

# **High Speed 2 Strategic Alternatives Study**

## **London to West Midlands Rail Alternatives – Update of Economic Appraisal**

**February 2011**

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# Glossary

Abbreviation	Definition
BCR	Benefit Cost Ratio
DECC	Department of Energy and Climate Change
ECML	East Coast Main Line
GDP	Gross Domestic Product
HS2	High Speed 2
IEP	Inter-city Express Programme
MML	Midland Main Line
NATA	New Approach To Appraisal
NMF	Network Modelling Framework
NPV	Net Present Value
PDFH	Passenger Demand Forecasting Handbook
PLD	PLANET Long Distance
PM	PLANET Midlands
PS	PLANET South
PVB	Present Value of Benefits
PVC	Present Value of Costs
RPI	Retail Prices Index
TEE	Transport Economic Efficiency
TPH	Trains per hour
TUBA	Transport User Benefit Analysis
WCML	West Coast Main Line

# 1. Introduction

## 1.1 Background

Atkins was appointed by the Department for Transport (DfT) in August 2009, to consider road and rail improvement alternatives to the High Speed Rail proposition being developed by High Speed Two (HS2) Ltd. The main objective of HS2 Ltd at the time was to consider the case for new high speed services between London and the West Midlands. However, in appraising the HS2 business case, and reaching investment decisions, it was necessary to take into account the case for a range of strategic alternatives to HS2. The study therefore looked at a range of road and rail interventions on the existing networks between London and the West Midlands, to increase both the passenger and freight capabilities in line with forecast demand, as well as bringing down journey times between the two conurbations.

Atkins was subsequently re-engaged by the Department for Transport in October 2010 to update the economic appraisal of the London to West Midlands Strategic Rail Alternatives, to be consistent with the latest assessment of the HS2 scheme by HS2 Ltd. This update of the Strategic Alternatives is the subject of this current report. The road packages from the previous study have not been re-examined as part of this additional work.

## 1.2 Purpose of the Report

This document provides an update to the appraisal of the London to West Midlands Strategic Rail Alternatives. The report outlines the appraisal of the alternatives being considered. It summarises the interventions developed, examines the Capital and Operating Costs, and then details the Economic Appraisal of the Alternatives.

This document should be read in conjunction with the original Atkins Strategic Alternatives Study Report, 'High Speed 2 Strategic Alternatives Study, Strategic Outline Case', March 2010.<sup>1</sup>

## 1.2 Structure of the Report

The remainder of this report is structured in the following manner:

- Section 2 describes the future year baseline, in the absence of any interventions;
- Section 3 outlines the description of packages of potential interventions being examined;
- Section 4 details the results of the demand forecasting of the interventions;
- Section 5 details the Capital and Operating Costs;
- Section 6 details the Economic Appraisal;
- Section 7 summarises the findings of the report and draws out conclusions from the work undertaken.

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<sup>1</sup> <http://www.dft.gov.uk/pgr/rail/pi/highspeedrail/alternativestudy/pdf/strategicoutline.pdf>

## 2. The Future Year Baseline

### 2.1 Introduction

In this section the likely issues on the rail network in future years are outlined. In the original study this was used as a first step towards examining potential interventions. This process was undertaken by constructing an initial view of the rail network, showing likely future schemes and levels of demand. This is effectively a Do-Minimum scenario, and is consistent between this study and the HS2 Ltd. study, to ensure that the strategic alternatives under consideration in this study are examined on a consistent basis with that of the proposed high speed rail line.

The Do-Minimum scenario has been assessed using the PLANET Suite of Models, developed specifically for the HS2 study. The HS2 Ltd. models have been used to ensure consistency between the appraisal of the high speed rail scheme and the proposed rail alternatives.

### 2.2 Supply

In developing the future year Do Minimum scenarios, committed or likely to be committed rail schemes were taken directly from the HS2 Ltd study. These were derived from a number of published sources including the Network Rail Strategic Business Plan, the TfL Business Plan, and the timetable and capacity enhancements included within the DfT's Network Modelling Framework (NMF) to 2019.

In line with the approach taken by HS2 Ltd, in order to achieve consistent forecasts from the Planet model for 2043, some additional ECML capacity was assumed in Scotland to address high forecast levels of crowding. It was also assumed that all WCML Pendolino services would be lengthened to 11 cars. The additional capacity was added in to both 2021 and 2043 models. As a result of these assumptions, forecast WCML crowding levels in 2043 in the do-minimum scenario are somewhat lower than those forecast by HS2 Ltd. This assumed additional capacity may result in some demand, and thus benefits, for the alternative packages potentially being excluded.

No additional uncommitted schemes were incorporated into the models beyond 2019, such that the future year rail networks are assumed to be consistent between 2021 and 2043.

Consistent with the approach taken by HS2 Ltd, a number of schemes were identified for inclusion in the Future Year Do Minimum scenarios. Of particular interest to this study are the following schemes:

- West Coast Main Line – station upgrade at Birmingham New Street and Bletchley re-modelling;
- West Coast Main Line – nine-car Pendolino trains assumed to be lengthened to eleven-cars;
- West Coast Main Line – Inter-City Express Programme capacity increases via new rolling stock; and
- Chiltern Line – capacity increase through train lengthening in the peaks.

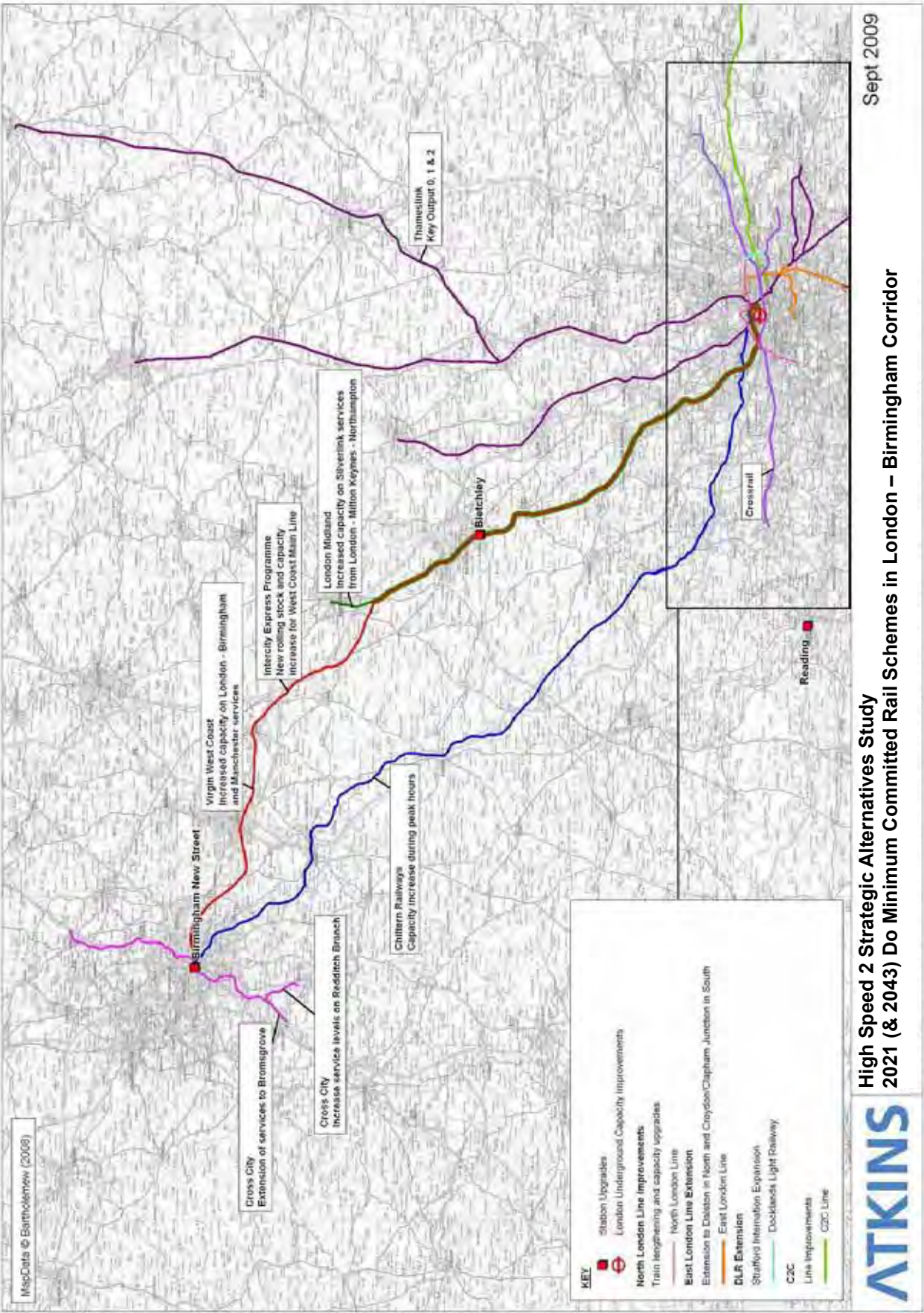
All of the schemes included are shown in Figure 2.1 below.

### 2.3 Passenger Demand

Future year exogenous rail demand growth was input directly into the PLANET Modelling Suite. Exogenous rail demand growth was forecast using the industry standard Passenger Demand Forecasting Handbook (PDFH) 4.1, and recent GDP forecasts that include the impact of the recession. Transport prices and population changes are taken from standard Department for Transport guidance and models.



Figure 2.1 – HS2: 2021 & 2043 Do Minimum Committed Rail Schemes



The overall impact of the application of the exogenous growth is given in Table 2.1 below. This forecast is consistent with that used by HS2 Ltd.

**Table 2.1 – Do Minimum Rail Forecast Demand**

PLANET South <sup>2</sup>	1,549,812	2,408,083	55%
PLANET Midlands <sup>2</sup>	34,436	49,385	43%
PLANET Long Distance <sup>3</sup>	974,804	1,562,615	60%

This shows that strategic demand of over 50 miles, as represented in the PLANET Long Distance model, is forecast to increase significantly, by approximately 60% between 2008 and 2043. Local demand increases are still noteworthy, with growth in PLANET Midlands and PLANET South forecast to be in excess of 40% between 2008 and 2043.

## 2.4 Issues

In order to determine the forecast implications for both passenger volumes and crowding in the London to Birmingham corridor, analysis was undertaken using the latest version of the HS2 Ltd. PLANET Long Distance (PLD) model. Crowding is defined as a proportion of the total passenger numbers to seated capacity.

The PLD model is an all day (16 hour) model. Outputs from the model, showing only WCML long distance services currently operated by Virgin trains are included, while the long distance Chiltern services, ie those going to Banbury or beyond in a northbound direction, or those going from High Wycombe and beyond in a southbound direction, are summarised in Figure 2.2.

The following key observations were noted:

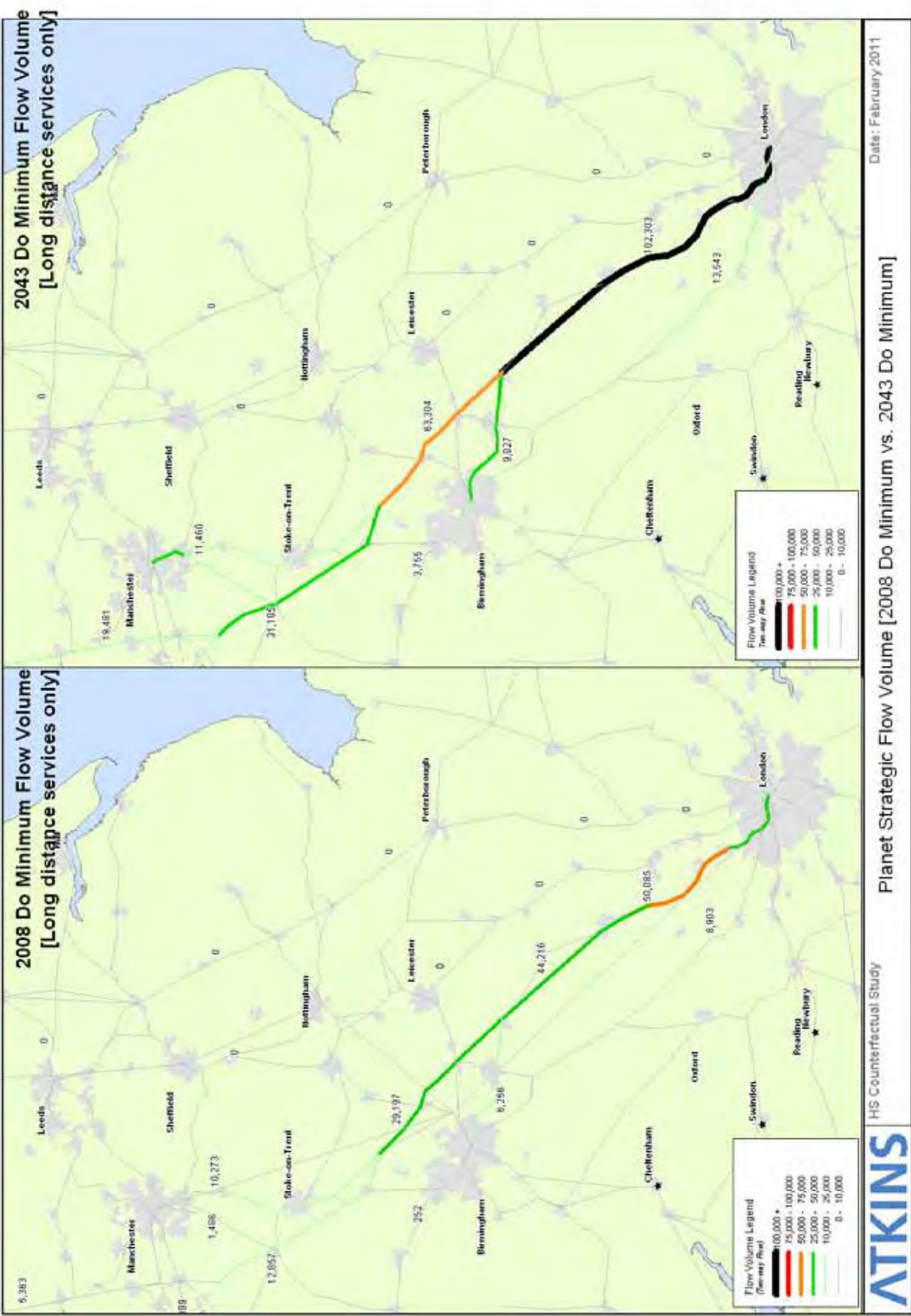
- Demand on the WCML long distance services is forecast to increase by over 100% up to 2043, with forecast (two-way) daily passenger volumes increasing from approximately 50,000 to over 100,000. This is considerably larger than the average rail growth of 60% shown in Table 4.1 above. However, it is noted that the PLD 2007/8 demand on the WCML does not include the effect of the higher service frequencies on some routes in the December 2008 timetable. This has led to a significant increase in trips such that the base year modelled flows on this line are lower than current patronage figures;
- WCML crowding levels on the section into London are forecast to increase from approximately 57% to 68%, which will result in serious crowding throughout the day;
- Passenger demand on the Chiltern line into London is forecast to increase by over 50% between 2008 and 2043 from around 9,000 to 13,500 two way passenger trips; and
- Passenger crowding levels along the Chiltern line are much lower than the WCML, with existing crowding levels on the section into London at approximately 40% in 2008, forecast to grow to 46% in 2043.

