London – Manchester, and Birmingham – Manchester (and vice versa).

2.14. North of the delta junction the HS2 route reverts to 2-track.

2.15. In this specification, only the London – Birmingham services call at the Birmingham Interchange station. They are able to do this without causing capacity loss on the main HS2 route. It would be possible for services to/from the North West of England or Central Scotland to call as well, but this would add a journey time penalty of circa 6 minutes, and may have an impact upon overall route capacity.

Birmingham terminal station

2.16. A central Birmingham station is constructed at Fazeley Street. The station consists of three island platforms (6 platform faces).

Connection to rolling stock maintenance depot

2.17. It is assumed that a rolling stock maintenance depot will be built in the vicinity of Washwood Heath, to the south of the current lines.

Connection to Water Orton route

2.18. A connection between the HS2 lines and the existing lines will be provided at the Birmingham end of the Water Orton route, so that services running via Birmingham New Street can access the HS2 route at this point. This would be combined with the depot access lines, in the vicinity of Washwood Heath.

Connection to West Coast Main Line

2.19. It is assumed that the HS2 route would run to the east of Lichfield then curve around to the north, joining the West Coast Main Line by means of a grade separated junction between Lichfield Trent Valley and Rugeley Trent Valley stations.

Stafford

2.20. It is assumed that some infrastructure/signalling works have taken place in the Stafford area to alleviate this known capacity constraint, but no journey time benefits are assumed.

Manchester Hub

2.21. It is assumed that works have taken place in Manchester to alleviate the congestion of the rail routes into/through Manchester, including the provision of additional capacity at Manchester Piccadilly. Confirmation of the precise nature of this scheme is expected in January 2010. Further liaison with Network Rail will be required once the timescale and nature of these works become clearer.

Manchester – Liverpool electrification

2.22. It is assumed that the electrification of the "Chat Moss" route between Manchester and Liverpool via Newton-le-Willows and St Helens Junction has been completed, together with some associated line speed improvements on that route. (This is a committed scheme which was announced after the exchange of letters between DfT and HS2 regarding committed schemes.)

3. Rolling stock assumptions

3.1. It is assumed that all services operated on the core section of HS2 (i.e. Old Oak Common to Birmingham International Interchange) will be operated by high-speed trains only. For the purposes of this exercise, we assume they will be one of two types.

- High speed captive services operating between London-Birmingham using standard European TSI compliant high speed trains. These are referred to as "captive" trains.
- Services running between London and destinations north of the West Midlands using specially designed and manufactured high speed rolling stock capable of traversing the UK classic rail network. These are referred to as " classic-compatible" trains.

3.2. Both types of trains will be maximum 200 metres long, and capable of working in multiple (both within class and between classes) to form 400-metre trains. For modelling purposes, the assumed seating capacity is 550 per 200 metre set.

3.3. It is assumed that the main traction maintenance depot for both classes of train will be located in the West Midlands, in the Washwood Heath area. Sets will be outstabled at a number of other locations as required.

3.4. The number of diagrams required to operate a particular service group is a simple calculation of journey time + turnround time in order to create a round-trip time.

3.5. It does not take into account any requirements for strengthening of peak-hour services (either by adding sets to diagrams or increasing service frequency); neither does it take cognisance of the requirement to examine bogies and axles every 4000 km, as specified by rolling stock manufacturers.

3.6. With the diagrams averaging well in excess of 2000 km per day, it will be necessary to increase the fleet size by a ratio of 4:5 (i.e. 5 diagrams actual to cover 4 diagrams theoretical) in order to overcome these issues. This will inflate the required fleet size, and is reflected in the Rolling Stock Strategy.

4. Demand assumptions

4.1. Removal of most non-stopping services from the Fast Lines of the West Coast Main Line route south of Lichfield facilitates a recast of the services remaining on that route. This enables a service level and stopping pattern more appropriate to the changing requirements of the route's users, both passenger and freight.

4.2. The growth in population in the Milton Keynes, Northampton and Rugby areas is catered for by an increase in the number of trains calling at those locations.

4.3. Local services on the Coventry Corridor are re-cast into a more-logical pattern, with Birmingham International and Coventry both being used as turn-back locations. (The current timetable is reliant upon a skip-stop pattern on a number of different services in order to minimize the capacity usage whilst serving the required locations at the desired frequencies. This results in a sub-optimal service pattern for local customers).

4.4. This service specification has only partly been subject to demand modelling, and therefore is subject to confirmation of demand in certain respects.

5. Train service specifications

5.1. This section of the timetable specification refers to *standard off-peak hours only*. Please refer to section 6 for details of peak-hours additional services. Services in the early morning/late evening periods are also likely to be different, both because of varying levels of customer demand and also because of the need to return the trains to their maintenance depot or servicing locations.

5.2. The train service specification will be set out in a common format:

Service Description

Service frequency

Calling Pattern(s) and Journey Times
Station
x mins = number of minutes running time to next station
Next station (y mins) = number of minutes station dwell

Turnround time (Origin/Destination)
Type of rolling stock

Number of sets required (without maintenance allowance)

Commentary

5.3. The service specification takes no cognisance of pre-existing contractual rights for the current train operators.

5.4. The specification will be split into the following groups of services:

High-Speed Services

a) London – Birmingham
b) London – Manchester
c) London – Liverpool
d) London – Preston – Scotland

Further Opportunities for other services to use part of HS2

e) Birmingham – Manchester
f) London – Chester – North Wales

Other Services

g) London – Crewe (semi-fast) and London – Glasgow (semi-fast)
h) London – Stoke – Manchester (semi-fast)
j) London – Birmingham – Wolverhampton – Liverpool
k) London – Milton Keynes – Northampton and beyond
l) Coventry Corridor

High-speed services

a) London – Birmingham (High Speed)

Service frequency

3 tph

Calling Pattern(s) and Journey Times

Euston
5 mins
Old Oak Common (2 mins)
31 mins
Birmingham Interchange (2 mins)
9 mins
Birmingham Fazeley Street

Total 49 mins

Turnround time (Origin/Destination)

21 mins/21 mins

Type of rolling stock

HS2 Captive

Number of sets required (without maintenance allowance)

7

Commentary

20-minute interval service operating throughout the day.

b) London – Manchester (High Speed)

Service frequency
3 tph

Calling Pattern(s) and Journey Times

2 tph:
Euston
5 mins
Old Oak Common (2 mins)
40 mins
Rugeley North Junction (non-stop)
42 mins
(Running non-stop via Stoke)
Stockport (2 mins)
9 mins
Manchester Piccadilly

Total 100 mins

1 tph:
Euston
5 mins
Old Oak Common (2 mins)
40 mins
Rugeley North Junction (non-stop)
37 mins
Wilmslow (1 mins)
8 mins
Stockport (2 mins)
9 mins
Manchester Piccadilly

Total 104 mins

Turnround time (Origin/Destination)
20 mins/20 mins
(16 mins/16 mins for service via Wilmslow)

Type of rolling stock
Classic Compatible

Number of sets required (without maintenance allowance)
12

Commentary
This service pattern provides 2 fast trains per hour non-stop from Old Oak Common to Stockport and a third service which runs non-stop via Crewe and serves Wilmslow then Stockport.

See also Euston – Milton Keynes – Stoke – Macclesfield – Stockport – Manchester service (h) below.

c) London – Liverpool (High Speed)

Service frequency
2 tph

Calling Pattern(s) and Journey Times

1 tph:
Euston
5 mins
Old Oak Common (2mins)
40 mins
Rugeley North Junction (non-stop)
8 mins
Stafford (2 mins)
17 mins
Crewe (2 mins)
15 mins
Runcorn (2 mins)
17 mins
Liverpool Lime Street
Total 110 mins

1 tph:
Euston
5 mins
Old Oak Common (2 mins)
40 mins
Rugeley North Junction (non-stop)
36 mins
Warrington Bank Quay (2 mins)
25 mins
Liverpool Lime Street
Total 110 mins

Turnround time (Origin/Destination)
25 mins/25 mins (for both service patterns).

Type of rolling stock
Classic Compatible

Number of sets required (without maintenance allowance)
9

Commentary
One Liverpool service runs via Runcorn, calling first at Stafford and Crewe.

The second Liverpool service runs non-stop to Warrington (ideally to be spaced on the opposite half-hour from the Euston – Glasgow HS2 service calling at Warrington). It then takes advantage of the recently-announced Manchester – Liverpool electrification to run non-stop via St Helens Junction.

Both services complete the journey in 110 minutes.

An opportunity for further examination would be whether or not stops in these HS2 services could be justified at Liverpool South Parkway (Train 1) and St Helens Junction (Train 2), with a journey time penalty of circa 3 minutes in each case.

d) London – Preston – Scotland (High Speed)

Service frequency
1 tph

Calling Pattern(s) and Journey Times
Euston
5 mins
Old Oak Common (2 mins)
40 mins
Rugeley North Junction (non-stop)
36 mins
Warrington Bank Quay (2 mins)
9 mins
Wigan North Western (2 mins)
12 mins
Preston (2 mins)
130 mins
Glasgow

Total 240 mins – (108 mins London – Preston)

Turnround time (Origin/Destination)
35 mins/25 mins

Type of rolling stock
Classic Compatible

Number of sets required (without maintenance allowance)
9

Commentary
The HS2 service only serves the principal North West locations of Warrington, Wigan and Preston. A semi-fast Pendolino service (see section g below) would connect into and out of the HS2 service at Preston, serving all main intermediate locations.

See also service group (g) and associated timetable summary below.

Initial demand modelling indicates that demand on this axis may be high, in which case an alternative train service pattern may be implemented, involving separation of the London – Preston and London – Glasgow flows. This would require 5 additional classic-compatible train sets.

Further Opportunities for other services to use part of HS2

e) Birmingham (New Street) – Manchester (Further Opportunities)

The opportunity exists to link Birmingham and Manchester by means of services from Birmingham, running on the HS2 lines along the Water Orton Corridor and joining the core HS2 route at the delta junction, continuing northbound along HS2 to join the West Coast Main Line at Lichfield HS2 Junction, thence via Stoke and Stockport to Manchester Piccadilly.

Ideally such a service would be operated by vehicles capable of attaining full line speed on HS2. However, as an interim "Day 1" service specification, they might be operated by lower speed (200 km/h or 225 km/h) vehicles instead, which would necessitate operation from Birmingham New Street station.

Such a link would cause the existing Birmingham – Manchester Cross Country services via Wolverhampton to be reduced in frequency or withdrawn entirely.

Further work would be needed to identify the relative merits/demerits of this proposal, which does not form part of the core HS2 scheme at this time.

f) London – Chester – North Wales

The existing London – Chester service is operated by Class 221 tilting "Super Voyager" diesel multiple units, via the West Coast Main Line. This service has to be diesel-operated because the line is not electrified beyond Crewe.

Proposals by others for electrification of Crewe – Chester are at an advanced stage. In the event of such an electrification scheme taking place, this service could then be diverted onto HS2.

Further work would be needed to identify the ideal stopping pattern and relative merits/demerits of this proposal, which does not form part of the core HS2 scheme at this time.

Other Services

g) London – Crewe (semi-fast) and London – Glasgow (semi-fast)

Service frequency

1 tph (London – Crewe)
1 tph (London – Glasgow)

Calling Pattern(s) and Journey Times

See timetable on next page.

Turnround time (Origin/Destination)

London – Crewe 29 mins /31 mins
London – Glasgow 24 mins /43 mins

Type of rolling stock

Class 390 "Pendolino"

Number of sets required (without maintenance allowance)

5 (London – Crewe)
11 (London – Glasgow)

Commentary

The HS2 service from London to Glasgow (see (d) above) provides the fast service on this route. The two services in this group provide an interconnecting semi-fast service, providing a good mix of journey time and connectivity.

Milton Keynes receives an enhanced service to the North, reflecting the anticipated growth in population size.

Rugby has a direct service to the North reinstated.

The Trent Valley towns/cities of Nuneaton, Tamworth and Lichfield receive a comparatively fast service to London throughout the day for the first time.

The Euston – Crewe semi-fast service connects with the Euston – Glasgow semi-fast service at Crewe, offering good end-to-end journey times for passengers from intermediate stations.

The Euston – Glasgow semi-fast service connects into and out of the Euston – Glasgow HS2 service at Preston.

Oxenholme and Penrith stations gain an hourly service to/from London throughout the day (instead of alternate hours with some gaps).

