East West Rail Western Section

Updated Business Case

Department for Transport

PPRO 4/92/79

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ATKINS

Plan Design Enable

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Table of contents

Tables

Figures

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Executive summary

The East West Rail Western Section (EWR-WS) project proposes the introduction of direct rail passenger services between Oxford, Milton Keynes and Bedford, and also between London (Marylebone) and Milton Keynes (via Aylesbury), by reconstructing and upgrading the partially-disused Oxford – Bicester – Bletchley – Bedford, and Princes Risborough - Aylesbury – Claydon Junction lines. The project also includes additional capacity to facilitate the exploitation of potential new passenger and freight markets afforded by the creation of a direct link between the main radial routes from London to the west and north.

Our approach to the updating of the business case for EWR-WS recognises the need to take into account the following changes since the previous document was published in 2010, these include:

- Incorporation of the scheme into the HLOS and now being a committed scheme for delivery in CP5;
- The announcement of the 'Electric Spine' project and the inclusion of EWR-WS as part of that scheme;
- Changes to the scope and specification of EWR-WS as a result of these announcements;
- Changes in government policy, particular with reference to policies for supporting economic growth;
- Changes in government guidance on the contents of the business case for transport schemes; and
- Changes to WebTAG, in both the parameters and methodology, for forecasting and modelling rail schemes.

Taking all of these into account we have produced an updated business case for the scheme which is summarised here.

EWR Infrastructure Options

Following the completion of the work which led to the production of the previous business case and outline design for the scheme, further development work has been undertaken by Network Rail. This work has refined the scope of what is now referred to as the 'core' scheme which is a development of the preferred option which was identified in the previous business case. Key changes in the core scheme include:

- Double Track throughout between Oxford and Bletchley;
- 100mph capability between Oxford and Bletchley and Bletchley & Bedford;
- 90mph capability between Claydon Junction and Princess Risborough;
- Loops or double tracking on a section of the Aylesbury to Princess Risborough route;
- The requirement to provide a capacity enhancement on the WCML between Denbigh Hall Junction and Milton Keynes;
- Double tracking through Bedford St John's Station;
- Provision of electrification between Oxford and Bletchley on the behalf of the Electric Spine Project;

In addition to the 'core' scheme a further variant, known as the 'incremental' scheme has been developed. This specification includes all of the 'core' scheme plus the following:

- Requirement for enhanced track & signalling throughout the route to deliver the Incremental target capability specification, with a high degree of performance reliability, equivalent to or better than similar routes elsewhere.
- A new chord linking the Up EWR line with the Down Fast WCML line to accommodate northbound inter-regional passenger services (Southbound inter-regional services would use the existing flyover to avoid conflict with the WCML Fast Lines);
- Target line speed between Oxford – Bletchley - Bedford to be raised to 125mph;
- Target line speed between Claydon Junction and Princes Risborough raised to 100mph
- Major enhancement at Bedford Station to address capacity and operational constraints with the Midland main Line Electrification, Thameslink, Electric Spine and EWR Central Section projects

The additional capability and capacity provided by the 'incremental' scheme enables more trains paths to be provided for both passenger and freight services. The following two diagrams, produced by Network Rail, highlight the difference between the two specifications.