<sup>2</sup> Number of trips in 3 hour peak period

<sup>3</sup> Number of trips in 16 hour all day period



Figure 2.2 – HS2: PLD WCML Long Distance & Chiltern Services Rail Passenger Volumes (two way)



## 3. Strategic Interventions

### 3.1 Introduction

Due to the geographic scale of the proposed HS2 route between London and the West Midlands few alternative interventions would be able, on their own, to deliver an equivalent level of functionality, whether in terms of journey time improvements or capacity enhancements. It was therefore considered more appropriate to examine packages of interventions.

This Chapter outlines the process that was undertaken to derive ‘packages’ of interventions. The process effectively involved examining the future year baseline situation, described in the previous chapter, to determine the key issues. A series of individual interventions were then developed that addressed these issues. These interventions were then packaged, and then passed forward for analysis.

### 3.2 The Packages

In this section we detail the rail intervention packages that were taken forward for examination in the remainder of the study, and how they were derived. Full details of this process are given in the documents produced as part of the original study, including the supporting ‘High Speed 2 Strategic Alternatives Study: Rail Intervention Packages’ document, March 2010.

The process resulted in four intervention packages being taken forward for evaluation. These are described in outline, below:

**Table 3.1 – Rail Intervention Packages**

Package	Description
Package 2	Extra long distance capacity delivered by an increase in train service frequencies on the West Coast Main Line with supporting infrastructure enhancements.
Package 3	This assumes that long distance capacity on the WCML has been maximised by Package 2. This Package therefore builds on Package 2 and provides additional long distance capacity on the parallel Chiltern route between London and Birmingham and allows ‘fast’ WCML London – Birmingham trains to be diverted to the Chiltern Line, releasing capacity on the WCML for other services.
Package 4	This package builds on Package 3 and further upgrades the Chiltern Line to reduce London – Birmingham journey times.
Package 5	This package builds on Package 4 and provides additional capacity between Birmingham and Stafford to enable WCML services between London and the North West to be diverted to the Chiltern route, releasing capacity on the WCML for other services.

The packages were designed so that each subsequent package builds on the preceding one. Thus package 3 is package 2, with additional functionality.

The individual interventions in Packages 2 to 5 are shown in the following table.

**Table 3.2 – Intervention Package Components**

Package	Components
Package 2	<p>This package comprises a series of infrastructure enhancements on the West Coast Main Line. These include:</p> <ul style="list-style-type: none"> <li>– Stafford area by-pass;</li> <li>– grade-separation between Cheddington and Leighton Buzzard;</li> <li>– 3 new platforms at Euston Station;</li> <li>– 3 extra platforms at Manchester Piccadilly (with grade-separation at Ardwick);</li> <li>– 4-tracking Attleborough – Brinklow (including freight capacity works at Nuneaton)</li> <li>– Northampton area speed improvements; and</li> <li>– 4-tracking Beechwood Tunnel to Stechford</li> </ul>
Package 3	<p>This package comprises the same infrastructure enhancements on the West Coast Main Line as in Package 2, with the exception of the 4-tracking of Beechwood Tunnel to Stechford.</p> <p>In addition it comprises the following enhancements on the Chiltern Line:</p> <ul style="list-style-type: none"> <li>– electrification throughout;</li> <li>– line speed increase to 125 mph maximum;</li> <li>– provision of extra platforms at Birmingham Moor Street;</li> <li>– Kenilworth (Leamington – Coventry) track doubling;</li> <li>– 4-tracking Tyseley – Dorridge;</li> <li>– extended (freight) loop at Fenny Compton;</li> <li>– Banbury by-pass line;</li> <li>– improvements at Princes Risborough;</li> <li>– new 2-track tunnel Saunderton – Seer Green (avoiding High Wycombe);</li> <li>– 4-tracking Seer Green – South Ruislip (Northolt Junction);</li> <li>– 2-tracking South Ruislip – Paddington (via Park Royal and Old Oak Common)</li> </ul>
Package 4	<p>This package includes the same WCML enhancements as Package 3, plus:</p> <ul style="list-style-type: none"> <li>– new 2 track alignment from Berkswell to the Chiltern Line near Harbury including a Parkway station South of Coventry</li> <li>– 4-tracking Berkswell-Stechford; and,</li> <li>– extra platforms at Birmingham Moor Street (served by the WCML route).</li> </ul> <p>On the Chiltern line the enhancements are the same as in Package 3, with the exclusion of 4-tracking Tyseley-Dorridge, 2-tracking Kenilworth-Coventry and provision of extra platforms at Birmingham Moor Street (served by the Chiltern route).</p>
Package 5	<p>This package builds on Package 4. On the WCML it has the same infrastructure enhancements. On the Chiltern Line, it has the same infrastructure enhancements, plus:</p> <ul style="list-style-type: none"> <li>– 4-tracking the remainder of the route;</li> <li>– grade-separation of Aston Junction; and</li> <li>– 4-tracking Aston – Stafford (via Bescot, Wolverhampton avoiding line, and Penkridge).</li> </ul>

## 3.3 Package Deliverables

An outline description of each of the rail packages that were assessed in detail is provided in the following section. The packages are unchanged from the previous report. The objectives for each package were to provide increased passenger capacity to accommodate forecast growth in demand and, where possible, to reduce journey times. The indicative train service patterns assumed for the modelling of each package are represented diagrammatically in Appendix A.

### 3.3.1 Package Two

Package 2 assumes that the train service frequency on the WCML “fast” lines is increased as far as possible without the provision of six tracks. This is assumed to provide 16 trains per hour (tph) over the busiest section of the WCML: Euston – Ledburn Junction (just south of Leighton Buzzard) (equating to a capacity utilisation of some 80%), with the following assumed service specification:

- Standard hour timetable;
- Euston – Manchester: 4 tph “fasts”;
- Euston – Birmingham: 4 tph “fasts”;
- Euston – Liverpool: 3 “fast” trains every 2 hours;
- Euston – Glasgow: 3 trains every 2 hours;
- Euston – Chester/North Wales 1tph;
- Euston – Milton Keynes – Northampton – Rugby: 4tph (fast):
  - 2 tph extended to Birmingham New Street;
  - 1 tph terminating at Rugby; and
  - 1 tph extended to serve stations along the Trent Valley route.

### 3.3.2 Package Three

Package 2 is assumed to result in the WCML fast lines operating at maximum capacity. In Package 3, in order to free up additional WCML capacity, the ‘fast’ WCML services between London and Birmingham are diverted onto the Chiltern route. Three WCML paths per hour are assumed to be released to provide other services.

The train service assumed on the WCML in Package 3 is similar to Package 2, with the exception of the following:

- Euston – Birmingham services diverted to the Chiltern Paddington – Birmingham route;
- Euston – Liverpool service frequency increased to 2 tph “fasts”;
- Euston – Glasgow service frequency increased to 2 tph “fasts”; and
- Euston – Warrington stopping service (new) 1 tph.

This package includes infrastructure enhancements to enable the Chiltern route to maintain existing London – West Midlands journey times, safeguarding existing benefits for passengers.

As the Chiltern route North of Aynho is a main route for freight, two paths per hour in each direction were assumed to be reserved for freight services.

### 3.3.3 Package Four

This package builds on Package 3. It assumes similar WCML “fast” line services with Euston – Milton Keynes – Northampton services extended to Birmingham with improved journey times.

Further infrastructure enhancements enable additional journey time reductions for Paddington – Birmingham services with journey times of between 61-65 mins.

### 3.3.4 Package Five

Package 5 builds on Package 4 and assumes that, with enhancements to the route between Birmingham and Stafford, further long distance WCML services to and from the North West could be diverted to the Chiltern route releasing further capacity on the WCML.

Some of the engineering and environmental challenges associated with Package 5 remain unresolved. The total cost for implementation of this Package is therefore uncertain, and deliverability is at risk.

### 3.3.5 Summary of Journey Time Impacts

In assessing the potential of each package to deliver benefits through reduced journey times, it was noted that there were three main possible ways in which such reductions might be achieved.

Firstly, certain of the infrastructure enhancements required to deliver additional capacity are also capable of delivering journey time reductions through line speed improvements, such as at Ledburn Junction. Secondly, the improved reliability of the enhanced infrastructure and the extra capacity it generates might enable a reduction in the time allowed within current timetables for recovery from delays, such as from the doubling of Beechwood Tunnel (Coventry) to Stechford (Birmingham). Thirdly, some of the indicative train service specifications are based on having a higher train frequency which can be used to reduce the average typical number of stops per train – typically improving journey times for through passengers by around four/ five minutes per stop omitted, such as in package 3 where London – Birmingham Moor Street trains are assumed to run non-stop. No journey time savings were assumed to arise from new rolling stock or possible future use of in-cab signalling.

The table below gives an illustration of the typical journey time savings which could arise these factors and which were included, as appropriate, in the PLANET modelling of each of the packages:

**Table 3.3 – Typical Journey Time Savings (in minutes)**

Rail Service Group	Reference Case Journey Time	Time Saving over Reference Case due to:		
		Infrastructure Enhancement	Increased Train Frequency	Reduced Timetable Contingency
London – Birmingham New Street (package 2)	85	1	9	2
London – Birmingham New Street (package 2A)	85	1	9	0
London – Birmingham Moor Street (package 3)	85	12		2
London – Birmingham New Street (packages 4 & 5)	85	18/19		2
London – Manchester via Wilmslow	128	3/3.5		3

## 3.4 Additional Rail Packages

Following the assessments of the initial four packages in the original study, Packages 2 and 3 were revised and subject to further assessment as described below.

### 3.4.1 Package 2A

To underpin train service reliability, which is strongly valued by passengers, the current WCML public timetable includes additional journey time to assist recovery from delays and incidents. In the modelling of Package 2, this element was removed from the journey times for services on the WCML.

In order to assess the effect of retaining this additional time with a view to safeguarding reliability, particularly in light of the high level of capacity utilisation in the package, a variation of Package 2, Package 2A, was modelled in which no journey time savings from these sources were assumed. For example in Package 2A the typical journey time saving between Euston and Manchester (via Wilmslow) was 3.5 minutes, compared to 6.5 minutes assumed in Package 2.

### 3.4.2 Package 3A

In order to consider the case for enhancements to the Chiltern route without further enhancements of the WCML, a revised version of Package 3, Package 3A, was developed which excluded WCML infrastructure works.

The assumed train service specification included the diversion of fast London – Birmingham services from the WCML to the Chiltern route, releasing capacity on the WCML to allow the operation of additional services. This is shown diagrammatically in Appendix A. In order to be consistent with Package 2A, no reductions to WCML journey times were assumed through removal of existing public timetable contingency time.

The assumed train service on the WCML in Package 3A is similar to Package 3, with the exception of the following:



- Euston – Liverpool frequency 1 tph “fasts” with 2 additional peak hour trains;
- Warrington – Liverpool hourly shuttle service; and
- Euston – Glasgow frequency increased to 1 tph “fasts” with the Euston – Lancaster service extended to Glasgow 3 times a day.

## 4. Demand Forecasting

### 4.1 Introduction

The packages were assessed using the PLANET Suite of Models, developed specifically for the HS2 Ltd study. The HS2 Ltd models have been used to ensure consistency between the appraisal of the proposed high speed rail route between London and the West Midlands and the identified rail alternative packages.

This chapter describes the demand forecasting undertaken for the six alternatives packages previously described.

## 4.2 Modelling of Rail Packages

### 4.2.1 Introduction

The timetables associated with the six alternative packages were coded into the PLANET model and run for the years 2021 and 2043.

This section shows the change in demand associated with the six rail packages, and then highlights the impact of the packages on capacity and crowding on the major routes under consideration.

### 4.2.2 Impact on Demand

The 2043 total modal transfer and the number of generated rail trips that are estimated to occur as a result of the proposed rail interventions, is summarised in Table 4.1 below.

**Table 4.1 – Estimated 2043 Modal Transfer & Rail Trip Generation (trips per day)**

	<b>Modal Transfer from Air</b>	<b>Modal Transfer from Highway</b>	<b>Generated Rail Trips</b>	<b>Total Additional Rail Trips</b>
Package 2	2,166	3,219	11,607	16,993
Package 2A	1,755	2,799	10,101	14,655
Package 3	2,842	3,599	12,307	18,748
Package 3A	1,154	2,858	7,837	11,849
Package 4	2,799	5,003	14,930	22,732
Package 5	2,822	5,232	14,500	22,554

Table 4.1 shows that as the packages progress from Package 2 to Package 5 more additional rail trips are generated, as would be expected as the packages increment on each other. It also shows that there are significantly fewer additional trips in Package 3A than in the other packages. This is to be expected as Package 3A offers the least amount of new train services (if measured in terms of train miles) out of all the packages. Similarly, fewer trips are generated in Package 2A than in Package 2, as would be expected as lower journey time savings would arise.

### 4.2.3 Summary of Capacity and Crowding Impacts

As a result of assessing each of the packages in the PLANET demand model, forecast additional capacity and crowding levels on long distance WCML and long distance Chiltern line services to and from London were obtained. Long distance WCML services include those that are currently operated by Virgin Trains, while the long distance Chiltern services include those going to Banbury or beyond in a northbound direction, or High Wycombe and beyond in a southbound direction. A summary of the impact on capacity and crowding is given in table 4.2 below.