NORTHBOUND

		390	390	HS	
LONDON Euston	dep	11:35	12:00	12:35	
Old Oak Common	arr	|	|	12:40	
	dep	|	|	12:42	
Watford Junction	arr	|	|	|	
	dep	|	|	|	
Milton Keynes Central	arr	12:04	12:29	|	
	dep	12:06	12:31	|	
Rugby	arr	12:28	|	|	
	dep	12:30	|	|	
Nuneaton	arr	12:42	|	|	
	dep	12:44	|	|	
Tamworth	arr	12:56	|	|	
	dep	12:58	|	|	
Lichfield Trent Valley	arr	13:04	|	|	
	dep	13:06	|	|	
Birmingham International Interchange	arr	|	|	|	
	dep	|	|	|	
BIRMINGHAM Fazeley Street	arr	|	|	|	
	dep	|	|	|	
Rugeley North Junction	*pass*	*13/10*	*13/13*	13/22	
Stafford	arr	|	|	|	
	dep	|	|	|	
Stoke	arr	|	|	|	
	dep	|	|	|	
Macclesfield	arr	|	|	|	
	dep	|	|	|	
Crewe	arr	13:34	13:37	13/44	
	dep		13:39		
Wilmslow	arr		|	|	
	dep		|	|	
Stockport	arr		|	|	
	dep		|	|	
Manchester Piccadilly	arr		|	|	
	—		|	|	
Chester	arr		|	|	
	dep		|	|	
Runcorn	arr		|	|	
	dep		|	|	
Liverpool Lime Street	arr		|	|	
	—		|	|	
Warrington Bank Quay	arr		|	13:58	
	dep		|	14:00	
Wigan North Western	arr		14:05	14:09	
	dep		14:07	14:11	<—
Preston	arr		14:20	14:23	14:20
	dep		14:30	14:25	14:30
Lancaster	arr		—>	|	14:45
	dep		|	|	14:47
Oxenholme	arr		|	|	15:02
	dep		|	|	15:04
Penrith	arr		|	|	15:27
	dep		|	|	15:29
Carlisle	arr		|	|	15:42
	dep		|	|	15:44
Lockerbie	arr		|	|	|
	dep		|	|	|
Carstairs	arr		|	|	|
	dep		|	|	|
Glasgow Central	arr		|	16:35	16:57
	—				
Edinburgh Waverley	arr				
	—				
	Works	14:05		17:00	17:40
	Turnround	31'		25'	43'

SOUTHBOUND

		390	HS		390
Edinburgh Waverley	—				
	dep				
Glasgow Central	—				
	dep	11:40	12:00		
Carstairs	arr	|	|		
	dep	|	|		
Lockerbie	arr	|	|		
	dep	|	|		
Carlisle	arr	12:50	|		
	dep	12:52	|		
Penrith	arr	13:05	|		
	dep	13:07	|		
Oxenholme	arr	13:28	|		
	dep	13:30	|		
Lancaster	arr	13:44	|		
	dep	13:46	|	<—	
Preston	arr	14:04	14:10	14:04	
	dep	14:16	14:12	14:16	
Wigan North Western	arr	—>	14:24	14:28	
	dep		14:26	14:30	
Warrington Bank Quay	arr		14:35	|	
	dep		14:37	|	
Liverpool Lime Street	—		|	|	
	dep		|	|	
Runcorn	arr		|	|	
	dep		|	|	
Chester	arr		|	|	
	dep		|	|	
Manchester Piccadilly	—		|	|	
	dep		|	|	
Stockport	arr		|	|	
	dep		|	|	
Wilmslow	arr		|	|	
	dep		|	|	
Crewe	arr		14/50	14:57	
	dep			14:59	15:05
Macclesfield	arr		|	|	|
	dep		|	|	|
Stoke	arr		|	|	|
	dep		|	|	|
Stafford	arr		|	|	|
	dep		|	|	|
Rugeley North Junction	*pass*		15/13	15/23	15/29
BIRMINGHAM Fazeley Street	arr		|	|	|
	dep		|	|	|
Birmingham International Interchange	arr		|	|	|
	dep		|	|	|
Lichfield Trent Valley	arr		|	|	15:33
	dep		|	|	15:35
Tamworth	arr		|	|	15:43
	dep		|	|	15:45
Nuneaton	arr		|	|	15:57
	dep		|	|	15:59
Rugby	arr		|	|	16:11
	dep		|	|	16:13
Milton Keynes Central	arr		|	16:05	16:35
	dep		|	16:07	16:37
Watford Junction	arr		|	|	|
	dep		|	|	|
Old Oak Common	arr		15:53	|	|
	dep		15:55	|	|
LONDON Euston	arr		16:00	16:36	17:06
	Works		16:35	17:00	17:35
	Turnround		35'	24'	29'

h) London – Stoke – Manchester (semi-fast)

Service frequency
1 tph

Calling Pattern(s) and Journey Times
Euston
29 mins
Milton Keynes Central (2 mins)
56 mins
Stoke (2 mins)
14 mins
Macclesfield (2 mins)
12 mins
Stockport (2 min)
9 mins
Manchester Piccadilly

Total 128 mins

Turnround time (Origin/Destination)
22 mins/22 mins

Type of rolling stock
Class 390 "Pendolino"

Number of sets required (without maintenance allowance)
5

Commentary
Provides a semi-fast Pendolino service between London and Manchester, with intermediate calls at Milton Keynes Central, Stoke and Macclesfield. This replicates the existing Pendolino service, albeit slightly slower due to additional stops. This provides the only service between London and Stoke-on-Trent, which is not served by HS2 services.

j) London – Birmingham – Wolverhampton - Liverpool

Service frequency
1 tph

Calling Pattern(s) and Journey Times
Euston
12 mins
Watford Junction (2 mins)
20 mins
Milton Keynes Central (2 mins)
22 mins
Rugby (2 mins)
9 mins
Coventry (2 mins)
10 mins
Birmingham International (2 mins)
10 mins
Birmingham New Street (5 mins)
8 mins
(continues in next column)

(continued from previous column)
Sandwell & Dudley (1 min)
9 mins
Wolverhampton (2 mins)
13 mins
Stafford (2 mins)
18 mins
Crewe (2 mins)
16 mins
Runcorn (2 mins)
9 mins
Liverpool South Parkway (1 mins)
9 mins
Liverpool Lime Street

Total 190 mins

Turnround time (Origin/Destination)
20 mins/20 mins

Type of rolling stock
Class 390 "Pendolino".

Number of sets required (without maintenance allowance)
7

Commentary
Residual West Coast Euston – Birmingham – Wolverhampton service, serving all intermediate stations currently served by Virgin Pendolino services. Service doubles as a Birmingham – Liverpool fast service, providing Wolverhampton with a fast link to Crewe and the north, and replacing an existing London Midland Birmingham – Liverpool semi-fast service.

k) London – Milton Keynes – Northampton and beyond

Service frequency

a) 2 tph Euston – Tring
b) 2 tph Euston – Milton Keynes Central
c) 3 tph Euston – Northampton (on Fast Lines to Milton Keynes)

Calling Pattern(s) and Journey Times

a) Euston – Wembley Central – Harrow & Wealdstone – Bushey – Watford Junction – Kings Langley – Apsley – Hemel Hempstead – Berkhamsted – Tring.
b) Euston – Watford Junction – Hemel Hempstead – Berkhamsted – Tring – Cheddington – Leighton Buzzard – Bletchley – Milton Keynes Central
c) Watford Junction – Milton Keynes Central – Wolverton – Northampton; or
Leighton Buzzard – Milton Keynes Central – Wolverton – Northampton; or
Bletchley – Milton Keynes Central – Wolverton – Northampton

Turnround time (Origin/Destination)

Minimum 10 minutes, maximum 20 minutes.

Type of rolling stock

Class 350 "Desiro".

Number of sets required (without maintenance allowance)

Not calculated.

Commentary

Euston – Tring services (a) connect at Tring into Euston – Milton Keynes Central services (b).

Euston – Tring services also serve Wembley Central all day (for connection into Bakerloo line and London Overground services).

Euston – Northampton services run on Fast Lines to Milton Keynes Central, and call at either Watford Junction, or Leighton Buzzard or Bletchley. (Further timetable/capacity evaluation would need to be carried out to ensure these services could call at the Fast Lines platforms as specified. Use of the Fast Lines helps ensure adequate capacity retained on the Slow Lines for freight traffic). These three services are extended beyond Northampton to serve:

1) Long Buckby, Rugby, Coventry, Birmingham International and Birmingham New Street; or
2) Long Buckby, Rugby, Coventry, Birmingham International, Aston, Tame Bridge Parkway and Walsall.
3) Rugby, Nuneaton and all stations to Stafford (alternate hours only).

l) Coventry Corridor

Service frequency

a) 1 tph Euston – Wolverhampton – Liverpool (service group "J" above)

b) 2 tph Northampton – Birmingham New Street (of which 1 is through from Euston – service group "K" above)

c) 1 tph Euston – Northampton – Walsall (service group "K" above)

d) 2 tph Coventry to New Street

e) 2 tph International to New Street

f) 2 tph Cross Country via Leamington – Coventry – New Street

g) 1 tph International to Aberystwyth (occasional through workings to/from London Marylebone)

h) 0.5 tph London Marylebone – Shrewsbury (WSMR Open Access)

Calling Pattern(s) and Journey Times

a) Refer to service group "J" above

b) Northampton – Long Buckby – Rugby – Coventry – International – Birmingham New Street

c) Northampton – Long Buckby – Rugby – Coventry – International – Aston – Tame Bridge Parkway – Walsall

d) All stations Coventry to International then New Street only (or 1 of 2 tph call additionally at Marston Green, if timetabling permits)

e) All stations International to New Street

f) Coventry – International – New Street

g) (Coventry) – International – New Street (- Aberystwyth)

h) Coventry – International – Tame Bridge Parkway – Wolverhampton – (Shrewsbury)

Turnround time (Origin/Destination) Varies, minimum 5 minutes, maximum 20 minutes.

Type of rolling stock

a) Class 390 "Pendolino"

b) Class 350 "Desiro".

c) Class 350 "Desiro".

d) Class 350 "Desiro".

e) Class 323 (or modern replacement)

f) Class 220 "Voyager" or equivalent.

g) Diesel Multiple Unit

h) Class 67 diesel + Mk3 carriages, or DMU equivalent.

Number of sets required (without maintenance allowance)

Not calculated.

Commentary

The Coventry Corridor is constrained by being only 2-track, and having a number of intermediate stations. Removing some of the fastest services from this route enables a better use of overall capacity to be made, particularly benefitting the local passengers.

Diversion of the second Cross-Country train per hour via Birmingham International and Coventry is a long-standing requirement. (The train currently runs non-stop from Birmingham New Street to Leamington Spa via Solihull, as no path is available for it to run via and serve Birmingham International and Coventry).

Whilst an initial assessment of a service pattern similar to this was carried out by Network Rail's Performance and Capacity Analysis Team, confirmation of the viability of this specification would be dependent upon a more-detailed timetabling exercise.

6. Peak hours services

The following additional services are proposed for demand modelling for peak hours services (3 hours morning towards London, 3 hours evening away from London):

High speed services

a) London – Birmingham (High Speed)

Increase frequency of High Speed services from 3 to 4 per hour, same stopping pattern.

b) London – Manchester (High Speed)

No change.

c) London – Liverpool (High Speed)

No change.

d) London – Preston – Scotland (High Speed)

Additional Preston – Euston service, calling at Wigan, Warrington and Old Oak Common. Runs 30 minutes apart from Glasgow – Euston HS2 service, and connects out of peak-hour additional Glasgow – Euston Pendolino service.

West Coast Main Line Classic Services

g) London – Crewe (semi-fast) and London – Glasgow (semi-fast)

Service frequency:
Increased from 1 tph to 2 tph (Crewe – London)
Increased from 1 tph to 2 tph (Glasgow – London)
Stopping pattern unaltered.

h) London – Stoke – Manchester (semi-fast)

Service frequency:
Increased from 1 tph to 2 tph (Manchester – London)
Stopping pattern unaltered.

j) London – Birmingham – Wolverhampton - Liverpool

Service frequency:
Increased from 1 tph to 2 tph (Liverpool – Wolverhampton – London)
Stopping pattern unaltered.

k) London – Milton Keynes – Northampton and beyond

Services:

a) 2 tph Euston – Tring:
Stopping pattern amended, to run non-stop from Watford Junction to London Euston.
2 tph Watford Junction – Euston ADDITIONAL peak-hour services: Taking the stops of the Tring – Euston services south of Watford Junction (i.e. Bushey, Harrow & Wealdstone, and Wembley Central).

b) 2 tph Euston – Milton Keynes Central
Unaltered.

c) 3 tph Euston – Northampton (on Fast Lines to Milton Keynes)
Increased to 4 tph, the 4th train running non-stop between Northampton and Euston.

l) Coventry Corridor

No change, other than the increase from 1 tph to 2 tph of the Liverpool – Wolverhampton – Euston service (which may impose changes on other services due to capacity constraints).

7. Summary

7.1. The reconfiguration of the London – Scotland services as proposed in section 6 (d and g) above, in conjunction with the electrification of the Manchester – Liverpool route, would jointly facilitate a re-specification of the Manchester – Scotland and Birmingham – Scotland services. This does not form a core part of the HS2 business case, but the timetabling of the HS2/Pendolino services north of Preston will need to take cognisance of the limitations of route capacity on this section. Therefore some adjustment/improvement of traction types and stopping patterns of these other service groups may become necessary.

7.2. No specific investigation of released capacity for freight traffic has been undertaken, other than to note that capacity will be released on the West Coast Main Line slow lines between London and Lichfield, which will enable more freight trains to run on this section if required.