Figure ES-1 EWR-WS - Core Scheme Capacity Specification

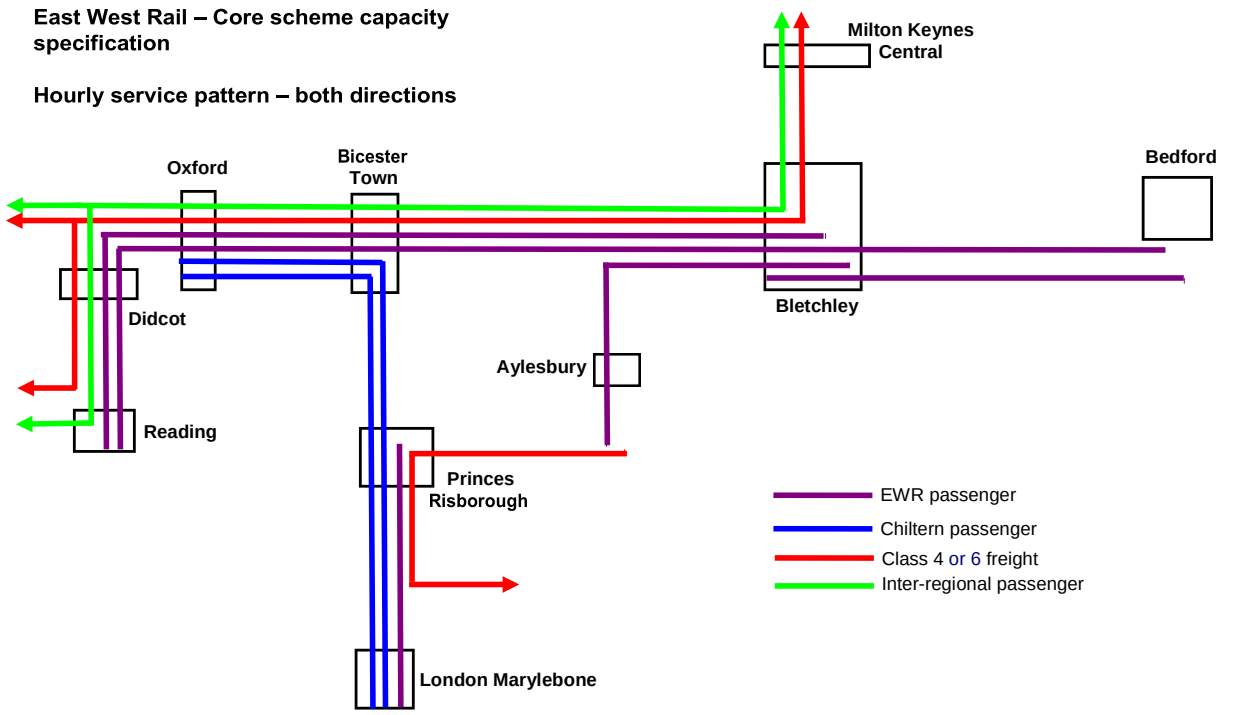
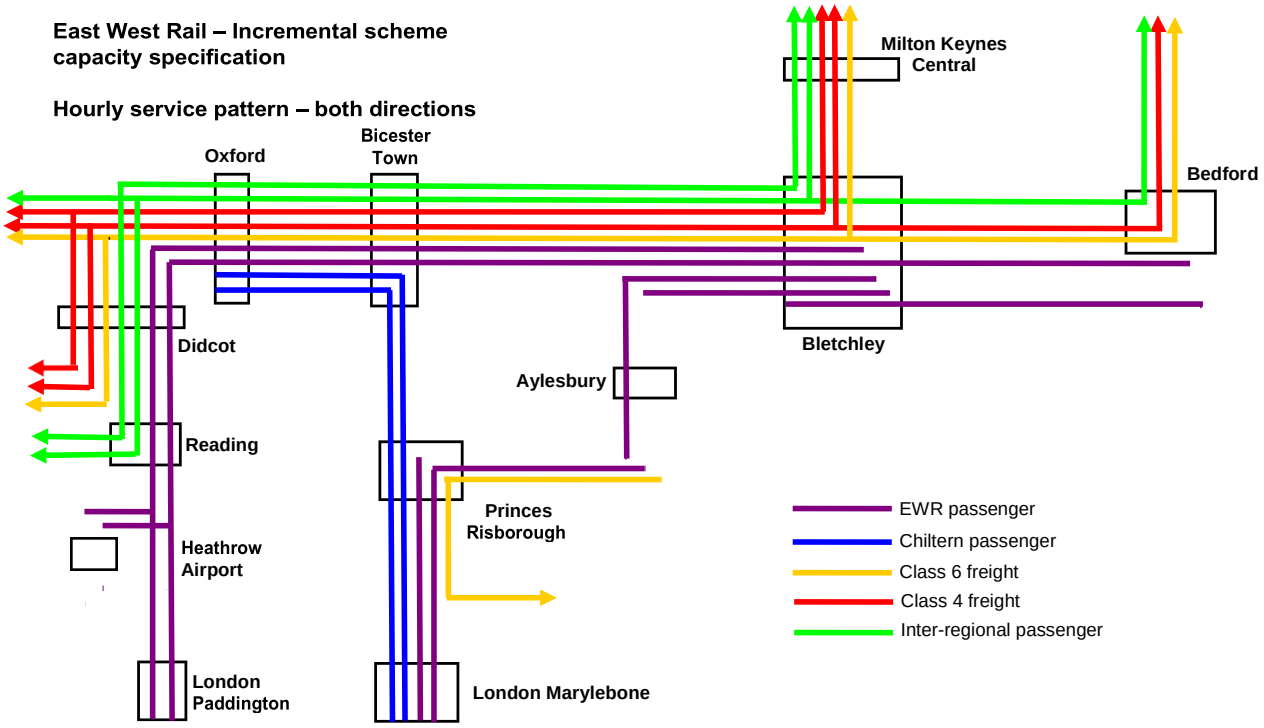