**Table 4.2 – Forecast Capacity & Crowding Impacts, 2043**

<b>Rail Package</b>	<b>Long distance seated capacity (16 hour two way) to/from London WCML &amp; Chiltern combined</b>	<b>% increase in seated capacity over Reference Case WCML &amp; Chiltern combined</b>	<b>WCML 2043 load factor approaching London (16 hour two way) (% seats)</b>	<b>Chiltern 2043 load factor approaching London (16 hour two way) (% seats)</b>
Reference Case	181,100	–	68	46
Package 2	253,500	40	55	44
Package 2A	253,500	40	55	44
Package 3	291,300	61	51	42
Package 3A	258,200	43	58	42
Package 4	291,300	61	45	33
Package 5	329,100	82	47	28

The modelling shows that the packages could provide additional long distance passenger capacity on the WCML and Chiltern routes ranging from around 40% to 80% of seated capacity to and from London – depending on the package concerned.

Modelling also shows that by 2043, in each of the packages (with the exception of Package 3A which does not provide additional capacity on the WCML) the all day load factor on WCML services to and from London is forecast to be approximately 45 – 55%. By comparison, if no further enhancements above those already assumed to be committed are undertaken on the WCML or the Chiltern routes, as assumed in the Do Minimum scenario, all day load factors are forecast to increase to 68% on the southern section of the WCML and 46% on the southern section of the Chiltern route.

## 5. Capital and Operating Costs

### 5.1 Introduction

The estimated costs of the packages are detailed in this section to inform the economic appraisal. These costs are at an order of magnitude level due to the early stage of development of the interventions. Should any of the proposals be progressed the cost estimates would be refined as the packages progress through the design process.

The cost estimates have been prepared by cost consultants, Faithful and Gould, who are part of the Atkins group of companies.

### 5.2 Capital Costs

#### 5.2.1 Methodology

The high level capital cost estimates presented have been developed using a model containing a series of high level unit rates, consistent with those used by HS2 Ltd, to determine the costs for each location within each package. The unit rates are grouped into the main elements of work, namely:

- Trackwork alterations and new work including renewals, realignment of track and turn outs, and provision of new track, grade-separated crossings or loops;
- Structural alterations to bridges, viaducts, tunnels, roads, etc.
- Signalling alterations including reconfiguring, repositioning and associated work including telecoms;
- Power and Electrification alterations to suit, including realignment, plus new power requirements as appropriate; and,
- Platform extensions, alterations and associated and consequential work.

To the base costs a series of percentage additions have been applied for management and project on-costs to arrive at a total 'all in' scheme cost per location. These location costs have then been summarised into a cost per package.

In preparing cost estimates, a benchmarking exercise has been carried out in tandem to validate the unit rates, with the outturn costs of other comparable route improvement schemes.

#### 5.2.2 Estimate Parameters

To determine the work necessary at each location to accommodate that particular package, workshops were held with DfT. For each package the extent of work was determined, broken down into the following key elements of work:

- Trackwork;
- Structures;
- Electrification (Traction Power systems);
- Signalling, telecoms and control systems;
- Buildings, including platforms;
- Other electrical and mechanical systems; and,
- Contractors' preliminaries, and other project on-costs.

Beneath this level the main components of the physical works associated with the scheme itself are broken down.

The elements listed above are then linked to a unit rates file, and quantified to produce an overall base construction cost.

The template established also makes provision for the addition of other indirect costs associated with the management and execution of the works, namely:

- The cost of procuring or leasing land, as necessary, for either the permanent works or temporary requirements;
- Ancillary costs, including environmental works and landscaping;
- Provision of main power substations and enhancements to the national grid (as considered necessary);
- Design, Project Management and other fees, during implementation; and,
- Optimism Bias.

At this stage the majority of the items listed above have been determined on the basis of an applied percentage. Of these the largest item is Optimism Bias, which has been applied at 66% of the overall costs, to reflect this early stage in the project development. This is consistent with HM Treasury's Green Book guidance.

### 5.2.3 Estimate Exclusions

Whilst at this stage of the project development there remain a number of gaps in the information necessary to populate the capital cost in detail in all areas, we have endeavoured to make the estimate as complete as possible, minimising the number of excluded items. Those exclusions that do remain are detailed below:

- Potential property development, income or resale value;
- Local taxes;
- Development costs expended by the client to date;
- Costs associated with the client team including its duties, accommodation and services;
- Financing charges associated with borrowing or raising funds; and
- Future inflation to the implementation phase (Costs are based at Average 2009 prices).

### 5.2.4 Estimating Assumptions

At this stage of the scheme development a number of high level assumptions have had to be made with regard to estimate content, both in terms of quantities of work and the rates applied to them. These can be summarised as follows, and should also be read in conjunction with the estimate exclusions detailed above:

- All construction, maintenance and renewal prices are based at a common base date of an Average 2009 price;
- No consideration has been taken for any cost effect in programming and procurement arrangements and planning;
- Track work by location has been determined by desk top studies;
- The related structural works have been assumed to be kept to the minimum;

- Signalling works are assumed to be kept to a minimum and relate to moving and repositioning only, without major area reconfiguration or central control alteration;
- It is assumed that existing power supplies will need upgrading for the new infrastructure. These were assumed at 10% of the construction cost of Package 2, including optimism bias. An additional £50m was factored into Package 5 for power costs;
- A further allowance of 10% of the construction cost of Package 2 was added to each package to account for other potential works on the WCML necessary to mitigate risks to operational performance arising from the high level of capacity utilisation proposed. For Package 5 this figure was increased by an additional 50%; and
- No costs have been assumed for unplanned disruption although experience with the West Coast Route Modernisation project and other schemes shows that this represents a significant risk. Over the Christmas/New Year period in 2008, works at Rugby over-ran by 2 days leading to severe disruption to passengers and freight customers.

If the schemes are progressed, and the estimates are developed further, then these assumptions will be challenged and addressed, although it is likely that a number of more detailed assumptions will still be required.

## 5.2.5 Capital Cost Estimate

The detailed capital cost estimate is given in Appendix C, broken down by package. A summary of the total capital cost of the three rail scenarios are given in Table 5.1 below.

**Table 5.1 – Capital Costs of Interventions (excluding rolling stock) (£ millions, Average 2009)**

Package	Total Cost (£, millions)
Package 2	3,619
Package 2A	3,619
Package 3	12,272
Package 3A	9,306
Package 4	14,892
Package 5	19,466

## 5.3 Rolling Stock

There are alternatives as to whether the rolling stock requirements for the six packages would be purchased, and thus treated as a capital cost in the appraisal, or leased, and thus incorporated into the operating costs. In implementing conventional improvement schemes of this nature the rolling stock is almost always leased, as it involves small numbers of additional trains being added to existing fleets. In this work, therefore, the central case figures assume that rolling stock is leased.

In the HS2 Ltd work, however, the rolling stock is assumed to be purchased, and thus is treated as a capital cost. We have therefore also produced figures where the rolling stock is assumed to be purchased so that a direct comparison with HS2 Ltd's analysis can be made.

The assumed capital costs of rolling stock were provided to Atkins by the Department for Transport.

The wider assumptions relating to the purchase of the rolling stock are consistent with those of HS2 Ltd, as follows:



- The initial investment costs were spread equally over a five year period prior to the package being implemented;
- All rolling stock is assumed to have a lifecycle of 35 years; and
- Optimism bias is added to the initial purchase cost at a rate of 18%, consistent with HS2 Ltd's assumptions.

The capital cost of purchasing rolling stock for the first time is given in Table 5.2 below.

**Table 5.2 – Capital Costs of Purchasing Rolling Stock for the first time (2009)**

<b>Package</b>	<b>Total Cost (£, millions)</b>
Package 2	1,142
Package 2A	1,142
Package 3	1,477
Package 3A	1,094
Package 4	1,559
Package 5	1,955

## 5.4 Operating Costs

Rail operating costs were estimated for each of the packages on an incremental basis. An estimate was made of the base costs for operating the West Coast Main Line and Chiltern Lines, in the Reference Case and in each of the packages. The difference between the Package cost and the Reference Case cost was the figure carried forward to the appraisal.

The operating costs only included the variable elements of operating costs, as follows:

- Rolling Stock Lease charges;
- Variable Track Access charges;
- Electricity and Diesel Fuel costs;
- Lease costs of Rolling Stock;
- Staff costs, based on £ per train set;
- Insurance;
- Variable Overheads/Administration costs; and
- Rolling Stock maintenance.

The assumptions underlying the estimation of the operating costs were consistent with those used by HS2 Ltd. These include:

- Staff costs used were current UK long distance operators' typical working hours, practices and costs.
- Electricity costs were assumed to grow in line with the 2010 DECC electricity price index, equating to 91% growth in between 2010 and 2030 (with no further growth in later years)
- An Optimism Bias allowance of 41% was applied to all operating costs consistent with the approach taken by HS2 Ltd..

Lease cost assumptions for rolling stock were provided by the Department for Transport.

The incremental operating costs for each of the rail packages are given in 2009 prices, in the table below.

**Table 5.3 – Operating Costs, where rolling stock is leased, £ millions, per annum**

<b>Package</b>	<b>Total Cost (£, millions per annum)</b>
Package 2	295
Package 2A	295
Package 3	408
Package 3A	288
Package 4	431
Package 5	555

The element of the annual operating costs that is related to the cost of leasing rolling stock for each of the six packages is given in the table below.

**Table 5.4 – Costs of leasing rolling stock, £ millions, per annum**

<b>Package</b>	<b>Total Cost (£, millions per annum)</b>
Package 2	135
Package 2A	135
Package 3	174
Package 3A	129
Package 4	184
Package 5	230

Under a scenario where rolling stock is purchased, therefore, the annual operating costs for each of the six packages is the total annual costs (given in Table 5.3) minus the lease costs (given in Table 5.4). These costs are given in the table below.

**Table 5.5 – Cost of Operations without rolling stock lease charges, £ millions, per annum**

<b>Package</b>	<b>Total Cost (£, millions per annum)</b>
Package 2	160
Package 2A	160
Package 3	234
Package 3A	159
Package 4	248
Package 5	325

## 6. Economic Appraisal

### 6.1 Overview

This section presents the results of the economic appraisal for the identified packages of rail interventions, focusing on the benefits that would be generated for users and transport providers as a result of the interventions, and the costs associated with their provision. For each set of interventions, the following information is presented:

- Derivation of Scheme Costs, which describes the methodology for converting base costs into a present value of costs used in the economic appraisal;
- Derivation of Scheme Benefits, which provides a summary of the modelling packages used to assess the impact of the interventions, and the appraisal tools used to generate the present value of benefits; and
- Summary of Results, which presents summary economic statistics (PVB, PVC, NPV and BCR) for each of the six packages of interventions.

### 6.2 Derivation of Scheme Costs

#### 6.2.1 Introduction

The costs associated with the packages of schemes are described in more detail in Chapter 5 of this document. This section below highlights how these costs were converted into a present value of costs for use in the economic appraisal.

#### 6.2.2 Capital Costs

NATA-based economic appraisal requires realistic and accurate scheme costs to be produced. The costs of transport schemes are an integral component of the scheme appraisal process, particularly where they are subsequently used to form decisions on scheme funding.

There are three main elements of a scheme cost estimate:

- The base cost, which is the basic cost of a scheme before allowing for risks;
- Adjustment for risk and optimism bias, which should cover all the risks that can be identified, and reflect the well-established and continuing systemic bias for estimated scheme costs and delivery times to be too low and too short respectively, and results in the risk and optimism bias-adjusted cost estimate.

Capital infrastructure costs for the six packages of rail-based interventions are presented in Table 6.1. These represent undiscounted real capital costs, in 2009 prices, expressed in factor cost unit of account. The costs do not include an allowance for future inflation, to be consistent with the approach of HS2 Ltd.

**Table 6.1 – Undiscounted Real Scheme Capital Costs (£m, Average 2009 prices and values)**

	Base Costs	Risk and Optimism Bias	Total Scheme Costs
Package 2	2,180	1,439	3,619
Package 2A	2,180	1,439	3,619
Package 3	7,393	4,879	12,272
Package 3A	5,606	3,700	9,306
Package 4	8,971	5,921	14,892
Package 5	11,727	7,740	19,466

In order to be consistent with the appraisal assumptions of HS2 Ltd., we have also examined a scenario whereby the rolling stock fleet required to operate each package would be purchased. These costs are presented in Table 6.2. In accordance with the approach taken by HS2 Ltd, it is assumed the rolling stock fleet would be replaced every 35 years. A further allowance is included to account for the re-furbishment of the rolling stock, approximately every 18 years.

**Table 6.2 – Undiscounted Real Scheme Capital Cost of Rolling Stock (£m, Average 2009 prices and values)**

Package 2	3,046
Package 2A	3,046
Package 3	3,938
Package 3A	2,917
Package 4	4,158
Package 5	5,212

Table 6.3 presents the scheme capital costs, including both infrastructure work and rolling stock.

**Table 6.3 – Undiscounted Real Scheme Capital Costs (£m, Average 2009 prices and values)**

Package 2	6,665
Package 2A	6,665
Package 3	16,210
Package 3A	12,223
Package 4	19,050
Package 5	24,679

### 6.2.3 Operating Costs

The assumptions underpinning the calculation of base operating costs are set out in Chapter 5. This section presents the operating costs included in the economic appraisal, which form part of the overall PVC for each package of rail options, summarised in Tables 6.4 and 6.5 below.

**Table 6.4 – Undiscounted Real Rail Operating Costs included in the Economic Appraisal when Rolling Stock is Assumed to be Leased (£m, 2009, over 60 year appraisal period)**

Package 2	30,601
Package 2A	30,601
Package 3	43,008
Package 3A	30,022
Package 4	45,509
Package 5	58,933

In order to understand the impact of alternative rolling stock procurement arrangements, the economic analysis was also undertaken assuming that the additional rolling stock was purchased. Under this scenario, the operating costs without the rolling stock charges, are summarised in Table 6.5.