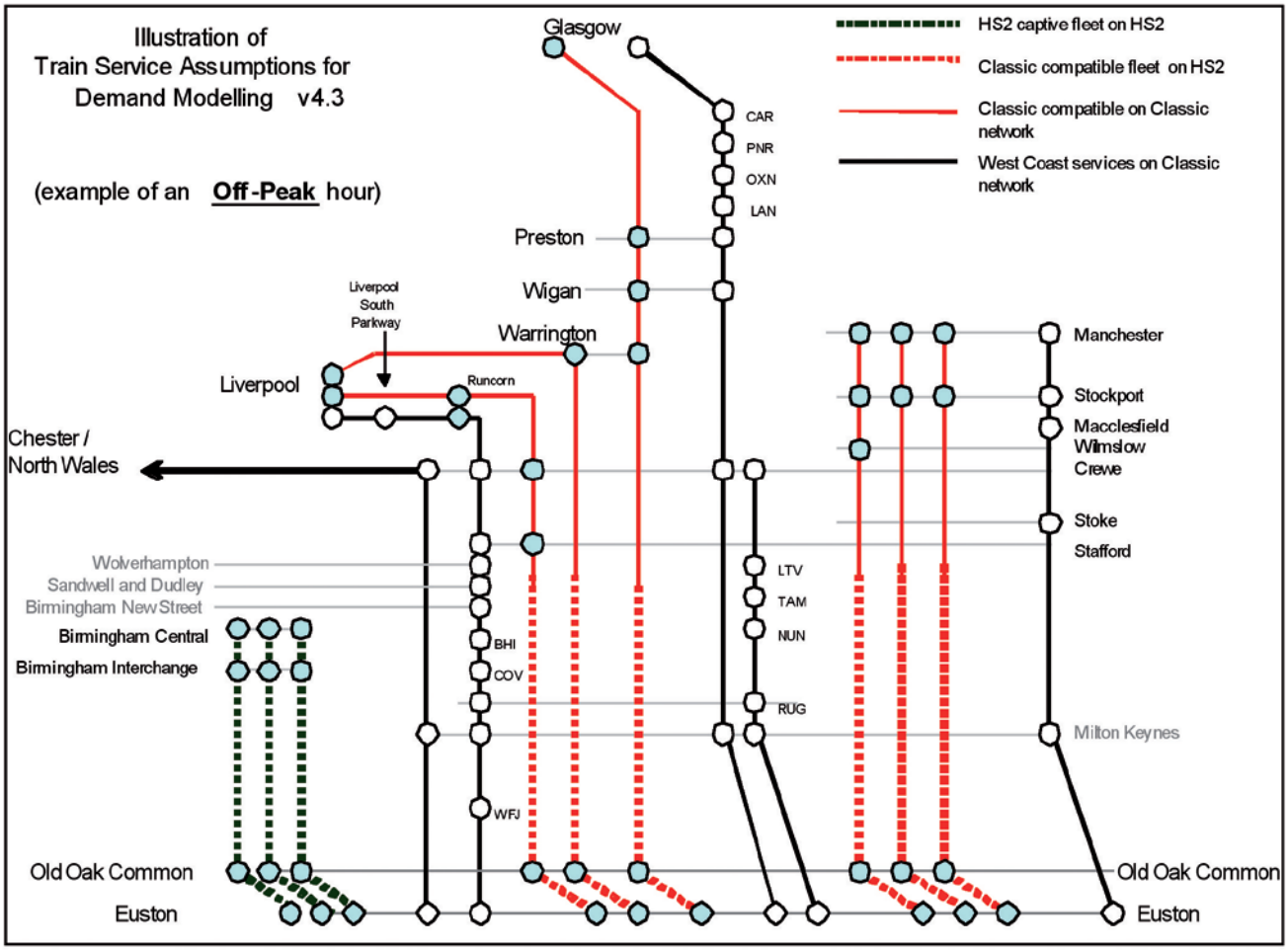
7.3. North of Lichfield the existing network is capacity constrained, so no additional freight could be envisaged at this point (i.e. north of the point at which HS2 rejoins the West Coast Main Line).

7.4. The station dwells at all High Speed stations have been set at 2 minutes (1 minute at Wilmslow). This may be reviewed in the light of demand modelling, and anticipated numbers of passengers boarding/alighting at specific locations.

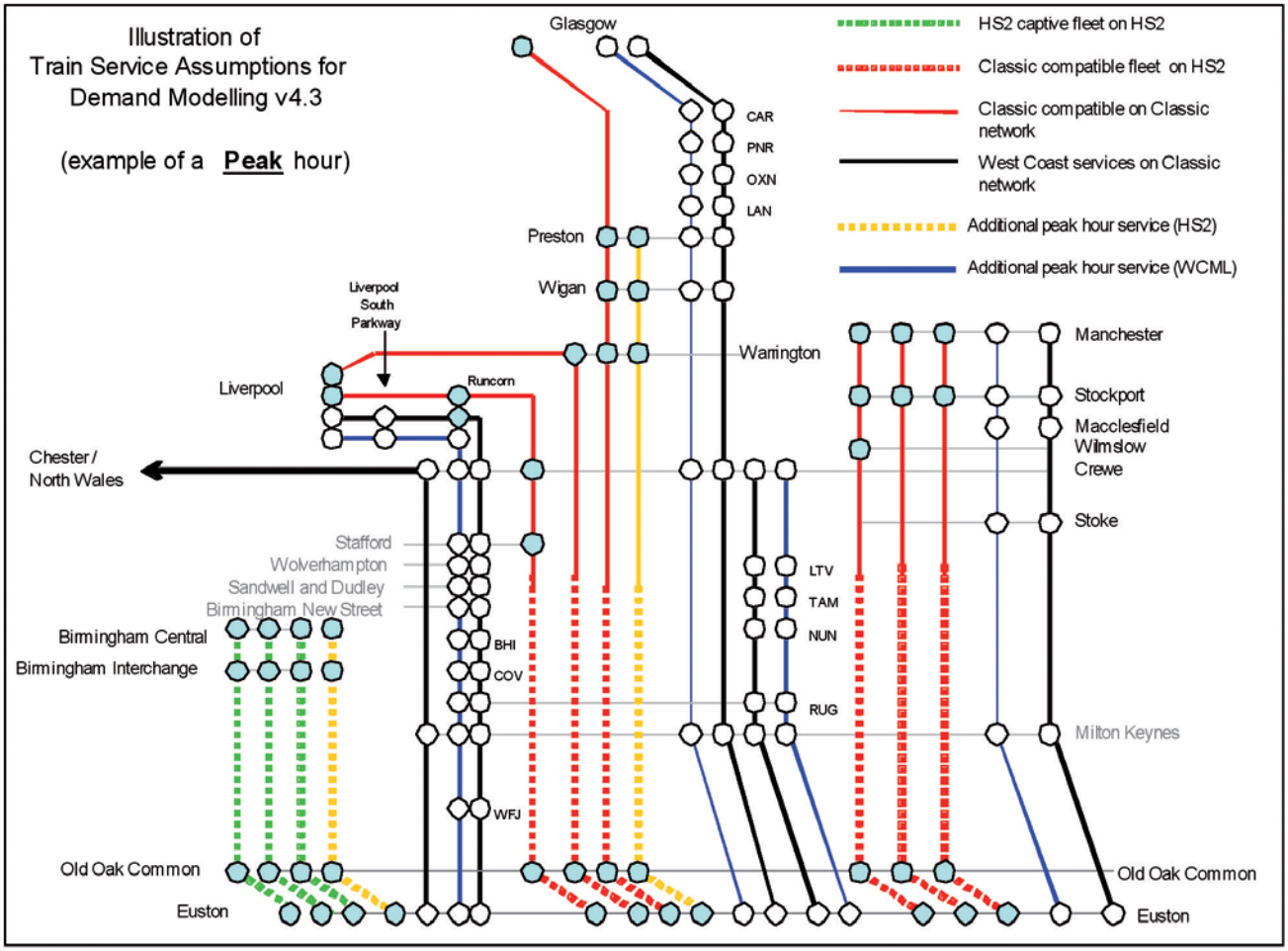
7.5. On the West Coast Main Line north of Lichfield it has been assumed that a small degree of infrastructure changes will be required in order that the HS2 trains can run at speeds higher than the current "Permissible Speed" signs, in order to reach a reasonable journey time. Further investigation would be needed to establish to what extent it might be possible to reduce the journey times further by selective investment in the infrastructure.

7.6. At Birmingham Interchange, only services to/from Birmingham are shown to call in this service specification. Further demand modelling will be required to establish the case for stopping services to/from locations further north at Birmingham Interchange.

Appendix A: Illustration of off-peak hour services



Appendix B: Illustration of peak hour services



Appendix 3

International Requirements

Version 1.0

Contents

List of Acronyms

EU	European Union
UKBA	United Kingdom Border Agency

1. Introduction

1.1. HS2 is required to consider the provision of station facilities to segregate international passenger flows. The guiding principles and emergent requirements for such provision are described in this document following consultation with the DfT's Transportation Security and Contingencies team and the UK Border Agency (UKBA).

2. Existing principles

2.1. All departing passengers must be security screened and go through emigration procedures, and thereafter remain segregated from domestic passengers.

2.2. Passport check should be assumed to take 20 - 30 seconds per passenger (this an average of UK, EU and non-EU passport holders at current Eurostar traffic mix. Some technology advances (iris/ fingerprint identification) might reduce this time to a limited degree by the time HS2 is brought into use.

2.3. The route onto the train must be security cleared ("swept") including escalators, lifts and platforms, and remain segregated until the train has departed. The train itself must have been swept, either following servicing in a shared facility or by being kept in a secured segregated facility.

2.4. Access to the train whilst out of service must be restricted to personnel who have been searched before entry into the servicing area and thereafter kept separate from others.

2.5. Incoming international passengers will be required to pass through a customs and immigration exit, remaining segregated from others until having done so. Only when the last such passenger has been processed may the arriving area, if required, be returned to domestic service.

3. Emergent principles

3.1. UKBA advise that HS2 should assume a requirement for departing passengers to pass through UK passport control as well as French passport control after security checking and before joining an international train.

3.2. The only foreseen development in security screening processes is the possible replacement of X-ray machines with body scanners. It may be assumed the floor area required will be similar to current requirements.

4. Station design implications

4.1. The station footprint will require sufficient space, sized for the expected throughput of passengers, for:

Outgoing Passengers

- Passenger check-in facilities
- An X-ray/body scanner and luggage X-ray line
- Closed off interview and examination rooms, staff facilities etc
- Two passport examination lines, one UK and one French
- A secure waiting area before being allowed to access a platform to board a train
- Separate, or capable of being separated and swept, secure access from the waiting area to the platform(s)
- Separate, or capable of being separated and swept, secure platform(s)

Incoming Passengers

- A secured exit through a customs examination area with a barrier line capable of being manned to undertake passport control activities if required.
- The arrival platform to be kept secure until the final incoming passenger has departed through the customs exit, and then swept, before being reopened to other services.

Other

- A train serviced in a secure space by staff that have been searched on access to that area, and kept in a secure space until departure for entry into service.
- A train may only halt at secured swept platforms.

4.2. HS2 station designs could be adapted to provide these facilities by the addition of an extra floor over the station building; it may not be necessary to extend the station footprint. Secure platforming can be provided by the addition of glass barriers along the centre of platform with dedicated access from the secure passenger handling level. It may also be possible to provide a dual use platform, by having secure facilities which can be opened when domestic services stop and secured when international trains use the station.

Appendix 4

Rolling Stock Strategy

Version 2.0

Contents

List of Acronyms

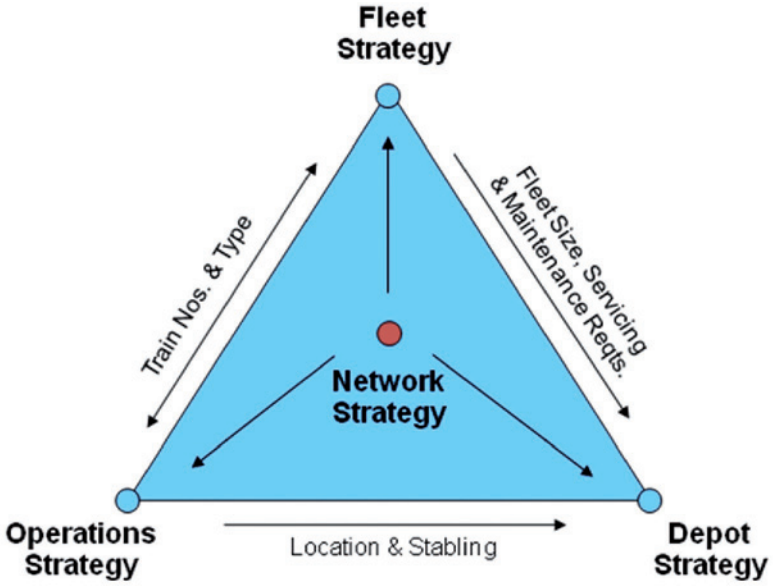
HS	High Speed
IEP	Intercity Express Programme
kph	Kilometres per hour
TSI	Technical Specifications for Interoperability

1. Introduction

1.1. Rolling Stock Strategy linkages

Rolling Stock (Fleet) Strategy is driven by Network Strategy, Operations Strategy and Depot Strategy. These interdependencies are valid for a single as for the longer-term potential High Speed Network. The linkages are reflected below:

Figure 1: Strategy Interdependencies



2. Fleet approach

In developing a fleet strategy for HS2, it is recognised that trains serving London – West Midlands can be captive to the TSI-compliant high speed route; however trains using HS2 and then continuing on to serve destinations beyond the West Midlands will also need to be compatible with the classic UK network. In order to maximise HS2 line capacity, it will be essential that the performance characteristics of the two potential stock types are as consistent as possible.

2.1. Captive HS fleet serving London – West Midlands

Current assumptions as defined in the HS2 Day 1 Train Service Assumptions for Demand Modelling:

- A 20-minute interval service will operate between London – West Midlands from Day 1
- During the peak hour, one additional service will operate
- One-way journey time is 49 minutes
- Turnaround time at either end is 21 minutes
- During hours of peak demand, it is assumed that each service will be formed by 2 x 200m units; outside of these hours, services will be formed by 1 x 200m unit

Estimated fleet size:

On the basis of the above assumptions, there is a requirement for 7 diagrams to operate the service from Day 1 (excluding peak hours strengthening).

Allowing for maintenance needs, including the requirement for a bogie/wheel inspection every 4,000 kilometres and service strengthening it is assumed that up to 16 train sets will be required for this captive HS fleet.

2.2. Captive HS fleet specification

The Captive HS Fleet will have the following requirements:

- Standard European high-speed GC gauge, TSI-compliant train
- Minimum commercial operating top speed of 360 kph
- Distributed power
- Train length of 200m
- Train internal configuration will be based on service needs
- Trains run singly or in 400m long pair as demand requires

The standard design allows follow-on orders at a later stage as and when the high-speed network grows.

2.3. Classic compatible HS fleet

Current assumptions as defined in the HS2 Day 1 Train Service Assumptions for Demand Modelling:

- An off-peak service utilising HS2 six train paths per hour will operate
- Services will run to/from Manchester, Liverpool and Glasgow with one-way journey times ranging between 100 – 240 minutes
- Typical turnaround times of 20-25 minutes, extended up to 35 minutes for Anglo-Scottish services
- During the peak hour, an additional service London – Preston will operate
- Each service is formed of 1 x 200m unit
- The design will be non-tilt, existing speed profiles on the WCML will be reviewed to optimise journey times through alteration to permitted speed signage and possibly some limited infrastructure alteration

Estimated Fleet Size:

On the basis of the above assumptions, a classic compatible fleet size of up to 45 trains is required to cover all inspection and maintenance requirements.[1]

It is unlikely there would be a further expansion of this fleet subsequently.

1 In the event of high demand indications for travel between London – Glasgow, crowding would be relieved by an additional hourly service London – Preston; up to 5 additional sets would be required to cover this.

2.4. Classic compatible HS fleet specification

The Classic Compatible HS Fleet will have the following requirements:

- European HS standard train adapted for UK Classic Network Compatibility (UK1 Gauge)
- Speed/performance compatible with the Captive HS Fleet[2]
- Minimum commercial operating top speed of 360 kph
- Distributed Power
- Train length of 200m
- Train internal configuration will be based on service needs

2.5. Fleet matrix – capacity and compatibility

An example of an emerging fleet matrix would be:

Fleet type	Capacity	Route compatibility		
		HS2	HS1	Classic[3]
Captive HS 360 kph	*Seats:* 550 *Length:* 200m	√	√	
Classic HS Compatible 360 kph	*Seats:* 550 *Length:* 200m	√	√	√ (at classic speed)

The size of the total fleet will ultimately be defined through iteration of a number of factors including:

- Destinations served
- End-to-end journey times
- Service frequency
- Customer demand (number of seats per route per time of day)
- Maintenance requirements
- Service peak responsiveness
- Service reliability

2 Essential requirement - calculation shows a 225kph train would consume at least 3 high speed paths south of the West Midlands on HS2 (see 2.6).
3 This may apply to specific routes only, rather than 'whole classic network' (similar to the Eurostar sets which were limited to specific routes).

2.6. Existing mainline stock – capacity and compatibility

The implications of use of other mainline rolling stock on HS2 have also been considered. There are significant potential impacts on loss of HS2 capacity by mixing these types of stock with HS stock due to their lesser speed/performance capabilities; running such a train at 225kph along the HS2 route would consume the equivalent of three HS2 train paths. In addition to performance capabilities, stock such as Pendolino and IEP would require adaptation to be able to call at TSI-compliant stations (i.e. those with a platform height of 760mm). This would be a significant design change.

Fleet type	Capacity	Route compatibility		
		HS2	HS1	Classic
Pendolino (11 car) 225 kph	*Seats:* 581 *Length:* 264m	TC1	TC1	√
IEP (10 car) 200 kph	*Seats:* 688 *Length:* 260m	TC2	TC2	√

TC1: No gauge issues; train signalling control system and door-stepping arrangements will need modification.

TC2: No gauge or signalling issues; door-stepping arrangements will need modification; potential need to increase maximum speed to 225 kph (power pack adaptation).

3. Fleet costs

3.1. Capital costs

The Captive HS train is estimated at £25 million per trainset (360 kph; 200m; European Standard Train). Within the HS2 cost model, a risk provision of 18%, analogous to a Level 4 Optimism Bias provision, will be made for these sets. This results in an overall provision of £29.5m/set.

A new Classic Compatible HS train is estimated at £37.5 million for a 360 kph; 200m trainset. This is 50% more than a captive HS standard set reflecting the premium for technical redesign. Within the HS2 cost model, a risk provision of 40%, analogous to a Level 3 Optimism Bias provision, will be made for these sets. This results in an overall provision of £52.5m/set.

3.2. Maintenance costs

The maintenance costs for the new Captive HS train as well as the Classic Compatible HS train have initially been derived on an annual mileage assumption of 400,000km per year; actual mileage will vary dependent upon the final trainset diagrams.

The Captive HS train is estimated at £2.80 per km per trainset.

A new Classic Compatible HS train is estimated at £3.50 per km per trainset (25% add-on for additional complexity and potential additional impact of using lower quality classic routes).

3.3. Fleet costs

Emerging fleet capital and maintenance costs are summarised below:

Fleet type	Number of trainsets	Capital cost/set	Maintenance cost/set
Captive HS	16	£25m +18% risk	£2.80/km
Classic Compatible	45	£37.5m + 40% risk	£3.50/km
Total	**61**		

4. Environmental impact

4.1. Energy

4.1.1. Energy consumption

It is assumed that the power consumption of the high speed trains operating along HS2 infrastructure will be broadly comparable with existing European high speed stock (i.e. in the range of 0.04 – 0.065 kWh/seat-km). Power consumption figures are heavily driven by the number of seats (currently assumed as 550 for the HS2 stock) and final route characteristics.

4.1.2. Regenerative braking effects

The train will be capable of regenerative braking and the traction power system will be receptive to this. It is currently assumed that on deceleration, the trains shall regenerate sufficient power such that the total route section power may be reduced by 20% within sections where significant acceleration and deceleration are planned. No allowance will be made for regeneration outside these route sections in the initial power assessment.

4.2. Noise

There is potential for higher noise levels with high speed operation. HS2 trains will be specified and designed to reduce aerodynamic effects particularly of air turbulence around train bogies. Higher noise levels do arise from high speed operation. However, with the emergence of a new generation of rolling stock it is anticipated that noise levels may be reduced. HS2 Ltd will work closely with industry and the EU TSI Committee to ensure improvements are secured.

Appendix 5

Rolling Stock Maintenance Strategy

Version 2.0

Contents

List of Acronyms

CET	Controlled Emission Toilet
TSI	Technical Specifications for Interoperability

1. Introduction

Introduction of HS2 services entails provision of facilities to service and maintain the rolling stock used to run these services. Two different types of passenger high speed stock will be used:

- Standard "off the shelf" GC gauge TSI-compliant stock for the HS2 services running on the dedicated HS2 route (Day 1 London – Birmingham only)
- Modified, smaller gauge, high speed rolling stock compatible with the UK classic network for services running along and off HS2 to other destinations

This strategy outlines how both types of stock will be maintained, stabled and serviced. As far as possible, empty coaching stock movements will be minimised for wear and tear, carbon footprint plus operational capacity and maintenance access impacts.

In developing the strategy, the experience of several rolling stock suppliers/maintainers has been sought and the HS1 Eurostar experience has been highly instructive.

2. Fleet Size

The Day 1 HS2 fleet size is estimated at 60 trainsets:

- 16 GC-gauge trainsets for HS2 captive services (London – Birmingham)
- 45 UK1-gauge classic compatible trainsets (covering London – other destinations)

Whilst this scale of fleet size has been considered in developing this maintenance strategy, passive provision for future increases in the size of the high speed fleet will be made, where possible. Depot provision will be required up to two years in advance of Day 1 service operation to facilitate testing/commissioning/delivery acceptance of the new fleet.

3. Rolling Stock Maintenance

In determining the rolling stock maintenance depot approach, the following factors are being considered:

Operational	• Fleet size and configuration (including potential futureproofing) • Operational diagram starts in morning • Overnight servicing and stabling requirements • Balancing of diagrams peak and off-peak • Mix of stock with different diagram mileages and maintenance cycles
Train	• Maintenance strategy (use of train intelligence, diagnostics, automation) • Maintenance requirements (regular/longer term) • Individual site facilities
Geographic	• Minimum depot footprint size whilst assessing future potential for growth• • Location possibilities and associated accessibility (Day 1 and future) • Resource/skills availability • Operational staff co-location • Spatial planning, social and environmental effects

3.1 Depot requirements

The following high-level depot requirements have been determined for the anticipated fleet size:

- One main maintenance depot is required with provision for a wide range of activities ranging from basic stabling to heavy works
- To point of stabling, the depot shall be within 10 minutes travelling time from the HS2 route (preferably adjacent)
- The depot shall be located within the West Midlands (convenient for both HS2 captive and classic compatible services; skills availability and suitable potential sites exist)
- The typical depot footprint shall be assumed as 1.8km long and 0.5km wide based on, but not restricted to, one end entry
- The depot shall be rail accessible to GC gauge, 400m long trains
- The depot will require good road access and connectivity to arterial routes for the delivery of spare parts and consumables

A number of requirements have been informed by the Eurostar experience at Temple Mills depot for the indicative depot layout and depot specification Appendix A.

3.2 Maintenance regime

The new depot will undertake rolling stock inspection, repair, cleaning, light and heavy maintenance, re-watering and replenishing of consumables. A typical scheduled maintenance pattern for a high speed train is shown in Appendix B1. By the time the HS2 fleet is introduced, it is anticipated that vehicle maintenance regimes will be better informed by vehicle diagnostics; it is expected that the maintenance regime shown is therefore a worst case scenario. Using this maintenance regime and an assumed trainset usage of 400,000km per year, the depot workload is detailed in Appendix B2; calculations to convert the workload to 'pitted road' occupancy and usage will be used to validate the footprint size.

The maintenance patterns and flow through the depot will also be used to ensure sufficient capacity remains to move trains around the depot to and prevent 'grid lock' both for day 1 and potential future proofing.

3.3 Potential Depot Locations

Any viable option must either be on HS2 or have its own purpose built link from HS2 to it because of the need to run GC gauge trains into the depot. A number of potential locations in the West Midlands area were considered at the outset and decisions made by the Programme Board on whether they should be pursued beyond initial review, as follows:

Location	Comments	Retain?
Washwood Heath, Birmingham	Sufficient space. Site used as train works previously. Potential noise impacts on residents to the south east. Floodplain issues to address. Good road access.	Yes
Bordesley, Birmingham	Site used as train/goods yard but too small.	No
Landor/Lawley St Freightliner depot	Existing busy Freightliner depot in central Birmingham, highly unlikely to become available.	No
Tyseley	Current and former goods yard/stabling facility; site too small.	No
Elmdon	Current Land Rover site - availability for future depot? Size acceptable, good road access and skills base. Technically challenging rail access link from the east through green belt.	Yes
Longbridge	Mothballed Rover works site, sufficient space; but too far away from HS2 (10km south west of central Birmingham).	No
Greenfield sites adjacent to HS2	Feasible potential locations are entirely dependent upon the preferred route.	Yes

3.4 Evaluation of Potential Depot Locations

The choice of depot location is heavily driven by the preferred HS2 route and is subject to sifting and stakeholder consultation. In addition to key environmental/sustainability effects, other factors to be considered during location evaluation include:

- Rail access and options for direct connection to route and service commencement
- Other operational issues – line capacity/conflicting traffic moves
- Ability to easily carry out empty coaching stock movements
- Location with respect to the needs of the site e.g. emptying of toilets
- Road access and connectivity
- Space required/available including suitable storage
- Ground conditions and topography
- Security of stores, accommodation, vehicles and stabled sets
- Ownership – freehold/lease
- Economic – multitude of factors
- Proximity to suppliers
- Availability of power and services suitable for Day 1 and future needs
- Resourcing – labour (skills, availability)
- Long term expansion potential without disturbance to established areas of the depot/access

It is estimated that circa 300 people will be employed at the new depot.

3.5 Depot Cost Estimate

A specimen cost has been derived through application of the depot specification to a potential depot site. At this stage, a cost of £200m has been included within the HS2 cost model for this depot.

It is noted that the HS2 depot will need to be flexible enough to cater for two types of stock and specialised spares; potential cost impacts of this requirement will be further assessed in subsequent development stages.

3.6 Future capacity

Where possible, the depot specification will seek to allow further growth in the fleet size – depot capacity will ultimately be dependent upon the site selected, the types of sets and associated maintenance regime.

Another option to provide additional capacity in the future for a larger fleet is to concentrate all heavy maintenance (overhauls) at the West Midlands depot. Residual capacity here would be used for light maintenance/inspections with another smaller light maintenance facility provided subsequently elsewhere on the high speed network away from London. This scenario potentially reduces the amount of empty coaching stock movements and also provides greater operational flexibility for a larger fleet. This approach is still compatible with the overall strategy proposed for the Day 1 high speed fleet in this document.