**Table 6.5 – Undiscounted Real Rail Operating Costs included in the Economic Appraisal when Rolling Stock is assumed to be a Capital Cost (£m, 2009, over 60 year appraisal period)**

Package 2	17,917
Package 2A	17,917
Package 3	26,665
Package 3A	17,866
Package 4	28,259
Package 5	37,358

## 6.3 Derivation of Scheme Benefits

### 6.3.1 Modelling of Rail Packages

The rail packages were assessed using the PLANET framework model, adopting identical assessment parameters to those of HS2 Ltd. This ensured that the approach to the assessment of the Strategic Alternative rail packages was consistent with that of the assessment of HS2.

Model runs were undertaken for both 2021 and 2043, and an economic appraisal undertaken consistent with the approach taken by HS2 Ltd.

### 6.3.2 Economic Appraisal of the Rail Packages

The economic appraisal of rail packages has been undertaken using a bespoke spreadsheet model, using outputs from the PLANET Strategic model in conjunction with economic parameters and formulae contained in the DfT's WebTAG Unit 3.5.6. The spreadsheet is based on conventional consumer surplus theory and is therefore consistent with the TUBA methodology recommended by DfT and used on the appraisal of rail-based packages described above.

The appraisal is based on the same 60-year appraisal period as for HS2 Ltd and we have assumed that the infrastructure works in the packages are completed for opening in 2026. Annualisation factors ensure that all 8,760 hours of the year are represented.

Summary economic statistics, assuming the rolling stock is included as a lease cost are presented in Table 6.6 for all six rail packages. The full TEE tables for each package are presented in **Appendix B**.

**Table 6.6 – Economic Summary Statistics – Assuming Rolling Stock is Leased**  
(£m, 2009 prices & values, 60 year appraisal period)

<b>Economic Summary Statistic</b>	<b>PVB</b>	<b>PVC</b>	<b>NPV</b>	<b>BCR</b>
Package 2	5,979	4,725	1,255	1.3
Package 2A	5,218	5,258	-40	1
Package 3	5,544	13,621	-8,077	0.4
Package 3A	3,273	10,345	-7,072	0.3
Package 4	5,738	16,098	-10,360	0.4
Package 5	6,233	22,952	-16,719	0.3

The range of benefits for each of the rail packages appears appropriate. Packages 3 to 5 build upon the WCML capacity enhancements provided in Package 2, providing additional capacity by diverting long distance WCML services onto the Chiltern Line. Between Packages 2 and 3 the overall level of benefits falls despite the additional capacity provision. This is due to the additional capacity benefits being offset by disbenefits associated with the lack of accessibility of Paddington Station compared to Euston Station. There are also wait time disbenefits in Package 3 compared to Package 2, as 4 tph to Birmingham from Euston Station in Package 2 is replaced by 2tph from Paddington and 2 tph from Euston in Package 3. Packages 4 and 5 take the additional capacity provided on the Chiltern Line in Package 3 as a starting point, with benefits then increasing accordingly.

The results in Table 6.6 show that packages 3 to 5 have negative Net Present Values and Benefit to Cost Ratios of less than one, thus representing poor value for money schemes. Package 2, has a Benefit to Cost Ratio of 1.3 and can thus be categorised as a 'low' value for money scheme – however the risk of poor train service reliability, due to the removal of timetabling allowances, is not quantified in the appraisal. Package 2A which retains timetabling allowances to safeguard reliability, is forecast to have a Benefit to Cost Ratio of 1 making this a "low" value for money scheme.

The economic results for the scenario whereby the rolling stock is assumed to be purchased are summarised in Table 6.7.



**Table 6.7 – Economic Summary Statistics – Assuming Rolling Stock is Purchased (£m, 2009 prices & values, 60 year appraisal period)**

<b>Economic Summary Statistic</b>	<b>PVB</b>	<b>PVC</b>	<b>NPV</b>	<b>BCR</b>
Package 2	5,979	3,155	2,824	1.9
Package 2A	5,218	3,688	1,529	1.4
Package 3	5,544	11,605	-6,060	0.5
Package 3A	3,273	8,841	-5,568	0.4
Package 4	5,738	13,971	-8,233	0.4
Package 5	6,233	20,297	-14,063	0.3

The effect of assuming that the rolling stock is purchased is to decrease the present value of costs. This means that under this scenario, the BCRs for the rail packages are higher than when the rolling stock is assumed to be leased. However, rolling stock leasing reduces the initial capital outlay of the packages and hence improves affordability.

Table 6.7 shows that Packages 3 to 5 have BCRs less than one, so they would be categorised as 'poor' value for money schemes. In Package 2, the BCR is forecast to be 1.9, making this a 'medium' value for money scheme – however the risk of poor train service reliability due to the removal of timetabling allowances is not quantified in the appraisal. Package 2A, which retains timetabling allowances to safeguard reliability, is forecast to have a BCR of 1.4, making this a "low" value for money scheme.

## 7. Summary and Conclusions

### 7.1 The Packages

Six conventional rail upgrade packages were identified as Strategic Alternatives to the High Speed 2 London – West Midlands route proposition. The main four packages were largely incremental, with each subsequent package building upon the preceding one.

### 7.2 Package 2

Packages 2 and 2A show that with infrastructure investment (in the region of £3.6 billion) the capacity of the West Coast Main Line could potentially be enhanced. Subject to further engineering and capacity modelling, it could be possible to operate an additional five trains per hour (tph) in a standard off-peak hour, resulting in a total of 16 tph into/out of Euston.

Both packages could have an impact on journey times. In Package 2, journey times to Manchester are forecast to decrease by 6.5 minutes. Journey times to Birmingham are forecast to decrease by approximately 12 minutes – primarily as a result of serving fewer intermediate stations.

Depending on the assumptions made in relation to rolling stock procurement, this package has an indicative Benefit to Cost Ratio (BCR) of between 1.3 and 1.9. – however the risk of poor train service reliability due to the removal of timetabling allowances is not quantified in the appraisal.

Package 2A, which retains timetabling allowances to safeguard reliability but delivers lower journey time savings, has a BCR of between 1 and 1.4 depending on rolling stock procurement assumptions

The works would be disruptive to passengers. The extent of this depends on the scheme design and the scope of staging works, and has not been assessed in detail at this stage.

### 7.3 Package 3

With significant investment on the Chiltern Line, in addition to the WCML investment in Package 2, it could be possible to operate the 3 trains per hour (previously WCML) London to West Midlands services on the Chiltern route. The infrastructure works for this package are forecast to cost in the region of £12.3 billion, and could release up to three London to North West paths on the WCML.

Although the investment would electrify the Chiltern route, and provide additional capacity, it would not significantly further reduce journey times between London and the West Midlands/North West.

Depending on the assumptions made in relation to rolling stock procurement this package has an indicative BCR of between 0.4 and 0.5.

The works would be disruptive to passengers. The extent of this depends on the scheme design and the scope of staging works, and has not been assessed in detail at this stage.

The cost of Package 3A, which considers the case for enhancements to the Chiltern route without further enhancements of the WCML, is approximately 30% less than that of Package 3. Depending on the assumptions made in relation to rolling stock procurement whilst retaining timetabling contingency to assist recovery from delays and incidents results in Package 3A having an indicative BCR of between 0.3 and 0.4.

## 7.4 Package 4

Package 4 assumes further works on the Chiltern Line between London and the West Midlands, in an attempt to further improve the journey times to the West Midlands. It includes a number of additional infrastructure schemes, and is forecast to cost in the region of £14.9 billion.

In this package it could be possible to reduce the journey time between London and Birmingham to around 64 minutes, assuming a single stop. Typical journey times to Manchester remain as in Packages 2 and 3.

Depending on the assumptions made in relation to rolling stock procurement this package has an indicative BCR of around 0.4.

The works would be disruptive to passengers. The extent of this depends on the scheme design and the scope of staging works, and has not been assessed in detail at this stage.

## 7.5 Package 5

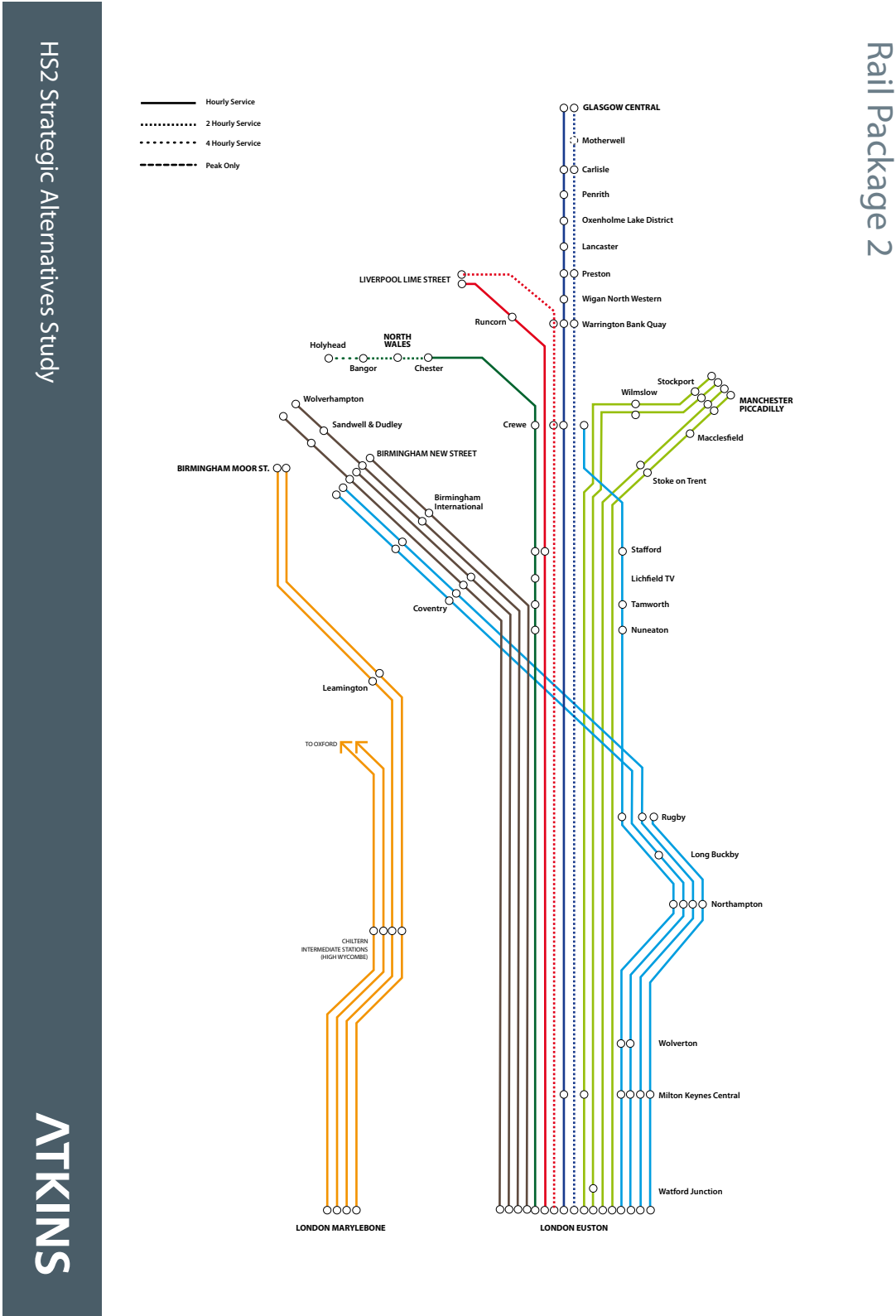
Package 5 involves additional infrastructure works to enable the Chiltern Lines to become an alternative to the West Coast Main Line as far North as Stafford. This package could cost in the region of £19.5 billion, but may not be deliverable in engineering or operational terms. A considerable amount of additional work would be required to assess whether this option is feasible.

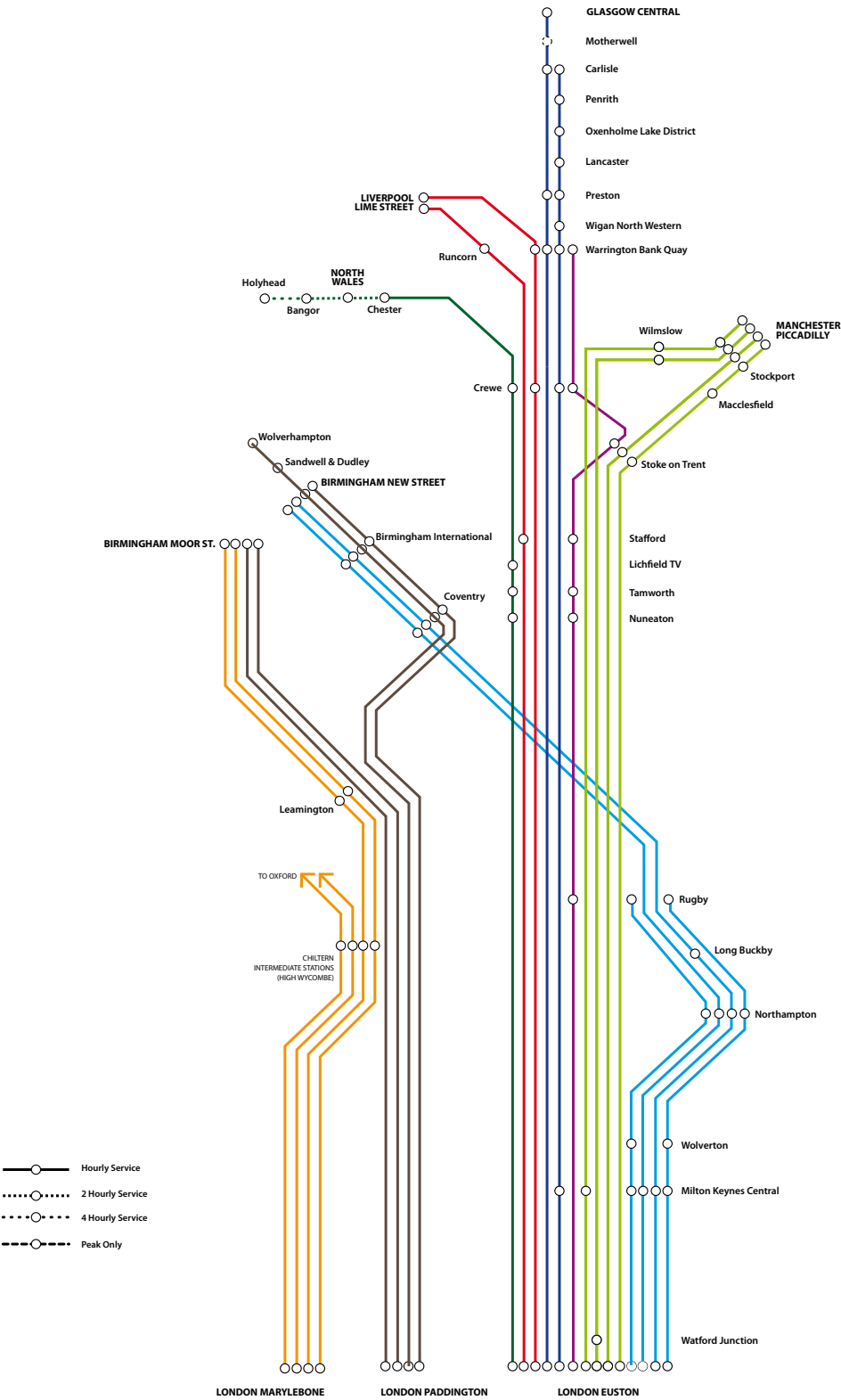
Package 5, if possible to implement, could allow a limited number of extra services (notionally 1 tph to Warrington and 1 extra tph to Manchester) to be operated via the Chiltern Line but the impact on crowding levels would only be marginally greater than in package 4. It would not improve on the journey times achieved in Package 4.