4. Rolling Stock Stabling

For the captive HS2 sets, operational diagrams will start and finish at both the London and Birmingham ends of the route. Classic compatible set diagrams will also start and finish at London and at a mixture of other locations – e.g. Manchester, Liverpool and Glasgow.

Where feasible, stock will return to the main West Midlands depot for overnight stabling and servicing.

4.1 London stabling

A number of sets will need to be stabled overnight in London. Potential stabling locations will be driven by choice of London terminal and approach route, as stabling facilities and access to it would need to be GC-gauge to accommodate the captive HS2 sets in addition to the smaller UK1-gauge classic sets. As a minimum, stabling facilities must have watering facilities; CET emptying facilities and shore supplies are likely to be required; carriage washing and a pitted road for ad hoc inspections would be ideal. It is currently assumed that an acceptable solution to stabling in London will be found once the preferred route/station package is confirmed, potentially including consideration of use of stabling within the London terminus and also existing facilities at Wembley.

4.2 Other stabling

It is assumed that the classic compatible sets used for the last services of the day to destinations beyond HS2 will typically remain at these locations and form the first services the following morning. As these sets are UK1-gauge, it is currently assumed that they can either be stabled overnight in the station or at existing stabling facilities (high speed sets will potentially be replacing other services, so capacity should be available).

At this stage, an estimate of £50m is included in the HS2 cost model for stabling facilities at the London end only.

5. Rolling Stock Servicing at Terminal Stations

Consideration will be given to servicing requirements in due course – typically this can cover cleaning, re-stocking for catering and comfort needs, watering, minor fault repairs. Factors affecting servicing include the length of turnaround times, the type of catering offer (if any) and anticipated passenger loadings.

Appendix A – Depot Specification

Site footprint:

- Assumed footprint circa 1.8km long and 0.5km wide based on one end entry[1]
- Site may need to be 'slightly' longer for both end entry or with stand-off stabling to ensure suitable access/egress from HS2 or other lines of route
- Typically there can be some 'tapering' effect at either end to the site to accommodate the entry and exit points, but the curvature of turnouts will be at maximum radii to prevent excessive wear or maintenance
- The footprint also includes provision for accommodation and ancillary buildings, car parking and storage

Layout:

- 8 x 400m tracks within the main shed to allow work on complete coupled trainsets, eliminating the need for trains to be split for maintenance
- Main shed configured to deal with both types of train
- Track spacing 6.5m to provide sufficient working space for maintenance staff, tool storage, plant and equipment
- Provision of wheel lathe and bogie drop facilities on suitable additional stabling roads (capable of dealing with up to 400m trains)
- Provision of a minimum of 8 stabling roads for 400m trains
- Provision of two CET roads if no provision made on stabling roads
- Suitable capacity provision for run through movements to position stock for maintenance or longer ad hoc servicing due to unplanned faults

1 It is possible to flex the footprint dimensions by reconfiguring the depot layout e.g. so that the site is shorter and fatter or through provision of stand-off stabling facilities. The over riding parameter is the ability to maintain and move 400m trainsets around and service any vehicle in that set without splitting.

Facilities:

- 450 m long and 60 m wide covered main maintenance building designed with environmental considerations for economic heating and grey water attenuation/reuse
- Carriage washing plant
- Sufficient toilet-emptying and water replenishment facilities – potentially on all reception and stabling roads
- Discharge consent and attenuation provision to comply with local drainage network with suitable recycling as necessary
- Automatic wheel and pantograph equipment and download points for onboard telemetry equipment to assist maintenance scheduling
- Bogie drop able to handle two trains simultaneously
- Provision for overhead cranes on site, positioned to handle both 200m and 400m trainsets
- Signalling and overhead power for all depot lines (all controlled from one control room)
- Heavy repair facility plus bogie removal, wheel drop, etc.
- Wheel turning facility (minimum requirement 1 lathe per 1200 axles)
- Office facilities for depot production control, technical support, drivers signing on, messing etc.
- Stores facility with handling automation in storage
- Facilities to allow for working of approx 200 or so staff working shifts
- Adequate power and water provision to all roads
- Suitable road access and delivery point for rail vehicles delivered by road or equipment by low loader
- Waste fluid and hazardous material storage suitably located for proximity of use and disposal

Appendix B1 – High Speed Maintenance Service Schedule

Inspection	System/Task	Mileage Interval [km]	Depot Equipment needed	Time including emerging work and CET extraction (1 day = 24 hours)	Men/shift	Man-hours
I1	Bogie and wheels	4,000	Any pitted road	4hr	6	24
I2	Roof mounted equipment	8,000	Roof access	6hr	8	48
M1	Majority of on-board equipment	100,000	Main traincare facility	2,3 days	4	224
M2	Majority of on-board equipment	400,000 & 120,000	Main traincare facility	4 days	6	576
M3	Majority of on-board equipment	800,000	Main traincare facility			
R1	First Revision	1,600,000				
R2	Second Revision	3,200,000				
Wheel re-profiling		175-200,000				
Ultrasonic testing		100-200,000				

Appendix B2 – Estimated Depot Workload

year		1	2	3	4	5	6	7	8	9	10
Kms at the end of the year		400,000	800000	1200000	1600000	2000000	2400000	2800000	3200000	3600000	4000000
No. tests per year	I1	50	50	50	50	50	50	50	50	50	50
	I2	50	50	50	50	50	50	50	50	50	50
	M1	4	4	4	4	4	4	4	4	4	4
	M2	1	1	1	1	1	1	1	1	1	1
	M2 revision	0	0	1	0	0	1	0	0	1	0
	M3	0	1	0	1	0	1	0	1	0	1
	R1	0	0	0	1	0	0	0	1	0	0
	R2	0	0	0	0	0	0	0	1	0	0
	Wheel re-profiling	2	2	2	3	2	2	3	2	2	2
	Ultrasonic testing	4	4	4	4	4	4	4	4	4	4

Appendix 6

HS2 Infrastructure Maintenance Strategy

Version 2.0

Contents

List of Acronyms

FMECA	Failure Mode, Effects and Criticality Analysis
OHLE	Overhead Line Equipment
S&C	Switches and Crossings

1. Introduction

1.1. This strategy describes how the HS2 high speed line will be maintained and the requirements necessary to support the railway operation and train service specification. The prime requirements are to deliver a safe, reliable, efficient and environmentally compliant system. This strategy will be further developed in line with the development of the route, train timetable and infrastructure component specification.

1.2. The main objective is for a Proactive Maintenance system that optimises inspection, monitoring and maintenance activities and eliminates the risk of operational failure. This will be achieved through the application of a robust design process and the implementation of targeted maintenance using condition monitoring to identify failure risks prior to them occurring.

2. Guiding principles

2.1. The operation of high-speed services and any inspection/maintenance activities shall be segregated. High speed infrastructure recording and monitoring equipment in conjunction with remote condition monitoring will be used. Visual inspection shall be restricted to locations with a high reliability risk and undertaken only when trains are not running.

2.2. The monitoring and maintenance of fixed assets shall be undertaken in a manner that will eliminate disruption to the operational railway. A failure management system aligned with a dedicated Asset Management system shall be developed and implemented prior to the commencement of service and shall be aligned to the route FMECA.

2.3. Infrastructure condition degradation will be detected through the implementation of routine inspections and remote condition monitoring and rectified early, as far as practicable before causing infrastructure failure.

2.4. A route FMECA shall be undertaken throughout all stages of feasibility, design and implementation in order to identify all high risk/high value locations and to eliminate/reduce the probability and severity of failure modes.

2.5. General maintenance shall be undertaken in a systematic and planned manner thereby reducing 'The Mean Time Between Failure'.

2.6. Through the life cycle of an asset detailed monitoring and inspection shall be undertaken in order to monitor deterioration and co-ordinate replacement.

2.7. Inspection frequencies shall be ascertained through the evaluation of proposed components and shall replicate, as a minimum, the criteria specified within the TSI and/or manufacturers documentation.

2.8. General maintenance and engineering activities shall be segregated from the operational railway. Where work can be fully enclosed then it may be permissible on one track with the adjacent tracks open but subject to the imposition of appropriate restriction of speed on the operational line; subject to timetable capacity.

2.9. Prior to operation a schedule of all assets shall be provided identifying all high value components and the maximum period between inspections.

2.10. To achieve the specified operating performance, provision shall be made for the supply and storage of all high value components. This shall include all bespoke items with extended lead times and those shown to be critical to operational reliability.

3. Safety

3.1. The design, construction and maintenance of the infrastructure shall deliver operational safety as defined in the TSI and UK rail standards. This criterion shall be fulfilled through the application of appropriate European and UK design/construction standards and the implementation of robust maintenance practices to deliver a zero failure tolerance during operation.

3.2. Infrastructure design shall optimise reliability and reduce the need for maintenance inspections.

3.3. Materials likely to affect the health and safety of those maintaining it shall not be used within the infrastructure.

4. Preventative inspection and maintenance

4.1. To support the zero failure tolerance, a full life cycle preventative approach to design, installation and maintenance shall be applied in order to deliver the high speed operation strategy.

4.2. Access to the railway shall be between the hours of 00:00 and 05.00 Monday to Saturday and 00:00 to 08:00 on Sundays. With the exception of high speed infrastructure recording and monitoring, all planned inspection and maintenance shall be undertaken during these periods.

4.3. Fault identification shall be through the application and use of the High Speed Train monitoring and recording equipment and Remote Condition Monitoring.

4.4. An Asset Database shall be developed through the Design and Construction of the project and shall be based around a geodetic control grid using Ordnance Survey referencing to locate and identify all asset components.

4.5. The design shall take into consideration the requirements for the wholesale replacement of components and the methodology for delivering the renewal without disrupting the day to day services.

4.6. The database shall be used to identify:

- The position, age and type of component
- Maintenance history
- Component design
- Incident history
- Resource inventory

5. Components to be monitored and examined

5.1. Through the stipulated access parameters, provision shall be made to monitor and examine:

- Rails – including wear and defect propagation
- Switch & Crossing mechanism and components
- Sleepers – condition and fastening
- Ballast – profile and condition
- Geometry – application of Fixed Track Geometry
- Electrical components – including insulator and OHLE wire condition
- Drainage – including outfalls and crest/embankment drainage.
- Neutral sections.
- Section Insulators.
- Viaducts – access walkways for condition monitoring
- Tunnel shafts – access for fire system maintenance

5.2. Access to remote condition monitored data shall either be via the central control system or through on site data links.

6. Track access

6.1. All high value assets shall be identified during feasibility/early development so that provision is made within the design to allow easy maintenance access to all such asset components.

6.2. All access shall be monitored and controlled through the HS2 control-command centre thereby reducing the risk of trespass.

6.3. All staff working on the infrastructure shall be issued with a personnel identification code which shall be used to control access.

6.4. Along the route, secure controlled vehicle access shall be provided at key points including:

- Tunnel portals and ventilation shafts
- Viaducts
- Junctions and crossovers
- High Voltage Feeder stations
- Pumping stations

6.5. Apart from specific areas of restricted clearance, the line of route footprint is wide enough to enable the provision of a maintenance access 'road'.

6.6. Access shall be through booked possessions, however, unlike current UK possession principles the 'taking and giving back' of the track shall be undertaken via direct on site links to the Operations centre.

7. Lighting

7.1. To inspect high value assets, provision shall be made for lighting at junctions, tunnels and viaducts. Lighting shall only be operated under the specified maintenance arrangements.

7.2. Lighting shall be of sufficient lux to light all components within the designated area and permit maintenance staff to visually inspect and/or repair components without the need for hand held or portable lighting equipment.

7.3. Power supplies for the operation of portable maintenance equipment shall be provided along the HS2 route and at all high value components.

8. Maintenance depots

8.1. The proposal shall be to locate the maintenance depot along side the core route with access to the national rail network thereby allowing access for the transportation and delivery of critical rail components.

8.2. The proposal shall be to locate the principle maintenance depot along side the core route, midway between London and the West Midlands; thereby optimising maintenance time.

8.3. The depot shall have direct access to the high speed line and the UK freight network for the supply of ballast and other rail delivered materials.

8.4. The main depot shall be available 24hrs, 7 days a week.

8.5. The depot will be the centre for all maintenance and renewal activities and shall be sized to accommodate:

- Office accommodation
- Training offices and compounds
- Road vehicle access for HGVs
- Maintenance Staff facilities
- Stabling for all on track plant, locomotives and maintenance wagons.
- Workshops for on track plant
- Compound lighting
- Rail access, North and South, for all plant including tampers, on-track inspection vehicles, Multi Purpose Vehicles
- Rail access to the broader UK rail network.
- Storage for all components including S&C, ventilation fans, rail.

8.6. Additional facilities for messing and local storage shall be provided at other, intermediate locations along the route at high risk asset locations e.g. junctions, feeder stations.

Appendix 7

Appraisal of Sustainability
Sustainable Design Guidance

Contents

INTRODUCTION

As one of the most significant pieces of infrastructure proposed to be developed in the UK over the next 15-20 years, HS2 needs to be closely linked with national objectives for sustainable development by supporting and reflecting stated priorities enshrined in the *UK Sustainable Development Strategy: Securing the Future (2005)*. This sets out the Government's approach to tackling the problems of climate change, poverty and environmental degradation, with the aim of enabling people to satisfy their basic needs, whilst enjoying a better quality of life for themselves and future generations. The nation's key priority areas for action are:

- reducing greenhouse gas emissions and combating climate change;
- natural resource protection and environmental enhancement;
- creating sustainable communities; and
- sustainable consumption and production.

These priorities provide the focus for evaluating the sustainability performance of HS2. All work in support of the scheme's appraisal of sustainability (AoS), including criteria used in the AoS Framework and input to the options sifting process, is structured around these priorities, although note that the second priority has been amended to include cultural resources, thus ensuring all elements of sustainability (social, environmental and economic) are considered.

This guidance note has been prepared to assist the HS2 team including design and technical advisers to better understand how their work can directly support these priorities. Sustainability consultants Booz & Co and the Temple Group (B-T) are working closely with engineering consultants Arup and the HS2 Ltd team in the appraisal of options in order to ensure that sustainability issues are taken into account alongside those of cost, strategic fit and constructability. Use of the guidance in this document should help strengthen this close working approach and so deliver a scheme that fits best with and supports these priorities.

The guidance note begins by presenting nine sustainable design aims, principles that, depending on how closely they are followed, would help to improve the scheme's sustainability.

HS2 is a key component to support wider objectives for enhancing passenger capacity; creating faster journeys; encouraging modal shift; improving connectivity; and supporting regeneration and growth. But to achieve these ends it will require building a new transport corridor, between about 75m (2-track) and 110m (4-track) wide and almost 175km long, which could affect/have implications for land containing valued landscapes, habitats and historic features and in proximity to communities of varying sensitivity, exposed to varying degrees of change in their surrounding environment. Section 3 describes the principles for mitigating, as far as practicable the physical impacts that will unavoidably arise to some degree.

SUSTAINABLE DESIGN AIMS

The following are sustainable design aims[1] that define principles relevant to all stages of scheme development, but Sift 3 in particular. They do not address other general sustainability objectives (e.g. employment creation and regeneration or transport benefits), but focus on those aspects that the engineers should seek to achieve in developing route alignments and station footprints and, where necessary, in mitigating the adverse impacts of the same.

The design aims are intended to provide a focus and to demonstrate intent. It is quite possible that, for many reasons, they may not always be practicable to achieve. But in defining expected standards they establish an ambition that HS2 Ltd is committed to.

The design aims may be expanded and refined as detailed design progresses to accommodate other sustainability issues, such as equality of access and security, and to reflect changing legislative requirements and best practice.

Each sustainable design aim addresses specific considerations in isolation (e.g. energy, flood storage and the protection of environmental resources). The design team shall consult Booz-Temple to ensure the wider sustainability context, including potential inter-relationships between elements of sustainability, and impacts (including cumulative and those in combination) are understood and considered.

Ideally, these aims will become an intuitive consideration in any decisions influencing the design (route alignment and station selection) of the scheme. These aims represent a commitment to avoid, where practicable, potentially adverse impacts of HS2 at all stages of scheme development.

The hierarchy of mitigation (see Section 4) shall be applied in identifying the most practicable means of mitigation taking into consideration a range of factors including cost and engineering feasibility.

Although the Sustainable Design Guidance will form an appendix of the Project Specification, it is not a mandatory requirement that the design team achieves any, or all of the design aims, as set out below, but will endeavour to ensure these aim are achieved.

1 Theses sustainable design aims have been prepared for this project and do not represent wider commitments in respect of sustainability, on behalf of any other government department, in particular the Department for Transport. These aims are for internal, HS2 project team use only.

i. Managing energy

The project shall consider the energy efficiency of the operation of trains and rail infrastructure (commensurate with the detail of design), as well as the energy requirements of construction and materials, as a means of establishing low energy priorities within the scheme as a whole.

ii. Managing flood risk

The project shall aim to ensure no increase in flood risk. This will be achieved by maintaining overall flood storage capacity (through, in order of priority, option selection that avoids flood plains, infrastructure design and flood compensation) and minimising disruption of flood flows.

iii. Protecting environmental resources

The project shall where reasonably practicable seek to avoid direct or indirect harm to valued landscape, water and ecological resources, to mitigate adverse impacts where necessary, and to enhance such resources where practicable. Measures to achieve this will be commensurate with the sensitivity of the resource and the level of protection afforded such resources through relevant laws and policies.

iv. Protecting historic cultural resources

The project shall seek to avoid direct or indirect harm to valued historic cultural resources, to mitigate adverse impacts where necessary, and to enhance such resources where practicable. Measures to achieve this will be commensurate with the sensitivity of the resource and the level of protection afforded such resources through relevant laws and policies.

v. Controlling noise and vibration

Where reasonably practicable, the operation of HS2 infrastructure shall result in no significant adverse noise and vibration impacts (by reference to relevant guidance and precedence) to residents and other sensitive receptors near the route or proposed stations. Measures to mitigate potential impacts will be introduced, but where such impacts are unavoidable and cannot be appropriately mitigated, the project shall define circumstances under which residential properties shall be eligible for sound insulation.

vi. Minimising property impacts

The project shall seek to avoid or, where this is not practicable, to minimise demolition of properties and, in particular, to minimise residential land-take and demolition.

vii. Protecting communities

The project shall seek to maintain the health and amenity of residential communities potentially affected by the scheme. This shall include, where practicable, maintenance of access to services (such as health facilities, schools and places of worship) and shops, and maintenance of environmental conditions such that significant adverse effects on health and amenity are mitigated.

viii. Safety

The project design shall seek to ensure that the travelling public and general public are not subject to increased risk of death or injury as a result of the operation of HS2 services.

ix. Optimising the land resource

The project shall seek, where practicable, to use land with planning designation appropriate to development for high speed rail and its infrastructure. The project shall seek to maintain and enhance land use, so long as this does not compromise other sustainability design aims.

CONSTRAINTS AND OPPORTUNITIES – THINGS TO AVOID AND THINGS THAT ATTRACT

A selection of the key features and designations potentially affected by the various HS2 options are set out in *Appendix 1*. For each one, along with a general description, a status indicator is provided from 5: very high status to 1: low status. This gives an instant but non-categorical indication as to how important the feature or designation is by reference to its legal status and the extent, and ease, with which any impact can be mitigated.

The status indicator "A" indicates the feature to be an attractor, where proximity to HS2 is a considered potentially beneficial.

The definitions of the status indicators are provided below. These indicators should be applied in conjunction with the sustainable design aims, as set out in section 2 and in discussion with Booz-Temple and other stakeholders, as appropriate, to understand other contextual factors which will influence how such indicators are applied, and how they ultimately inform the design.

The indicators should not be taken as definitive as this will depend on the particular circumstances. Further advice should therefore be sought as appropriate as part of the application of the indicators to these circumstances.

In all cases the preferred solution is generally to avoid the area or feature altogether, but recognising that this might not always be practicable for a number of reasons, priority should be given to avoiding the areas or features attracting higher status indicators and otherwise apply other forms of mitigation as appropriate as described in section 4 below.

Status indicator	Definition
5	**Very high** • Area/feature to be avoided unless no reasonable alternative exists; potential to prevent project proceeding; • Protected directly by International (e.g. Ramsar, World Heritage Site), European, or national legislation and highly likely to encounter high level scrutiny or challenge and significant public objection; • Impacts may be accepted following completion of a statutory exemption procedure but adequate compensation may be required. If mitigation is possible it is only likely to be achieved by alignment (vertical or horizontal) shift to avoid.
4	**High** • Area/feature to be avoided unless no reasonable alternative exists; potential to prevent project proceeding • Protected by national statute or regulation and highly likely to encounter high level scrutiny or challenge and/or objection • Impacts mitigated by alignment (vertical or horizontal) shift unless effects relatively small (e.g. peripheral impact to a large area, where agreements on compensation and/or remediation/enhancement of other areas of the feature may be sought.)
3	**Moderate** • Area/feature to be avoided if impact likely to be large • Protected by at least regional policy and likely to encounter regional opposition depending on degree of impact • Mitigation is required, but minimising or abating the impact may be acceptable.
2	**Low** • Area/feature protected by local policy • Local opposition is likely • Relatively easy to mitigate
1	**Very low** • Area/feature protected by local policy • Local opposition is possible, but should be possible to address through effective mitigation and consultation • Easy to mitigate impact
A	**Attractor** • Feature would benefit from location of HS2 infrastructure

To support the option sifting process, the features, as described below, have been classified as either Tier 1 or Tier 2 information. Tier 1 information is intended to aid in the identification of those features that are likely to present a substantial constraint to the proposed alignment and station locations.

Tier 2 information comprises those features which are likely to present a less substantial constraint, and are likely to be helpful in addressing the finer detail of route alignment and station option selection. As discussed, the design team should be aware of the potential impacts, to a number (cumulative) or a range (in combination) of Tier 2 features which may have the potential to prevent the project proceeding. Therefore close liaison with the B-T team will be necessary to understand the significance of such discrete impacts to Tier 1 features and the potential significance of both cumulative, and in combination impacts, for both Tier 1 and Tier 2 features.

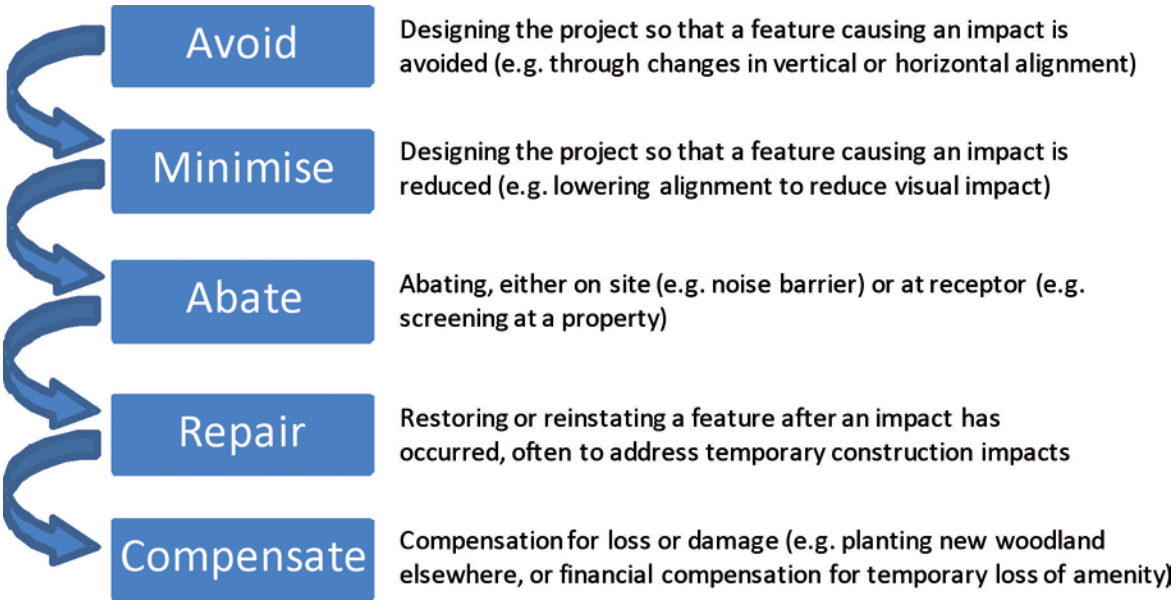
As mentioned, the project design team should bear in mind that the indicators are indicative rather than definitive. Therefore the project design team should make sure that all relevant information, in respect of sustainability, is taken into account in considering the potential for the impacts identified, in isolation and/or in combination, to prevent the project proceeding.

MITIGATING ADVERSE IMPACTS

Identifying potentially adverse impacts on people and resources in the development of HS2, and taking steps to mitigate these is fundamental to securing the sustainability of the scheme.

Mitigation can be applied at different times and in different ways. In its most basic form it involves identifying a potentially adverse impact and avoiding or minimising it; for example rejecting a damaging option in favour of a benign (or at least less damaging) one during the earliest option development stage. Much later in the project lifecycle it might involve providing compensation for an adverse impact that is otherwise deemed unavoidable.

There is a hierarchy of mitigation between these extremes, which is summarised below.



The prevalence of each of these types of mitigation will change as the scheme progresses. At the earliest stage, opportunities to avoid and minimise are clear and will be taken where practicable. As the scheme detail is developed with the emergence of a preferred option, opportunities to make further major changes will be fewer, and opportunities to mitigate through abatement, repair or compensation will become appropriate.