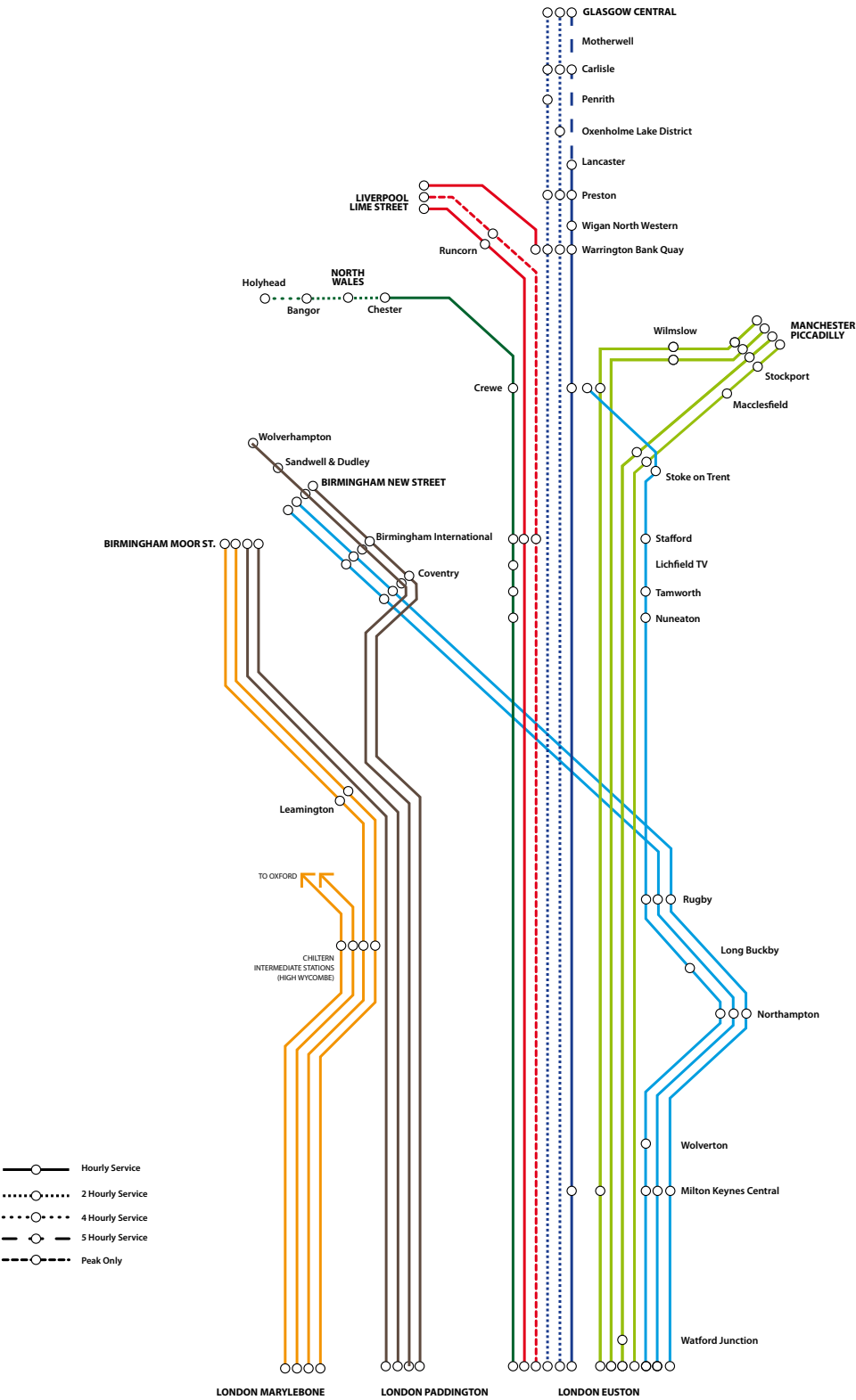
Depending on the assumptions made in relation to rolling stock procurement this package has an indicative BCR of around 0.3.

The works would be disruptive to passengers. The extent of this depends on the scheme design and the scope of staging works, and has not been assessed in detail at this stage.

# Appendix A: Rail Packages modelled train service patterns

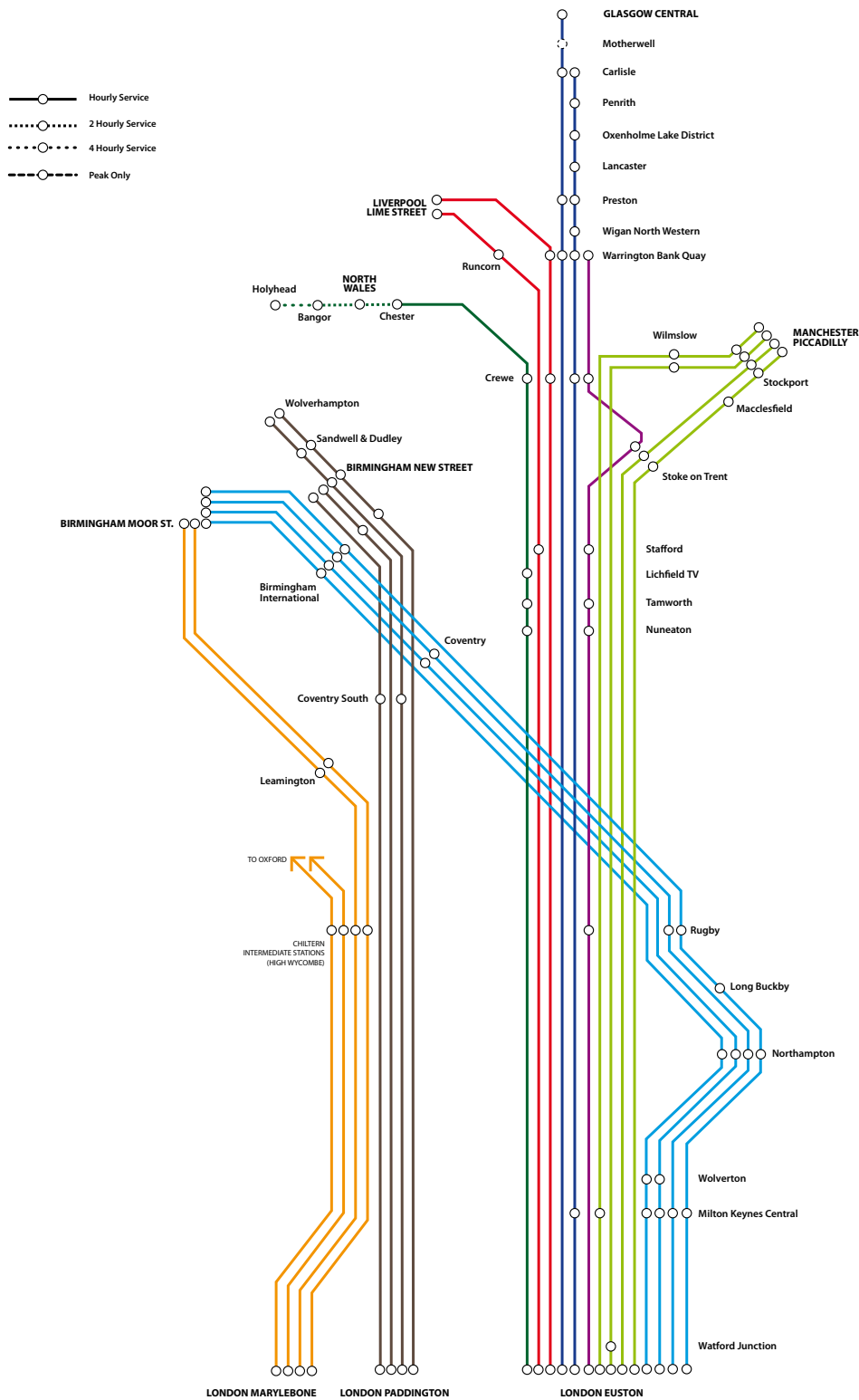








Rail Package 4





## Appendix B:

### TEE Tables (Rail Packages)

TEE/Public Accounts Table	Rail Package 2 – Purchased rolling stock
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**Table 1: Economic Efficiency of Transport System** (£mill, revenues are scored as positives, costs as negatives)

	Total	Road	Classic Rail*	Air
Consumers user benefits				
– travel time saving	3,128	242	2,885	1
– Vehicle opcost	69	69	–	–
– user charges	0	–	0	-0
– during construction & maintenance	–	–	–	–
Net (1)	<b>3,197</b>	311	2,885	1
Business				
User benefits				
– Travel time	3,351	471	2,855	25
– Vehicle opcost	5	5	–	–
– user charges	0	–	0	0
– during construction & maintenance	–	–	–	–
Net (2)	<b>3,356</b>	477	2,855	25
Private sector provider impact				
– revenue	5,779	–	5,779	–
– opcost	-4,886	–	-4,886	–
– investment cost	-4,048	–	-4,048	–
– grant/subsidy	8,934	–	8,934	–
– revenue transfer	-5,779	–	-5,779	–
Sub total (3)	–	–	–	–
Other impacts				
– Developer contribution (4)	<b>0</b>	–	–	–
Net business impact (5 = 2+3+4)	<b>3,356</b>	477	2,855	25
Total, PV of transport econ eff. Benefits (6 = 1+5)	<b>6,554</b>			

Note that subtotals (1) and (5) flow into the AMCB table. Subtotal (6) does not.

**Table 2 Public Accounts** (£mill costs should be recorded as a positive number, surpluses as a negative one)

	<b>All Modes Total</b>	<b>Highway/Air</b>	<b>Rail</b>
Local Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	–	0	0
– Revenue transfer	–	0	0
Net (7)	–	–	–
Central Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs*	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	8,934	0	8,934
– Indirect Tax Revenues (i)	612	22	591
– Revenue transfer	-5,779	0	-5,779
Net (8)	<b>3,768</b>	22	3,746
Total PV of costs (9 =7+8)	<b>3,768</b>		

\*The public sector costs in these boxes should exclude developer contribution e.g. developer contribution is subtracted from these figures to give Net (8)

**Table 3: Analysis of Monetised Costs and Benefits (AMCB)**

	<b>Total</b>	
Noise	2	
Local air quality	4	
Greenhouse gases	–	<i>Excluded due to high level of uncertainty</i>
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	–	
Accidents (incl. safety)	31	
Consumer users (sub-total 1, Table 1)	3,197	
Business users and providers (sub-total 5, Table 1)	3,356	
Reliability (incl. performance & reliability)	–	
Option values	–	
Interchange (station quality and crowding)	–	
<b>PVB (a = sum of all benefits)</b>	<b>6,591</b>	
<b>PVC (b = sub-total 9, Table 2)</b>	<b>3,768</b>	
Overall impact, total		
– NPV (a-b)	2,824	
– BCR (a/b)	1.7	
<b>Revised WebTAG BCR Calculation</b>		
<i>(indirect tax included in PVB rather than PVC)</i>		
<b>PVB (a-i)</b>	<b>5,979</b>	
<b>PVC (b-i)</b>	<b>3,155</b>	
<b>BCR (a-i)/(b-i)</b>	<b>1.9</b>	

TEE/Public Accounts Table	Rail Package 2A – Purchased rolling stock
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**Table 1: Economic Efficiency of Transport System** (£mill, revenues are scored as positives, costs as negatives)

	Total	Road	Classic Rail*	Air
<b>Consumers user benefits</b>				
– travel time saving	2,913	231	2,681	1
– Vehicle opcost	62	62	–	–
– user charges	-0	–	0	-0
– during construction & maintenance	–	–	–	–
<b>Net (1)</b>	<b>2,974</b>	293	2,681	1
<b>Business</b>				
<b>User benefits</b>				
– Travel time	2,771	459	2,273	39
– Vehicle opcost	6	6	–	–
– user charges	-13	–	0	-13
– during construction & maintenance	–	–	–	–
<b>Net (2)</b>	<b>2,764</b>	465	2,273	25
<b>Private sector provider impact</b>				
– revenue	5,246	–	5,246	–
– opcost	-4,886	–	-4,886	–
– investment cost	-4,048	–	-4,048	–
– grant/subsidy	8,934	–	8,934	–
– revenue transfer	-5,246	–	-5,246	–
<b>Sub total (3)</b>	<b>–</b>	–	–	–
<b>Other impacts</b>				
– Developer contribution (4)	<b>0</b>	–	–	–
<b>Net business impact (5 = 2+3+4)</b>	<b>2,764</b>	465	2,273	25
<b>Total, PV of transport econ eff. Benefits (6 = 1+5)</b>	<b>5,738</b>			

Note that subtotals (1) and (5) flow into the AMCB table. Subtotal (6) does not.