APPENDIX 1: Key features and designations

Tier 1

Sustainability Criteria	Description	Status indicator
Reducing Greenhouse Gases and Combating Climate Change		
Route characteristics	There is little that can be used to distinguish route options in terms of climate impact. Information on line speed and the number of stops (parkway and intermediate stations requiring greater energy use in slowing and accelerating trains) gives an approximate idea of relative energy requirements at the operational phase. Information on infrastructure requirements gives an indication of potential differences in embedded carbon, with large concrete structures requiring considerable energy to manufacture and build. Tunnels form the most energy-intensive structures, both in terms of the amount of raw material (mostly concrete) required, and the energy required for tunnel excavation and spoil disposal.	**3**
Natural and Cultural Resource protection and Environmental Enhancement		
National Parks	The national parks of England and Wales are areas of relatively undeveloped and scenic landscape that are designated under the National Parks and Access to the Countryside Act 1949. The two purposes of the National Park designation are to conserve and enhance the natural beauty, wildlife and cultural heritage of the area; and to promote public understanding and enjoyment of the areas special qualities by the public. In pursuing these purposes, a National Park authority shall seek to foster the economic and social well-being of their local communities. If there arises a conflict between the two purposes, relevant authorities shall give greater weight to the conservation and enhancement purpose. The National Parks (Scotland) Act 2000 enabled the establishment of National Parks in Scotland. In addition to the two purposes described above, National Parks in Scotland are designated to promote the sustainable use of the natural resources of the area and the sustainable social and economic development of its communities. These purposes have equal weight and are to be pursued collectively unless conservation interests are threatened. As well as representing a natural and cultural resource, National Parks may equally be considered as crucial in their support of sustainable communities.	**4**

Sustainability Criteria	Description	Status indicator
Areas of Outstanding Natural Beauty (AONB) – England	AONBs have equivalent status to National Parks as far as conservation is concerned. AONBs are designated under the National Parks and Access to the Countryside Act 1949. The Countryside and Rights of Way Act 2000 added further regulation and protection. The single purpose of AONB designation is to conserve and enhance the natural beauty of the area. Where there is a Conservation Board (as in the Chilterns AONBs), the Board has an additional purpose of increasing the understanding and enjoyment by the public of the special qualities of the area. A Board must also seek to foster the economic and social well-being of their local communities. If it appears to a Board that there is ever a conflict between these two purposes, it must give greater weight to the conservation and enhancement purpose.	**4**
National Scenic Areas - Scotland	National Scenic Areas are Scotland's only national landscape designation. They are those areas of land considered of national significance on the basis of their outstanding scenic interest which must be conserved as part of the country's natural heritage. They have been selected for their characteristic features of scenery comprising a mixture of richly diverse landscapes including prominent landforms, coastline, sea and freshwater lochs, rivers, woodlands and moorlands. Section 6 of the Natural Heritage (Scotland) Act 1991 is the statutory authority for creating Natural Heritage Areas. The NSA has international recognition through all areas being listed as Category V (Protected Landscapes) in the IUCN's World List of Protected Areas.	**4**
Regional Parks (Scotland)	Extensive areas of the countryside in Scotland where existing land uses continue but are managed by agreement with the landowners to also allow for public access and informal recreation and to protect local landscapes. Local authority proposals for the establishment of Regional Parks are designated upon the confirmation by Scottish Ministers under the Wildlife and Countryside (Scotland) Act 1981.	**3**

Sustainability Criteria	Description	Status indicator
London Protected Views	The London Plan requires that the Mayor of London designate a selected set of strategically important views. It requires that the Mayor will, and boroughs should, assess development proposals where they fall within the assessment areas of (listed) designated views against general principles of good design, local urban design policies, and management principles. Policies 4B.16, 4B.17 and 4B.18 of the London Plan relate to protected views and seek to designate, protect and manage twenty-six views of London and some of its major landmarks. The views designated by the London Plan are classified in four ways. They are panoramas across substantial parts of London ('London Panoramas'); views of landmarks framed by objects in the landscape ('Linear Views'); broad prospects along the river Thames ('River Prospects'); or views of the urban townscape ('Townscape Views'). Each view has specific characteristics that contribute to an appreciation of London at the strategic level. New development should make a positive contribution to the characteristics and composition of the Designated Views. In July 2007, the Mayor published the London View Management Framework Supplementary Planning Guidance which provides guidance on the policies in the London Plan. Further, the Mayor published the draft London View Management Framework in June 2009 for consultation.	**3**
World Heritage Sites	World Heritage Sites are designated to meet the UK's commitments under the 1972 World Heritage Convention concerning the Protection of the World Cultural and Natural Heritage. These sites are designated for their globally important cultural or natural interest and require appropriate management and protection measures. Sites are nominated and confirmed for inclusion on the list maintained by the international World Heritage Programme administered by the UNESCO World Heritage Committee, composed of 21 State Parties (countries) which are elected by the General Assembly of States Parties for a fixed term.	**5**
Scheduled Monuments	Defined in the Ancient Monuments and Archaeological Areas Act 1979 and (in England only) through the National Heritage Act 1983 as a protected archaeological site or historic building of national importance. The Department of Culture, Media and Sport are responsible for identifying and scheduling (registering) new sites, as well as ensuring that scheduled sites are protected. Scheduled Monument Consent is required from the Secretary of State prior to any work affecting a monument taking place. English Heritage (EH) would advise in these matters.	**4**

Sustainability Criteria	Description	Status indicator
Listed Buildings	A listed building is one that is 'of special architectural or historic interest' and has been included on a list kept by the Secretary of State. A listed building may not be demolished, extended or altered without special permission (listed building consent) from the local planning authority (who typically consult English Heritage/Cadw/Historic Scotland). In England and Wales the authority for listing is granted by the Planning (Listed Buildings and Conservation Areas) Act 1990. Listed buildings are classified according to their importance and are given a grade depending on how important they are:	
	• Grade I: of outstanding architectural or historic interest	**5/4**[2]
	• Grade II*: particularly significant of more than local interest	**4**
	• Grade II[3] : of special architectural or historic interest	**3**
Registered Parks and Gardens (England)	Parks and gardens listed within the Register of Parks and Gardens of special historic interest in England, which was established and is maintained by English Heritage. There are currently close to 1,450 sites on the register split into 3 bands according to their significance. Inclusion on the Register brings no additional statutory protection, but local authorities are required by central government to make provision for the protection of the historic environment in their policies and their allocation of resources. Registration is a material consideration in planning terms so, following an application for development which would affect a registered park or garden, local planning authorities must, when determining whether or not to grant permission, take into account the historic interest of the site.	
	• Grade I: of outstanding landscape and historic interest	**5/4**[4]
	• Grade II*: particularly significant landscape and historic interest	**4/3**[5]
	• Grade II: of special landscape and historic interest	**3/2**[6]
Gardens and Designed Landscapes (Scotland)	Gardens and designed landscapes are defined as grounds which are laid out for artistic effect and most often include architectural features, trees, shrubs, flowers, lawns and parkland. Historic Scotland works to protect these assets against threats from development.	**3**

2 Depending on extent of impact and importance of structure affected
3 Although a national designation, Grade II buildings are deemed of Tier 2 status
4 Depending on extent of impact and importance of feature affected
5 Depending on extent of impact and importance of feature affected
6 Depending on extent of impact and importance of feature affected

Sustainability Criteria	Description	Status indicator
Historic Battlefields	The English Heritage Register of Historic Battlefields offers protection for the 43 English battlefields and promotes a better understanding of their significance. Each Register entry is based on the available evidence and includes a map of the battlefield area showing the position of the armies and features which were part of the original battleground. These maps are intended to be the starting point for battlefield conservation and interpretation by identifying the most visually sensitive areas. The inclusion of a site on the register does not give any statutory protection but it is a material consideration when a local planning authority determines a planning application. At the time of writing the Scottish Government had issued the go-ahead for an inventory for all Scottish historic battlefields to be created by local authorities and Historic Scotland. The list is expected to be complete by 2011. Currently these sites are covered by archaeological and landscape designations.	**4/3**[7]
Actual and candidate Special Areas of Conservation (SAC/ cSAC)	SACs are designated under Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the EU "Habitats Directive") as areas identified as best representing the range and variety of habitats and (non-bird) species listed in Annexes I and II to the Directive within the European Union. SACs in terrestrial areas and marine waters within British Fishery limits (up to 200 nautical miles) are designated under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). With SPAs (see below) they form the Natura 2000 network.	**5**
Actual and proposed Special Protection Area (SPA/pSPA)	SPAs are classified by the UK Government under Directive 79/409/EEC on the conservation of wild birds (the EU "Birds Directive"). SPAs are areas of the most important habitat for rare (listed on Annex I in the Directive) and migratory birds within the European Union. SPAs in terrestrial areas and marine waters within British Fishery limits (up to 200 nautical miles) are designated under the Wildlife and Countryside Act 1981 but governed by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). With SACs (see above) they form the Natura 2000 network.	**5**
RAMSAR	Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. The Convention covers all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities.	**5**
National Nature Reserves (NNRs)	NNRs contain examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats or to provide special opportunities for scientific study of the habitats communities and species represented within them. NNRs are declared by the statutory national conservation agencies (NE, SNH, CCW) under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981.	**4**

7 Depending on extent of impact and importance of battlefield

Sustainability Criteria	Description	Status indicator
Sites of Special Scientific Interest (SSSI)	Identified by Natural England (or SNH in Scotland) under section 28 of the Wildlife & Countryside Act 1981 as requiring protection from damaging development on account of its flora, fauna, geological and/or physiological features. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and the Nature Conservation (Scotland) Act 2004. The SSSI series has developed since 1949 as the national suite of sites providing statutory protection for the best examples of the UK's flora, fauna, geological or physiographical features. These sites are also used to underpin other national and international nature conservation designations (see below). Most SSSIs are privately-owned or managed; others are owned or managed by public bodies or non-government organisations.	4
Flood Risk Areas	Before considering development, land or property that lies within a Flood Risk Zone (FRZ) needs to be identified. The Environment Agency (EA) produce indicative flood plain maps which indicate which areas are at high, medium or low risk of flooding. High to medium risk zones are as follows:	
	• Zone 3b. Functional flood plain.	4
	• Zone 3a. High risk of flooding; area designated as having a 1 in 100 or greater chance of river flooding (→1%).	3
	• Zone 2. Medium risk of flooding; area designated as having between 1 in 100 and 1 in 1000 chance of river flooding (1% - 0.1%).	2
Source Protection Zones	Some aquifers are naturally protected against pollution by being covered with impermeable soil or rock, but where this is not the case several approaches are taken to provide protection. The first of these is to map where groundwater sources such as wells, boreholes and springs used for public drinking water supply, are most vulnerable. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. For large public groundwater supplies, the areas of land from which water flows is also mapped, and activities that might cause pollution are carefully controlled. These areas are called Source Protection Zones (SPZs). The EA have defined SPZs for 2000 groundwater sources. SPZs are mapped showing different zones –inner (zone 1), outer (zone 2) and total catchment (zone 3) zones – which indicate the increasing vulnerability of the groundwater source to contamination. A fourth zone of special interest is sometimes also defined, where local conditions mean that industrial sites and other polluters could affect the groundwater source even though they are outside the normal catchment area.	
	• SPZ1 – inner zone	3
	• SPZ2 – outer zone	2
	• SPZ3 – total catchment	1

Sustainability Criteria	Description	Status indicator
Creating Sustainable Communities		
Growth points	The Government's Growth Points initiative is designed to provide support to local communities who wish to pursue large scale and sustainable growth, including new housing, through a partnership with Government. The Government invited local authorities to submit strategic growth proposals which were sustainable, acceptable environmentally and realistic in terms of infrastructure to be assessed by Government and its agencies. Criteria for growth points were published to help local partners develop good quality growth proposals. Twenty nine new Growth Points were announced in October 2006 with a wide regional spread covering the East and West Midlands, the East, South East and South West of England. Growth Points status is not a statutory designation but a relationship (defined by explicit conditions and based on detailed factual assessment) between central government and local partners.	**A or 2**[8]
Growth Areas	Growth Areas are closely related in intent to growth points and are one of the measures that the Government has established to tackle housing supply in the wider South East due to its failure to keep pace with the numbers of new households. The existing growth areas comprise the Thames Gateway and the three new Growth Areas of Milton Keynes and South Midlands; London-Stansted-Cambridge-Peterborough; and Ashford.	**A or 2**[9]
Eco-towns	Eco-towns are planned to be new communities with 5,000 -15,000 homes adhering to strict standards of building and performance.[10] Environmental building standards and low carbon energy sources will be used to make sure that eco-towns have the minimum impact on the environment. At least 30 per cent of housing will be affordable. The Government also announced plans to create hundreds of thousands of homes in 10 "carbon neutral" communities. Construction is to be underway by 2016. The locations of four new eco-towns were announced by the Government in July 2009, comprising Rackheath (Norfolk); north-west Bicester (Oxfordshire and within the London to West Midlands study area); Whitehill Bordon (East Hants); and the China Clay Community near St Austell, Cornwall.	**A or 2**[11]

8 Attractor when associated with stations, but may be a constraint to route options due to a risk of adverse impacts to communities
9 Attractor when associated with stations, but may be a constraint to route options due to a risk of adverse impacts to communities
10 http://www.communities.gov.uk/news/corporate/904561
11 Attractor when associated with stations, but may be a constraint to route options due to a risk of adverse impacts to communities