**Table 2: Public Accounts** (£mill costs should be recorded as a positive number, surpluses as a negative one)

	<b>All Modes</b>	<b>Highway/Air</b>	<b>Rail</b>
	<b>Total</b>		
Local Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	–	0	0
– Revenue transfer	–	0	0
Net (7)	–	–	–
Central Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs*	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	8,934	0	8,934
– Indirect Tax Revenues (i)	558	22	536
– Revenue transfer	-5,246	0	-5,246
Net (8)	<b>4,247</b>	22	4,225
Total PV of costs (9 =7+8)	<b>4,247</b>		

\*The public sector costs in these boxes should exclude developer contribution e.g. developer contribution is subtracted from these figures to give Net (8)



**Table 3: Analysis of Monetised Costs and Benefits (AMCB)**

	Total	
Noise	2	
Local air quality	4	
Greenhouse gases	–	Excluded due to high level of uncertainty
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	–	
Accidents (incl. safety)	31	
Consumer users (sub-total 1, Table 1)	2,974	
Business users and providers (sub-total 5, Table 1)	2,764	
Reliability (incl. performance & reliability)	–	
Option values	–	
Interchange (station quality and crowding)	–	
<b>PVB (a = sum of all benefits)</b>	<b>5,776</b>	
<b>PVC (b = sub-total 9, Table 2)</b>	<b>4,247</b>	
Overall impact, total		
– NPV (a-b)	1,529	
– BCR (a/b)	1.4	
<b>Revised WebTAG BCR Calculation</b>		
<i>(indirect tax included in PVB rather than PVC)</i>		
<b>PVB (a-i)</b>	<b>5,218</b>	
<b>PVC (b-i)</b>	<b>3,688</b>	
<b>BCR (a-i)/(b-i)</b>	<b>1.4</b>	

TEE/Public Accounts Table	Rail Package 3 – Purchased rolling stock
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**Table 1: Economic Efficiency of Transport System** (£mill, revenues are scored as positives, costs as negatives)

	Total	Road	Classic Rail*	Air
Consumers user benefits				
– travel time saving	2,956	266	2,690	1
– Vehicle opcost	80	80	–	–
– user charges	-0	–	0	-0
– during construction & maintenance	–	–	–	–
Net (1)	<b>3,036</b>	346	2,690	1
Business				
User benefits				
– Travel time	3,123	572	2,524	27
– Vehicle opcost	8	8	–	–
– user charges	0	–	0	0
– during construction & maintenance	–	–	–	–
Net (2)	<b>3,130</b>	579	2,524	27
Private sector provider impact				
– revenue	6,563	–	6,563	–
– opcost	-7,256	–	-7,256	–
– investment cost	-10,912	–	-10,912	–
– grant/subsidy	18,168	–	18,168	–
– revenue transfer	-6,563	–	-6,563	–
Sub total (3)	–	–	–	–
Other impacts				
– Developer contribution (4)	<b>0</b>	–	–	–
Net business impact (5 = 2+3+4)	<b>3,130</b>	579	2,524	27
Total, PV of transport econ eff. Benefits (6 = 1+5)	<b>6,166</b>			

Note that subtotals (1) and (5) flow into the AMCB table. Subtotal (6) does not.

**Table 2: Public Accounts** (£mill costs should be recorded as a positive number, surpluses as a negative one)

	All Modes	Highway/Air	Rail
	Total		
Local Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	–	0	0
– Revenue transfer	–	0	0
Net (7)	–	–	–
Central Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs*	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	18,168	0	18,168
– Indirect Tax Revenues (i)	665	25	640
– Revenue transfer	-6,563	0	-6,563
Net (8)	12,270	25	12,245
Total PV of costs (9 =7+8)	12,270		

\*The public sector costs in these boxes should exclude developer contribution e.g. developer contribution is subtracted from these figures to give Net (8)

**Table 3: Analysis of Monetised Costs and Benefits (AMCB)**

	Total	
Noise	3	
Local air quality	5	
Greenhouse gases	–	Excluded due to high level of uncertainty
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	–	
Accidents (incl. safety)	35	
Consumer users (sub-total 1, Table 1)	3,036	
Business users and providers (sub-total 5, Table 1)	3,130	
Reliability (incl. performance & reliability)	–	
Option values	–	
Interchange (station quality and crowding)	–	
<b>PVB (a = sum of all benefits)</b>	<b>6,209</b>	
<b>PVC (b = sub-total 9, Table 2)</b>	<b>12,270</b>	
Overall impact, total		
– NPV (a-b)	-6,060	
– BCR (a/b)	<b>0.5</b>	
<b>Revised WebTAG BCR Calculation</b>		
<i>(indirect tax included in PVB rather than PVC)</i>		
<b>PVB (a-i)</b>	<b>5,544</b>	
<b>PVC (b-i)</b>	<b>11,605</b>	
<b>BCR (a-i)/(b-i)</b>	<b>0.48</b>	

TEE/Public Accounts Table	Rail Package 3A – Purchased rolling stock
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**Table 1: Economic Efficiency of Transport System** (£mill, revenues are scored as positives, costs as negatives)

	Total	Road	Classic Rail*	Air
<b>Consumers user benefits</b>				
– travel time saving	1,881	220	1,660	1
– Vehicle opcost	51	51	–	–
– user charges	-0	–	0	-0
– during construction & maintenance	–	–	–	–
<b>Net (1)</b>	<b>1,932</b>	<b>271</b>	<b>1,660</b>	<b>1</b>
<b>Business</b>				
<b>User benefits</b>				
– Travel time	1,726	439	1,283	4
– Vehicle opcost	3	3	–	–
– user charges	0	–	0	0
– during construction & maintenance	–	–	–	–
<b>Net (2)</b>	<b>1,729</b>	<b>441</b>	<b>1,283</b>	<b>4</b>
<b>Private sector provider impact</b>				
– revenue	4,271	–	4,271	–
– opcost	-4,867	–	-4,867	–
– investment cost	-8,244	–	-8,244	–
– grant/subsidy	13,111	–	13,111	–
– revenue transfer	-4,271	–	-4,271	–
<b>Sub total (3)</b>	<b>–</b>	<b>–</b>	<b>–</b>	<b>–</b>
<b>Other impacts</b>				
– Developer contribution (4)	<b>0</b>	<b>–</b>	<b>–</b>	<b>–</b>
<b>Net business impact (5 = 2+3+4)</b>	<b>1,729</b>	<b>441</b>	<b>1,283</b>	<b>4</b>
<b>Total, PV of transport econ eff. Benefits (6 = 1+5)</b>	<b>3,661</b>			

Note that subtotals (1) and (5) flow into the AMCB table. Subtotal (6) does not.

**Table 2: Public Accounts** (£mill costs should be recorded as a positive number, surpluses as a negative one)

	<b>All Modes</b>	<b>Highway/Air</b>	<b>Rail</b>
	<b>Total</b>		
Local Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	–	0	0
– Revenue transfer	–	0	0
Net (7)	–	–	–
Central Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs*	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	13,111	0	13,111
– Indirect Tax Revenues (i)	423	20	403
– Revenue transfer	-4,271	0	-4,271
Net (8)	<b>9,263</b>	20	9,244
Total PV of costs (9 =7+8)	<b>9,263</b>		

\*The public sector costs in these boxes should exclude developer contribution e.g. developer contribution is subtracted from these figures to give Net (8)

**Table 3: Analysis of Monetised Costs and Benefits (AMCB)**

	Total	
Noise	2	
Local air quality	4	
Greenhouse gases	–	Excluded due to high level of uncertainty
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	–	
Accidents (incl. safety)	29	
Consumer users (sub-total 1, Table 1)	1,932	
Business users and providers (sub-total 5, Table 1)	1,729	
Reliability (incl. performance & reliability)	–	
Option values	–	
Interchange (station quality and crowding)	–	
<b>PVB (a = sum of all benefits)</b>	<b>3,696</b>	
<b>PVC (b = sub-total 9, Table 2)</b>	<b>9,263</b>	
Overall impact, total		
– NPV (a-b)	-5,568	
– BCR (a/b)	<b>0.4</b>	
<b>Revised WebTAG BCR Calculation</b>		
<i>(indirect tax included in PVB rather than PVC)</i>		
<b>PVB (a-i)</b>	<b>3,273</b>	
<b>PVC (b-i)</b>	<b>8,841</b>	
<b>BCR (a-i)/(b-i)</b>	<b>0.4</b>	



TEE/Public Accounts Table	Rail Package 4 – Purchased rolling stock
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**Table 1: Economic Efficiency of Transport System** (£mill, revenues are scored as positives, costs as negatives)

	Total	Road	Classic Rail*	Air
Consumers user benefits				
– travel time saving	3,072	128	2,944	1
– Vehicle opcost	96	96	–	–
– user charges	-0	–	0	-0
– during construction & maintenance	–	–	–	–
Net (1)	<b>3,168</b>	224	2,944	0
Business				
User benefits				
– Travel time	3,178	287	2,887	3
– Vehicle opcost	3	3	–	–
– user charges	-0	–	0	-0
– during construction & maintenance	–	–	–	–
Net (2)	<b>3,181</b>	290	2,887	3
Private sector provider impact				
– revenue	6,688	–	6,688	–
– opcost	-7,690	–	-7,690	–
– investment cost	-12,969	–	-12,969	–
– grant/subsidy	20,659	–	20,659	–
– revenue transfer	-6,688	–	-6,688	–
Sub total (3)	–	–	–	–
Other impacts				
– Developer contribution (4)	<b>0</b>	–	–	–
Net business impact (5 = 2+3+4)	<b>3,181</b>	290	2,887	3
Total, PV of transport econ eff. Benefits (6 = 1+5)	<b>6,349</b>			

Note that subtotals (1) and (5) flow into the AMCB table. Subtotal (6) does not.

**Table 2: Public Accounts** (£mill costs should be recorded as a positive number, surpluses as a negative one)

	All Modes	Highway/Air	Rail
	Total		
Local Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	–	0	0
– Revenue transfer	–	0	0
Net (7)	–	–	–
Central Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs*	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	20,659	0	20,659
– Indirect Tax Revenues (i)	645	21	625
– Revenue transfer	-6,688	0	-6,688
Net (8)	<b>14,616</b>	21	14,595
Total PV of costs (9 =7+8)	<b>14,616</b>		

\*The public sector costs in these boxes should exclude developer contribution e.g. developer contribution is subtracted from these figures to give Net (8)

**Table 3: Analysis of Monetised Costs and Benefits (AMCB)**

	Total	
Noise	2	
Local air quality	4	
Greenhouse gases	–	Excluded due to high level of uncertainty
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	–	
Accidents (incl. safety)	28	
Consumer users (sub-total 1, Table 1)	3,168	
Business users and providers (sub-total 5, Table 1)	3,181	
Reliability (incl. performance & reliability)	–	
Option values	–	
Interchange (station quality and crowding)	–	
<b>PVB (a = sum of all benefits)</b>	<b>6,384</b>	
<b>PVC (b = sub-total 9, Table 2)</b>	<b>14,616</b>	
Overall impact, total		
– NPV (a-b)	-8,233	
– BCR (a/b)	<b>0.4</b>	
<b>Revised WebTAG BCR Calculation</b>		
<i>(indirect tax included in PVB rather than PVC)</i>		
<b>PVB (a-i)</b>	<b>5,738</b>	
<b>PVC (b-i)</b>	<b>13,971</b>	
<b>BCR (a-i)/(b-i)</b>	<b>0.4</b>	

TEE/Public Accounts Table	Rail Package 5 – Purchased rolling stock
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**Table 1: Economic Efficiency of Transport System** (£mill, revenues are scored as positives, costs as negatives)

	Total	Road	Classic Rail*	Air
Consumers user benefits				
– travel time saving	3,001	147	2,854	0
– Vehicle opcost	99	99	–	–
– user charges	0	–	0	-0
– during construction & maintenance	–	–	–	–
Net (1)	<b>3,100</b>	246	2,854	0
Business				
User benefits				
– Travel time	3,742	336	3,404	2
– Vehicle opcost	6	6	–	–
– user charges	-0	–	0	-0
– during construction & maintenance	–	–	–	–
Net (2)	<b>3,748</b>	342	3,404	2
Private sector provider impact				
– revenue	6,718	–	6,718	–
– opcost	-10,161	–	-10,161	–
– investment cost	-16,854	–	-16,854	–
– grant/subsidy	27,015	–	27,015	–
– revenue transfer	-6,718	–	-6,718	–
Sub total (3)	–	–	–	–
Other impacts				
– Developer contribution (4)	<b>0</b>	–	–	–
Net business impact (5 = 2+3+4)	<b>3,748</b>	342	3,404	2
Total, PV of transport econ eff. Benefits (6 = 1+5)	<b>6,848</b>			

Note that subtotals (1) and (5) flow into the AMCB table. Subtotal (6) does not.

**Table 2: Public Accounts** (£mill costs should be recorded as a positive number, surpluses as a negative one)

	<b>All Modes</b>	<b>Highway/Air</b>	<b>Rail</b>
	<b>Total</b>		
Local Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	–	0	0
– Revenue transfer	–	0	0
Net (7)	–	–	–
Central Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs*	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	27,015	0	27,015
– Indirect Tax Revenues (i)	652	22	631
– Revenue transfer	-6,718	0	-6,718
Net (8)	<b>20,949</b>	22	20,927
Total PV of costs (9 =7+8)	<b>20,949</b>		

\*The public sector costs in these boxes should exclude developer contribution e.g. developer contribution is subtracted from these figures to give Net (8)

**Table 3: Analysis of Monetised Costs and Benefits (AMCB)**

	Total	
Noise	2	
Local air quality	4	
Greenhouse gases	–	<i>Excluded due to high level of uncertainty</i>
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	–	
Accidents (incl. safety)	30	
Consumer users (sub-total 1, Table 1)	3,100	
Business users and providers (sub-total 5, Table 1)	3,748	
Reliability (incl. performance & reliability)	–	
Option values	–	
Interchange (station quality and crowding)	–	
<b>PVB (a = sum of all benefits)</b>	<b>6,885</b>	
<b>PVC (b = sub-total 9, Table 2)</b>	<b>20,949</b>	
Overall impact, total		
– NPV (a-b)	-14,063	
– BCR (a/b)	<b>0.33</b>	
<b>Revised WebTAG BCR Calculation</b>		
<i>(indirect tax included in PVB rather than PVC)</i>		
<b>PVB (a-i)</b>	<b>6,233</b>	
<b>PVC (b-i)</b>	<b>20,297</b>	
<b>BCR (a-i)/(b-i)</b>	<b>0.3</b>	

TEE/Public Accounts Table	Rail Package 2 – Leased rolling stock
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**Table 1: Economic Efficiency of Transport System** (£mill, revenues are scored as positives, costs as negatives)

	Total	Road	Classic Rail*	Air
Consumers user benefits				
– travel time saving	3,128	242	2,885	1
– Vehicle opcost	69	69	–	–
– user charges	0	–	0	-0
– during construction & maintenance	–	–	–	–
Net (1)	<b>3,197</b>	311	2,885	1
Business				
User benefits				
– Travel time	3,351	471	2,855	25
– Vehicle opcost	5	5	–	–
– user charges	0	–	0	0
– during construction & maintenance	–	–	–	–
Net (2)	<b>3,356</b>	477	2,855	25
Private sector provider impact				
– revenue	5,779	–	5,779	–
– opcost	-7,798	–	-7,798	–
– investment cost	-2,706	–	-2,706	–
– grant/subsidy	10,504	–	10,504	–
– revenue transfer	-5,779	–	-5,779	–
Sub total (3)	–	–	–	–
Other impacts				
– Developer contribution (4)	0	–	–	–
Net business impact (5 = 2+3+4)	<b>3,356</b>	477	2,855	25
Total, PV of transport econ eff. Benefits (6 = 1+5)	<b>6,554</b>			

Note that subtotals (1) and (5) flow into the AMCB table. Subtotal (6) does not.

**Table 2: Public Accounts** (£mill costs should be recorded as a positive number, surpluses as a negative one)

	All Modes	Highway/Air	Rail
	Total		
Local Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	–	0	0
– Revenue transfer	–	0	0
Net (7)	–	–	–
Central Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs*	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	10,504	0	10,504
– Indirect Tax Revenues (i)	612	22	591
– Revenue transfer	-5,779	0	-5,779
Net (8)	<b>5,337</b>	22	5,315
Total PV of costs (9 =7+8)	<b>5,337</b>		

\*The public sector costs in these boxes should exclude developer contribution e.g. developer contribution is subtracted from these figures to give Net (8)



**Table 3: Analysis of Monetised Costs and Benefits (AMCB)**

	Total	
Noise	2	
Local air quality	4	
Greenhouse gases	–	Excluded due to high level of uncertainty
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	–	
Accidents (incl. safety)	31	
Consumer users (sub-total 1, Table 1)	3,197	
Business users and providers (sub-total 5, Table 1)	3,356	
Reliability (incl. performance & reliability)	–	
Option values	–	
Interchange (station quality and crowding)	–	
<b>PVB (a = sum of all benefits)</b>	<b>6,591</b>	
<b>PVC (b = sub-total 9, Table 2)</b>	<b>5,337</b>	
Overall impact, total		
– NPV (a-b)	1,255	
– BCR (a/b)	1.2	
<b>Revised WebTAG BCR Calculation</b>		
<i>(indirect tax included in PVB rather than PVC)</i>		
<b>PVB (a-i)</b>	<b>5,979</b>	
<b>PVC (b-i)</b>	<b>4,725</b>	
<b>BCR (a-i)/(b-i)</b>	<b>1.3</b>	

TEE/Public Accounts Table	Rail Package 2A – Leased rolling stock
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**Table 1: Economic Efficiency of Transport System** (£mill, revenues are scored as positives, costs as negatives)

	Total	Road	Classic Rail*	Air
Consumers user benefits				
– travel time saving	2,913	231	2,681	1
– Vehicle opcost	62	62	–	–
– user charges	-0	–	0	-0
– during construction & maintenance	–	–	–	–
Net (1)	<b>2,974</b>	293	2,681	1
Business				
User benefits				
– Travel time	2,771	459	2,273	39
– Vehicle opcost	6	6	–	–
– user charges	-13	–	0	-13
– during construction & maintenance	–	–	–	–
Net (2)	<b>2,764</b>	465	2,273	25
Private sector provider impact				
– revenue	5,246	–	5,246	–
– opcost	-7,798	–	-7,798	–
– investment cost	-2,706	–	-2,706	–
– grant/subsidy	10,504	–	10,504	–
– revenue transfer	-5,246	–	-5,246	–
Sub total (3)	–	–	–	–
Other impacts				
– Developer contribution (4)	<b>0</b>	–	–	–
Net business impact (5 = 2+3+4)	<b>2,764</b>	465	2,273	25
Total, PV of transport econ eff. Benefits (6 = 1+5)	<b>5,738</b>			

Note that subtotals (1) and (5) flow into the AMCB table. Subtotal (6) does not.

**Table 2: Public Accounts** (£mill costs should be recorded as a positive number, surpluses as a negative one)

	<b>All Modes</b>	<b>Highway/Air</b>	<b>Rail</b>
	<b>Total</b>		
Local Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	–	0	0
– Revenue transfer	–	0	0
Net (7)	–	–	–
Central Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs*	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	10,504	0	10,504
– Indirect Tax Revenues (i)	558	22	536
– Revenue transfer	-5,246	0	-5,246
Net (8)	<b>5,816</b>	22	5,794
Total PV of costs (9 =7+8)	<b>5,816</b>		

\*The public sector costs in these boxes should exclude developer contribution e.g. developer contribution is subtracted from these figures to give Net (8)

**Table 3: Analysis of Monetised Costs and Benefits (AMCB)**

	Total	
Noise	2	
Local air quality	4	
Greenhouse gases	–	<i>Excluded due to high level of uncertainty</i>
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	–	
Accidents (incl. safety)	31	
Consumer users (sub-total 1, Table 1)	2,974	
Business users and providers (sub-total 5, Table 1)	2,764	
Reliability (incl. performance & reliability)	–	
Option values	–	
Interchange (station quality and crowding)	–	
<b>PVB (a = sum of all benefits)</b>	<b>5,776</b>	
<b>PVC (b = sub-total 9, Table 2)</b>	<b>5,816</b>	
Overall impact, total		
– NPV (a-b)	-40	
– BCR (a/b)	1.0	
<b>Revised WebTAG BCR Calculation</b>		
<i>(indirect tax included in PVB rather than PVC)</i>		
<b>PVB (a-i)</b>	<b>5,218</b>	
<b>PVC (b-i)</b>	<b>5,258</b>	
<b>BCR (a-i)/(b-i)</b>	<b>1.0</b>	

TEE/Public Accounts Table	Rail Package 3 – Leased rolling stock
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**Table 1: Economic Efficiency of Transport System** (£mill, revenues are scored as positives, costs as negatives)

	Total	Road	Classic Rail*	Air
<b>Consumers user benefits</b>				
– travel time saving	2,956	266	2,690	1
– Vehicle opcost	80	80	–	–
– user charges	-0	–	0	-0
– during construction & maintenance	–	–	–	–
<b>Net (1)</b>	<b>3,036</b>	346	2,690	1
<b>Business</b>				
<b>User benefits</b>				
– Travel time	3,123	572	2,524	27
– Vehicle opcost	8	8	–	–
– user charges	0	–	0	0
– during construction & maintenance	–	–	–	–
<b>Net (2)</b>	<b>3,130</b>	579	2,524	27
<b>Private sector provider impact</b>				
– revenue	6,563	–	6,563	–
– opcost	-11,008	–	-11,008	–
– investment cost	-9,177	–	-9,177	–
– grant/subsidy	20,185	–	20,185	–
– revenue transfer	-6,563	–	-6,563	–
<b>Sub total (3)</b>	<b>–</b>	–	–	–
<b>Other impacts</b>				
– Developer contribution (4)	<b>0</b>	–	–	–
<b>Net business impact (5 = 2+3+4)</b>	<b>3,130</b>	579	2,524	27
<b>Total, PV of transport econ eff. Benefits (6 = 1+5)</b>	<b>6,166</b>			

Note that subtotals (1) and (5) flow into the AMCB table. Subtotal (6) does not.

**Table 2: Public Accounts** (£mill costs should be recorded as a positive number, surpluses as a negative one)

	All Modes	Highway/Air	Rail
	Total		
Local Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	–	0	0
– Revenue transfer	–	0	0
Net (7)	–	–	–
Central Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs*	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	20,185	0	20,185
– Indirect Tax Revenues (i)	665	25	640
– Revenue transfer	-6,563	0	-6,563
Net (8)	<b>14,286</b>	25	14,262
Total PV of costs (9 =7+8)	<b>14,286</b>		

\*The public sector costs in these boxes should exclude developer contribution e.g. developer contribution is subtracted from these figures to give Net (8)

**Table 3: Analysis of Monetised Costs and Benefits (AMCB)**

	Total	
Noise	3	
Local air quality	5	
Greenhouse gases	–	Excluded due to high level of uncertainty
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	–	
Accidents (incl. safety)	35	
Consumer users (sub-total 1, Table 1)	3,036	
Business users and providers (sub-total 5, Table 1)	3,130	
Reliability (incl. performance & reliability)	–	
Option values	–	
Interchange (station quality and crowding)	–	
<b>PVB (a = sum of all benefits)</b>	<b>6,209</b>	
<b>PVC (b = sub-total 9, Table 2)</b>	<b>14,286</b>	
Overall impact, total		
– NPV (a-b)	-8,077	
– BCR (a/b)	<b>0.4</b>	
<b>Revised WebTAG BCR Calculation</b>		
<i>(indirect tax included in PVB rather than PVC)</i>		
<b>PVB (a-i)</b>	<b>5,544</b>	
<b>PVC (b-i)</b>	<b>13,621</b>	
<b>BCR (a-i)/(b-i)</b>	<b>0.4</b>	

<b>TEE/Public Accounts Table</b>	<b>Rail Package 3A – Leased rolling stock</b>
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**Table 1: Economic Efficiency of Transport System** (£mill, revenues are scored as positives, costs as negatives)

	<b>Total</b>	<b>Road</b>	<b>Classic Rail*</b>	<b>Air</b>
<b>Consumers user benefits</b>				
– travel time saving	1,881	220	1,660	1
– Vehicle opcost	51	51	–	–
– user charges	-0	–	0	-0
– during construction & maintenance	–	–	–	–
<b>Net (1)</b>	<b>1,932</b>	<b>271</b>	<b>1,660</b>	<b>1</b>
<b>Business</b>				
<b>User benefits</b>				
– Travel time	1,726	439	1,283	4
– Vehicle opcost	3	3	–	–
– user charges	0	–	0	0
– during construction & maintenance	–	–	–	–
<b>Net (2)</b>	<b>1,729</b>	<b>441</b>	<b>1,283</b>	<b>4</b>
<b>Private sector provider impact</b>				
– revenue	4,271	–	4,271	–
– opcost	-7,658	–	-7,658	–
– investment cost	-6,959	–	-6,959	–
– grant/subsidy	14,616	–	14,616	–
– revenue transfer	-4,271	–	-4,271	–
<b>Sub total (3)</b>	<b>–</b>	<b>–</b>	<b>–</b>	<b>–</b>
<b>Other impacts</b>				
– Developer contribution (4)	<b>0</b>	<b>–</b>	<b>–</b>	<b>–</b>
<b>Net business impact (5 = 2+3+4)</b>	<b>1,729</b>	<b>441</b>	<b>1,283</b>	<b>4</b>
<b>Total, PV of transport econ eff. Benefits (6 = 1+5)</b>	<b>3,661</b>			

Note that subtotals (1) and (5) flow into the AMCB table. Subtotal (6) does not.



**Table 2: Public Accounts** (£mill costs should be recorded as a positive number, surpluses as a negative one)

	<b>All Modes Total</b>	<b>Highway/Air</b>	<b>Rail</b>
Local Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	–	0	0
– Revenue transfer	–	0	0
Net (7)	–	–	–
Central Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs*	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	14,616	0	14,616
– Indirect Tax Revenues (i)	423	20	403
– Revenue transfer	-4,271	0	-4,271
Net (8)	<b>10,768</b>	20	10,749
Total PV of costs (9 =7+8)	<b>10,768</b>		

\*The public sector costs in these boxes should exclude developer contribution e.g. developer contribution is subtracted from these figures to give Net (8)

**Table 3: Analysis of Monetised Costs and Benefits (AMCB)**

	Total	
Noise	2	
Local air quality	4	
Greenhouse gases	–	Excluded due to high level of uncertainty
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	–	
Accidents (incl. safety)	29	
Consumer users (sub-total 1, Table 1)	1,932	
Business users and providers (sub-total 5, Table 1)	1,729	
Reliability (incl. performance & reliability)	–	
Option values	–	
Interchange (station quality and crowding)	–	
<b>PVB (a = sum of all benefits)</b>	<b>3,696</b>	
<b>PVC (b = sub-total 9, Table 2)</b>	<b>10,768</b>	
Overall impact, total		
– NPV (a-b)	-7,072	
– BCR (a/b)	<b>0.3</b>	
<b>Revised WebTAG BCR Calculation</b>		
<i>(indirect tax included in PVB rather than PVC)</i>		
<b>PVB (a-i)</b>	<b>3,273</b>	
<b>PVC (b-i)</b>	<b>10,345</b>	
<b>BCR (a-i)/(b-i)</b>	<b>0.316</b>	

TEE/Public Accounts Table	Rail Package 4 – Leased rolling stock
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**Table 1: Economic Efficiency of Transport System** (£mill, revenues are scored as positives, costs as negatives)

	Total	Road	Classic Rail*	Air
<b>Consumers user benefits</b>				
– travel time saving	3,072	128	2,944	1
– Vehicle opcost	96	96	–	–
– user charges	-0	–	0	-0
– during construction & maintenance	–	–	–	–
<b>Net (1)</b>	<b>3,168</b>	<b>224</b>	<b>2,944</b>	<b>0</b>
<b>Business</b>				
<b>User benefits</b>				
– Travel time	3,178	287	2,887	3
– Vehicle opcost	3	3	–	–
– user charges	-0	–	0	-0
– during construction & maintenance	–	–	–	–
<b>Net (2)</b>	<b>3,181</b>	<b>290</b>	<b>2,887</b>	<b>3</b>
<b>Private sector provider impact</b>				
– revenue	6,688	–	6,688	–
– opcost	-11,650	–	-11,650	–
– investment cost	-11,136	–	-11,136	–
– grant/subsidy	22,786	–	22,786	–
– revenue transfer	-6,688	–	-6,688	–
<b>Sub total (3)</b>	<b>–</b>	<b>–</b>	<b>–</b>	<b>–</b>
<b>Other impacts</b>				
– Developer contribution (4)	<b>0</b>	<b>–</b>	<b>–</b>	<b>–</b>
<b>Net business impact (5 = 2+3+4)</b>	<b>3,181</b>	<b>290</b>	<b>2,887</b>	<b>3</b>
<b>Total, PV of transport econ eff. Benefits (6 = 1+5)</b>	<b>6,349</b>			

Note that subtotals (1) and (5) flow into the AMCB table. Subtotal (6) does not.