Sustainability Criteria	Description	Status indicator
Super Output Areas and Indices Of Multiple Deprivation	The English Indices of Deprivation 2007 (ID 2007) are the Government's official measure of multiple deprivation at small area level. The Index of Multiple Deprivation 2007 (IMD 2007), which forms part of the ID 2007, is based on the small area geography known as Lower Super Output Areas (LSOAs). LSOAs have between 1000 and 3000 people living in them with an average population of 1500 people. In most cases, these are smaller than wards, thus allowing the identification of small pockets of deprivation. There are 32,482 LSOAs in England. The LSOA ranked 1 by the IMD 2007 is the most deprived and that ranked 32,482 is the least deprived. The measures used in the AoS refer to those LSOAs containing respectively the 20% and 50% most deprived LSOAs. The IMD brings together 37 different indicators which cover specific aspects or dimensions of deprivation: income, employment, health and disability, education, skills and training, barriers to housing and services, living environment and crime. These are weighted and combined to create the overall IMD 2007. Identification of areas of high deprivation is a proxy for those areas considered relatively more sensitive to further adverse impacts associated with HS2. Equally, there are potential benefits where HS2 offers regeneration opportunity from which people in deprived areas might benefit.	**A or 3/2**[12]
Sustainable Consumption and Production		
Green Belt (and Metropolitan Open Land in London)	Green Belt is designated for many reasons, including protection of natural environments; improving air quality within urban areas; ensuring urban dwellers have access to countryside and protection of rural communities from expanding suburbs. Green Belt therefore provides both a natural and community resource. Green Belt is, however, considered under sustainable consumption and production since in the UK it is principally a policy for controlling urban growth and preventing the coalescence of main urban areas. A railway through Green Belt could be considered adversely since, for example, it may create pockets of land that are susceptible to development infill and may conflict with the open and contiguous character for which a Green Belt is designated. Land included in the Green Belt must contribute to one or more of the five purposes of the Green Belt set out in Planning Policy Guidance Note 2 (PPG2 Green Belts): to check the unrestricted sprawl of built-up areas, safeguard the surrounding countryside from further encroachment, prevent neighbouring towns from merging into one another, preserve the special character of historic towns and to assist in urban regeneration. PPG2 states that there is a presumption against inappropriate development. Such development should not be approved except in very special circumstances. PPG2 includes guidance on development which would not be considered inappropriate.	**2**

12 20% most deprived areas are more sensitive to impact than those in the 50% (excluding bottom 20%) most deprived

Sustainability Criteria	Description	Status indicator
EA/SEPA registered "Special Sites" for Contamination and Registered Landfills	Thousands of sites have been contaminated by previous industrial use, often associated with traditional processes which are no longer used. These sites may present a hazard to the general environment, but there is a growing need to reclaim and redevelop them. The EA (SEPA in Scotland) are responsible for the regulation of "special sites" of contamination and for the maintenance of a register of regulatory action on such sites. Special sites do not necessarily represent the most heavily contaminated land but they are designated as such where they meet one of the descriptions in the Contaminated Land Regime. Special sites include sites owned by the Ministry of Defence, land contaminated by certain industrial activities or radioactive substances, nuclear sites, and contamination affecting rivers, groundwater and drinking water supplies. Contaminated land is regulated in two main ways: • Town and Country Planning Act 1990: Contamination or the potential for contamination should be considered during the planning process. Local authorities can place conditions on planning permissions requiring that developers investigate contamination and, where it's found, clean it up to prevent harm. • Contaminated land regime (Part 2A of the Environmental Protection Act 1990): The regime comes into effect if a site is not being redeveloped but is causing or has the potential to cause significant harm.	**2**
Agricultural Land (Grade 1 and 2)	The quality of agricultural land in England and Wales is assessed according to a system devised by MAFF/DEFRA, revised and published in 1989 and known as the Agricultural Land Classification (ALC). This is the nationally applicable system used for land use planning and development control. The two top grades are as follows: • Grade 1: excellent quality agricultural land - land with no or very minor limitations to agricultural use; • Grade 2: very good agricultural land - land with minor limitations which affect crop yield, cultivations or harvesting. Local authorities should take account of Agricultural Land Classification in order to make informed choices about future land use within the planning system	**2**

Tier 2

Sustainability Criteria	Description	Status Indicator
Natural and Cultural Resource protection and Environmental Enhancement		
Local Landscape Designation	A non-statutory local/county-wide designations adopted by planning authorities. PPS7 (paragraph 25) has discouraged their retention in English planning documents, favouring instead the use of criteria-based policies using tools such as landscape character assessment in preference to rigid local designations. However, they remain a material consideration in preparing plans and strategies and in planning decisions where it is felt that criteria-based planning policies cannot provide the necessary protection to valued landscape. Local Landscape Designations have more relevance in Scotland where they are an important tool in safeguarding and enhancing Scotland's landscape.	**2**
Regional Landscape Designations (Scotland)	Regional landscape designations were identified in 1974 to provide a mechanism whereby Scottish planning authorities can identify sites where there should be a strong presumption against development. They include: • Areas of Great Landscape Value (AGLV) • Highland Areas of Regional Landscape Significance (ARLS) • Areas of Scenic Value (ASV) • Regional Scenic Areas (RSA) • Regional Scenic Coasts (RSC) It is recognised that these scenic areas have considerable unexploited potential for tourism and therefore for benefiting local economies. Regional Landscape Designations vary in title, scale and objectives from one planning authority to another.	**2**
Areas of Archaeological Interest	Areas identified by the local planning authority in their planning policy documents from known records and other local information as potentially containing archaeological remains or artefacts which would warrant detailed site investigation as part of and prior to redevelopment of the site.	**2**
Conservation Areas	An area of special architectural or historic interest, designated under the Planning (Listed Buildings & Conservation Areas) Act 1990, whose character and appearance it is desirable to preserve and enhance. There are special rules on some development in conservation areas.	**2**

Sustainability Criteria	Description	Status Indicator
Local Nature Reserves	A Local Nature Reserve is a statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949 by principal local authorities. Parish and town councils can also declare LNRs but they must have the powers to do so delegated to them by the principal local authority. To establish a LNR the declaring local authority must first have a legal interest in the land concerned and the land must lie within the area which the declaring authority controls. LNRs are of local, but not necessarily national, importance. LNRs are almost always owned by local authorities, and they often pass the management of the LNR onto County Wildlife trusts. An LNR can also be an SSSI, or may have other designations (see below), although an LNR cannot also be an NNR.	**3/2**[13]
Sites of Importance for Nature Conservation (SINCs)	Site of Importance for Nature Conservation (SINC) is a designation used in many parts of the United Kingdom to protect areas of importance for wildlife at a county scale. In other parts of the country the same designation is known by various other names, including Site of Nature Conservation Interest (SNCI), County Wildlife Site and Site of Metropolitan Importance for Nature Conservation. Overall, the designation is referred to as a "non-statutory wildlife site", or a "Local Site". The designated sites are protected by local authorities from most development. In some areas, the designation is either subdivided, or additional local designations are used. For example, in London, sites are classified as being of metropolitan importance, borough importance or local importance for nature conservation, the former being of SNCI status.	**3/2**[14]
Ancient Woodlands	Ancient woodland is land continuously wooded since AD1600 in England and Wales or AD1750 in Scotland and which has never been cleared or replanted. Many ancient woodlands are designated for their scientific and conservation importance. The ancient woodland inventory records such woods over 2 hectares in England. Ancient woodlands do not enjoy their own statutory protection, although many are protected through designations such as SSSIs or other designations.	**3**
Biodiversity Action Plans (habitats and species)	A Biodiversity Action Plan (BAP) is an internationally recognized program addressing threatened species and habitats and is designed to protect and restore biological systems. The United Kingdom BAP covers terrestrial species, marine species and migratory birds. In August 2007, the new BAP (the original having been launched in 1997) identified 1,149 species and 65 habitats in the UK that need conservation and greater protection. UK BAP habitats are rare or threatened semi-natural habitats that are the subject of concerted action by many different organisations involved in wildlife conservation. The mapping of some habitats is incomplete and the data is being updated, with new habitats added as soon as the information becomes available.	**3/2**[15]

13 Depending on extent of impact and relative importance of site
14 Depending on extent of impact and relative importance of site
15 Depending on extent of impact and relative importance of site

Sustainability Criteria	Description	Status Indicator
Regionally Important Geological and Geomorphological Sites (RIGS)	RIGS, identified by locally developed criteria, are currently the most important places throughout the UK for geology and geomorphology outside statutorily protected land such as SSSI, which include sites of earth science importance as well as biological ones. RIGS are selected on a local or regional basis using four nationally agreed criteria, namely educational value, academic value, historical value and aesthetic value.	**3/2**[16]
Water bodies	Main rivers are usually larger streams and rivers. However, they do include smaller watercourses of local significance. An ordinary watercourse is every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows and which does not form part of a main river. Environment Agency powers to carry out flood defence works apply to main rivers only, but its other duties and functions extend to all watercourses. Until recently, a general quality assessment (GQA) scheme has been used to assess river water quality using chemistry, biology and nutrients as indicators of overall quality; and biological quality as an indicator of overall river 'health'. The European Water Framework Directive (WFD) now provides a more sophisticated way of assessing the whole water environment by looking at over 30 measures, grouped into ecological status (this includes biology as well as 'elements' like phosphorus and pH) and chemical status ('priority substances'). The WFD covers estuaries, coastal waters, groundwater and lakes as well as rivers. Ecological quality of rivers and lakes is mapped for sift 3, with their status classified into five grades between high and bad.	**3**[17]
Creating Sustainable Communities		
Registered Common Land	Common land is subject to 'rights of common' held by other individuals over the common, and to the special statutory controls that apply under commons legislation. Rights of common have their origin in local custom and include, for example, the right to graze stock. The Commons Registration Act 1965 established definitive registers of common land and town and village greens in England and Wales and recorded details of rights of common. The Act extends only to England and Wales; common land in Scotland and Northern Ireland is of a different character and subject to different legislation. There are around 572,000 hectares of common land in England and Wales. Many commons are still used for agriculture and serve the economic interest of farming communities. They are also valued for their landscape, wildlife and archaeological interests, and for public enjoyment. Over half of common land in England has been designated as SSSIs (see above). There is a public right of access to nearly all common land, either under the Countryside and Rights of Way Act 2000 (see below) or under earlier legislation. Like public open space, building on common land is discouraged and, where it is unavoidable, it is incumbent on developers to offer at least an equivalent area of replacement which is equally advantageous to its users.	**3/2**[18]

16 Depending on extent of impact and relative importance of site
17 For rivers of high and good status
18 Depending on extent of impact

Sustainability Criteria	Description	Status Indicator
Greens	A piece of land can be registered as a town or village green if a significant number of local inhabitants has indulged in lawful sports and pastimes, for 20 years, as of right on this land. It is estimated that there are about 3,650 registered greens in England and about 220 in Wales, covering about 8,150 and 620 acres respectively. Greens are protected under section 29 of the Commons Act 1876, together with section 12 of the Inclosure Act 1857. Registration as a town or village green can sterilise land from development. Doorstep Greens (of which there are about 200) were set up between 2001 and 2003 as permanent areas of public green space, close to people`s homes, in disadvantaged areas where regeneration of the local environment is crucial. Doorstep Greens are protected by restrictions on the registered title of the land in question. Millennium Greens (of which there are about 245) are also permanent areas of public green space, close to people`s homes, in urban or rural locations that provide breathing spaces for relaxation, play and enjoyment of nature. The Millennium Greens project was started in 1996 and ran until 2001.	**3/2**[19]
Open Country	Under the Countryside and Rights of Way Act 2000 (CROW), the public can walk freely on mapped areas of mountain, moor, heath, downland and registered common land (see above) without having to stick to paths. The new rights came into effect across all of England on 31 October 2005. In Scotland, under Part 1 of the Land Reform (Scotland) Act 2003, everyone has the right to be on most land and inland water (including mountains, moorland, woods and forests, grassland, margins of fields in which crops are growing, paths and tracks, rivers and lochs, the coast and most parks and open spaces) providing they act responsibly (in line with The Scottish Outdoor Access Code).	**2**
Country Parks	There are about 250 recognised Country Parks in England and Wales. Most were designated in the 1970s, under the Countryside Act 1968 with the support of the former Countryside Commission. In more recent times there has been no specific financial support for country parks directly, and fewer have been designated. Most are managed by local authorities, although other organisations and private individuals can also run them. There is nothing to stop anyone opening a site and calling it a Country Park, although they might not receive recognition from Natural England.	**2**
Air Quality Management Areas	Since 1997 local authorities in the UK have been carrying out a review and assessment of air quality in their area. The aim of the review is to assist authorities in carrying out their statutory duty to work towards meeting the national air quality objectives. If a local authority finds any places where the objectives are not likely to be achieved, it must declare an Air Quality Management Area there.	**3/2/ 1**[20]

19 Depending on extent of impact and relative importance of site

20 Depends on type of development and its potential impact on air quality. Could be a major constraint to building a parkway station, but little constraint to the route itself

Sustainability Criteria	Description	Status Indicator
Sustainable Consumption and Production		
Minerals planning areas	Minerals planning authorities are local authorities with responsibility for planning control over mineral working. Amongst their various duties are the identification of suitable locations for the winning and working of minerals and associated development. MPAs may also be waste planning authorities, responsible for the land use planning of facilities for the management of all forms of waste. All proposals for allocating land for minerals purposes are required to be included on an OS-based proposals map. Such sites are generally safeguarded from development. In addition, specific consultation areas are defined in order to ensure consultation between the relevant MPA, the minerals industry and others before certain non-mineral planning applications are made within the area.	**2**
Waste planning areas	Waste planning authorities are expected to plan for and consent the necessary number and range of facilities to support sustainable waste management. Regional planning bodies must also consider provision of waste management in the preparation of regional spatial strategies. Requirements for waste planning are contained in PPS10 (Planning for Sustainable Waste Management). Areas designated for waste management are designated as active or preferred sites in waste local plans.	**2**
Contaminated land Registers (Local Authority Sites)	Part 2A of the Environmental Protection Act 1990 requires local authorities to inspect their areas and identify any contaminated land. Land qualifies for inclusion if it is deemed to pose a risk to an identified sensitive receptor.	**1**

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