**Table 2: Public Accounts** (£mill costs should be recorded as a positive number, surpluses as a negative one)

	<b>All Modes</b>	<b>Highway/Air</b>	<b>Rail</b>
	<b>Total</b>		
Local Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	–	0	0
– Revenue transfer	–	0	0
Net (7)	–	–	–
Central Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs*	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	22,786	0	22,786
– Indirect Tax Revenues (i)	645	21	625
– Revenue transfer	-6,688	0	-6,688
Net (8)	<b>16,743</b>	21	16,722
Total PV of costs (9 =7+8)	<b>16,743</b>		

\*The public sector costs in these boxes should exclude developer contribution e.g. developer contribution is subtracted from these figures to give Net (8)

**Table 3: Analysis of Monetised Costs and Benefits (AMCB)**

	Total	
Noise	2	
Local air quality	4	
Greenhouse gases	–	Excluded due to high level of uncertainty
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	–	
Accidents (incl. safety)	28	
Consumer users (sub-total 1, Table 1)	3,168	
Business users and providers (sub-total 5, Table 1)	3,181	
Reliability (incl. performance & reliability)	–	
Option values	–	
Interchange (station quality and crowding)	–	
<b>PVB (a = sum of all benefits)</b>	<b>6,384</b>	
<b>PVC (b = sub-total 9, Table 2)</b>	<b>16,743</b>	
Overall impact, total		
– NPV (a-b)	-10,360	
– BCR (a/b)	<b>0.4</b>	
<b>Revised WebTAG BCR Calculation</b>		
<i>(indirect tax included in PVB rather than PVC)</i>		
<b>PVB (a-i)</b>	<b>5,738</b>	
<b>PVC (b-i)</b>	<b>16,098</b>	
<b>BCR (a-i)/(b-i)</b>	<b>0.4</b>	

TEE/Public Accounts Table	Rail Package 5 – Leased rolling stock
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**Table 1: Economic Efficiency of Transport System** (£mill, revenues are scored as positives, costs as negatives)

	Total	Road	Classic Rail*	Air
Consumers user benefits				
– travel time saving	3,001	147	2,854	0
– Vehicle opcost	99	99	–	–
– user charges	0	–	0	-0
– during construction & maintenance	–	–	–	–
Net (1)	<b>3,100</b>	246	2,854	0
Business				
User benefits				
– Travel time	3,742	336	3,404	2
– Vehicle opcost	6	6	–	–
– user charges	-0	–	0	-0
– during construction & maintenance	–	–	–	–
Net (2)	<b>3,748</b>	342	3,404	2
Private sector provider impact				
– revenue	6,718	–	6,718	–
– opcost	-15,114	–	-15,114	–
– investment cost	-14,557	–	-14,557	–
– grant/subsidy	29,670	–	29,670	–
– revenue transfer	-6,718	–	-6,718	–
Sub total (3)	–	–	–	–
Other impacts				
– Developer contribution (4)	<b>0</b>	–	–	–
Net business impact (5 = 2+3+4)	<b>3,748</b>	342	3,404	2
Total, PV of transport econ eff. Benefits (6 = 1+5)	<b>6,848</b>			

Note that subtotals (1) and (5) flow into the AMCB table. Subtotal (6) does not.

**Table 2: Public Accounts** (£mill costs should be recorded as a positive number, surpluses as a negative one)

	All Modes	Highway/Air	Rail
	Total		
Local Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	–	0	0
– Revenue transfer	–	0	0
Net (7)	–	–	–
Central Government funding			
– Direct Revenue	–	–	–
– Op costs	–	0	0
– Investment costs*	–	0	0
– Developer and other contributions	–	0	0
– Grant/Subsidy (k)*	29,670	0	29,670
– Indirect Tax Revenues (i)	652	22	631
– Revenue transfer	-6,718	0	-6,718
Net (8)	<b>23,604</b>	22	23,583
Total PV of costs (9 =7+8)	<b>23,604</b>		

\*The public sector costs in these boxes should exclude developer contribution e.g. developer contribution is subtracted from these figures to give Net (8)

**Table 3: Analysis of Monetised Costs and Benefits (AMCB)**

	Total	
Noise	2	
Local air quality	4	
Greenhouse gases	–	Excluded due to high level of uncertainty
Journey ambience (incl. rolling stock quality, and in vehicle crowding)	–	
Accidents (incl. safety)	30	
Consumer users (sub-total 1, Table 1)	3,100	
Business users and providers (sub-total 5, Table 1)	3,748	
Reliability (incl. performance & reliability)	–	
Option values	–	
Interchange (station quality and crowding)	–	
<b>PVB (a = sum of all benefits)</b>	<b>6,885</b>	
<b>PVC (b = sub-total 9, Table 2)</b>	<b>23,604</b>	
Overall impact, total		
– NPV (a-b)	-16,719	
– BCR (a/b)	<b>0.3</b>	
<b>Revised WebTAG BCR Calculation</b>		
<i>(indirect tax included in PVB rather than PVC)</i>		
<b>PVB (a-i)</b>	<b>6,233</b>	
<b>PVC (b-i)</b>	<b>22,952</b>	
<b>BCR (a-i)/(b-i)</b>	<b>0.3</b>	



## Appendix C: Summary of Capital Costs

### RAIL PACKAGE 2

Package	Scheme Name	Cost (£Billions)
Package 2	Stafford Area Bypass	£1.112
Package 2	Cheddington/Leighton Buzzard Grade Separated Jct	£0.243
Package 2	Euston Station 3nr Extra Platforms	£0.062
Package 2	Manchester Piccadilly Station 3nr Extra Platforms	£0.395
Package 2	Attleborough to Brinklow	£0.187
Package 2	Northampton Line Speed Improvements	£0.003
Package 2	Beechwood/Stechford 4 Track	£0.903
<b>Sub-Total Package 2 Cost (£Billions)</b>		<b>£2.903</b>
<i>Extras:</i>		
Power +10% of total package cost (inc OB)		£0.29
Other WCML locations +10% (inc OB) cost		£0.29
Disruption +10% of costs (excluding OB) cost		£0.11
Carlisle to Scotland works (£49m plus OB at 66%)		£0.08
<b>Total Cost Package 2 (£Billions, Q4 2009 Prices)</b>		<b>£3.673</b>
<b>Total Cost Package 2 (£Billions, Av 2009 Prices)</b>		<b>£3.619</b>

**RAIL PACKAGE 3**

<b>Package</b>	<b>Scheme Name</b>	<b>Cost (£Billions)</b>
<i>Package 2</i>	Stafford Area Bypass	£1.112
<i>Package 2</i>	Cheddington/Leighton Buzzard Grade Separated Jct	£0.243
<i>Package 2</i>	Euston Station 3nr Extra Platforms	£0.062
<i>Package 2</i>	Manchester Piccadilly Station 3nr Extra Platforms	£0.395
<i>Package 2</i>	Attleborough to Brinklow	£0.187
<i>Package 2</i>	Northampton Line Speed Improvements	£0.003
<i>Package 2</i>	Beechwood/Stechford 4 Track	£0.903
<i>Package 3</i>	Paddington Throat to South Ruislip via Park Royal	£0.474
<i>Package 3</i>	South Ruislip to Seer Green	£0.890
<i>Package 3</i>	Seer Green to Saunderton Tunnel	£3.448
<i>Package 3</i>	Princes Risborough Bypass/Avoiding Line	£0.682
<i>Package 3</i>	Ilmer to Haddenham & Thame Parkway	£0.662
<i>Package 3</i>	Kings Sutton to Little Bourton	£0.735
<i>Package 3</i>	Fenny Compton Extend Loop	£0.037
<i>Package 3</i>	Tyseley to Dorridge	£0.441
<i>Package 3</i>	Moor Street Connect Up	£0.008
<i>Package 3</i>	Kenilworth Corridor Two tracking	£0.199
<i>Package 3</i>	Package 3 Electrification	£0.784
<b>Sub-Total Package 3 Cost (£Billions)</b>		<b>£11.264</b>
<i>Extras:</i>		
Power (value consistent with that calc in package 2)		£0.290
Other WCML locations (value consistent with that calc in package 2)		£0.290
Disruption +10% of costs (excluding OB)		£0.612
<b>Total Cost Package 3 (£Billions, Q4 2009 Prices)</b>		<b>£12.456</b>
<b>Total Cost Package 3 (£Billions, Av 2009 Prices)</b>		<b>£12.272</b>

**RAIL PACKAGE 3A**

<b>PACKAGE 3A</b>	<b>Scheme Name</b>	<b>Cost (£Billions)</b>
<i>Package 3</i>	Paddington Throat to South Ruislip via Park Royal	<b>£0.474</b>
<i>Package 3</i>	South Ruislip to Seer Green	<b>£0.890</b>
<i>Package 3</i>	Seer Green to Saunderton Tunnel	<b>£3.448</b>
<i>Package 3</i>	Princes Risborough Bypass/Avoiding Line	<b>£0.682</b>
<i>Package 3</i>	Ilmer to Haddenham & Thame Parkway	<b>£0.662</b>
<i>Package 3</i>	Kings Sutton to Little Bourton	<b>£0.735</b>
<i>Package 3</i>	Fenny Compton Extend Loop	<b>£0.037</b>
<i>Package 3</i>	Tyseley to Dorridge	<b>£0.441</b>
<i>Package 3</i>	Moor Street Connect Up	<b>£0.008</b>
<i>Package 3</i>	Kenilworth Corridor Two tracking	<b>£0.199</b>
<i>Package 3</i>	Package 3 Electrification	<b>£0.784</b>
<b>Sub-Total Package 3 Cost (£Billions)</b>		<b>£8.361</b>
<i>Extras:</i>		
Power (value consistent with that calc in package 2)		£0.290
Other WCML locations (value consistent with that calc in package 2)		£0.290
Disruption +10% of costs (excluding OB)		£0.504
<b>Total Cost Package 3A (£Billions, Q4 2009 Prices)</b>		<b>£9.445</b>
<b>Total Cost Package 3A (£Billions, Av 2009 Prices)</b>		<b>£9.306</b>

**RAIL PACKAGE 4**

<b>Package</b>	<b>Scheme Name</b>	<b>Cost (£Billions)</b>
<i>Package 2</i>	Stafford Area Bypass	£1.112
<i>Package 2</i>	Cheddington/Leighton Buzzard Grade Separated Jct	£0.243
<i>Package 2</i>	Euston Station 3nr Extra Platforms	£0.062
<i>Package 2</i>	Manchester Piccadilly Station 3nr Extra Platforms	£0.395
<i>Package 2</i>	Attleborough to Brinklow	£0.187
<i>Package 2</i>	Northampton Line Speed Improvements	£0.003
<i>Package 2</i>	Beechwood/Stechford 4 Track	£0.903
<i>Package 3</i>	Paddington Throat to South Ruislip via Park Royal	£0.474
<i>Package 3</i>	South Ruislip to Seer Green	£0.890
<i>Package 3</i>	Seer Green to Saunderton Tunnel	£3.448
<i>Package 3</i>	Princes Risborough Bypass/Avoiding Line	£0.682
<i>Package 3</i>	Ilmer to Haddenham & Thame Parkway	£0.662
<i>Package 3</i>	Kings Sutton to Little Bourton	£0.735
<i>Package 3</i>	Fenny Compton Extend Loop	£0.037
<i>Package 4</i>	Harbury to Berkswell	£2.028
<i>Package 4</i>	Berkswell/Stechford 4 Track	£1.005
<i>Package 4</i>	Moor Street New Station	£0.085
<i>Package 4</i>	Package 4 Electrification	£0.824
<b>Sub-Total Package 4 Cost (£Billions)</b>		<b>£13.772</b>
<i>Extras:</i>		
Power (value consistent with that calc in package 2)		£0.290
Other WCML locations (value consistent with that calc in package 2)		£0.290
Disruption +10% of costs (excluding OB)		£0.763
<b>Total Cost Package 4 (£Billions, Q4 2009 Prices)</b>		<b>£15.115</b>
<b>Total Cost Package 4 (£Billions, Av 2009 Prices)</b>		<b>£14.892</b>

**RAIL PACKAGE 5**

<b>Package</b>	<b>Scheme Name</b>	<b>Cost (£Billions)</b>
Package 2	Stafford Area Bypass	£1.112
Package 2	Cheddington/Leighton Buzzard Grade Separated Jct	£0.243
Package 2	Euston Station 3nr Extra Platforms	£0.062
Package 2	Manchester Piccadilly Station 3nr Extra Platforms	£0.395
Package 2	Attleborough to Brinklow	£0.187
Package 2	Northampton Line Speed Improvements	£0.003
Package 2	Beechwood/Stechford 4 Track	£0.903
Package 3	Paddington Throat to South Ruislip via Park Royal	£0.474
Package 3	South Ruislip to Seer Green	£0.890
Package 3	Seer Green to Saunderton Tunnel	£3.448
Package 3	Princes Risborough Bypass/Avoiding Line	£0.682
Package 3	Ilmer to Haddenham & Thame Parkway	£0.662
Package 3	Kings Sutton to Little Bourton	£0.735
Package 3	Fenny Compton Extend Loop	£0.037
Package 4	Harbury to Berkswell	£2.028
Package 4	Berkswell/Stechford 4 Track	£1.005
Package 4	Moor Street New Station	£0.085
Package 5	Aston/Stafford 4 Tracking	£4.075
Package 5	Package 5 Electrification	£0.944
<b>Sub-Total Package 5 Cost (£Billions)</b>		<b>£17.967</b>
<i>Extras:</i>		
Power (as per package 2)		£0.290
Power: Plus an additional £50m		£0.050
Other WCML locations (value x1.5 that calc in pkge 2)		£0.435
Disruption +10% of costs (excluding OB)		£1.015
<b>Total Cost Package 5 (£Billions, Q4 2009 Prices)</b>		<b>£19.758</b>
<b>Total Cost Package 5 (£Billions, Av 2009 Prices)</b>		<b>£19.466</b>