Figure ES-2 EWR-WS - Incremental Scheme Capacity Specification



A visual; comparison of the core and incremental scheme highlights the difference in the number of paths per hour which can be accommodated on each scheme with a maximum of 5 trains per hour (per direction) on the core scheme and 9 trains per hour on the enhanced scheme. This represents a significant enhancement form the core scenario. The business case for both of these schemes is being considered as part of this report.

Phasing of the scheme

The EWR-WS overlaps with Chiltern Railways project to provide a new Oxford to London service by providing a new chord linking the EWR-WS with the Chiltern Main Line at Bicester. This project, known as Evergreen 3, will upgrade the EWR-WS route from just east of Bicester Town station to Oxford, including restoring much of the double track, that was removed many years ago, and installing new signalling and safety systems. In addition, Bicester Town and Islip stations will be rebuilt and additional platforms provided at Oxford, whilst a new station will be constructed near Water Eaton to serve Kidlington and North Oxford.

The Evergreen 3 scheme received Transport & Works Act Order (TWAO) consent in October 2012, this was held up by a subsequent legal challenge, which was dismissed in May 2013. Work on the scheme commenced during the summer of 2013, with the route between Oxford and Bicester closed for reconstruction in February 2014.

Following the inclusion of EWR-WS in the HLOS for CP5, it was determined that it would be more cost effective to undertake the work required for EWR-WS between Oxford and Bicester at the same time and as part of the Evergreen 3 works. This means that the route is being rebuilt as double track throughout, together with works to provide additional clearances for electrification which will be delivered as part of the wider EWR-WS project. The works between Oxford and Bicester and now referred to as EWR Phase 1.

The project cost for Phase 1 currently stands at £322million[1]. The project includes building a new one kilometre section of railway to connect the Bicester Town to Oxford line to the Chiltern main line. It also involved widening the existing track bed; doubling over 18km of track; increasing line speed to100mph; constructing new overbridges, underbridges and footbridges; closing 37 level crossings; building a new Oxford Parkway station at Water Eaton; upgrading Bicester Town and Islip stations; and installing a new signalling system.

Phase 2 of EWR-WS includes all work to the East of Bicester, including:

Bicester – Bletchley;
Bletchley – Milton Keynes;
Bletchley – Bedford; and
Claydon Junction – Princess Risborough.

The costs for this element of the scheme are discussed in the Financial Case.

Phase 1 of the scheme is planned to open between Water Eaton and Oxford in 2015 and open to services

EWR Service Specifications and Scenarios

In order to enable selection of a preferred option a range of service scenarios have been developed. These scenarios fall into two broad categories:

- Core Scheme and
- Core plus Cross Country Services.

Core services include:

- Oxford - Milton Keynes
- Oxford - Bedford; and
- Aylesbury to Milton Keynes

These are assumed to be either DMU or EMU operated depending on whether the route is assumed to be electrified or not.

The addition of Cross Country services considered both individually and in combination were:

- Bournemouth to Manchester

[1] Source: Network Rail

- Reading to Nottingham; and
- Bristol to Peterborough

Again, these are assumed to be either DMU or EMU operated depending on whether the route is assumed to be electrified or not.

Figures ES-3 to ES-7 present schematics representing the Core and Cross Country services considered for this business case.

Figure ES-1 EWR Core Scheme, DMU services

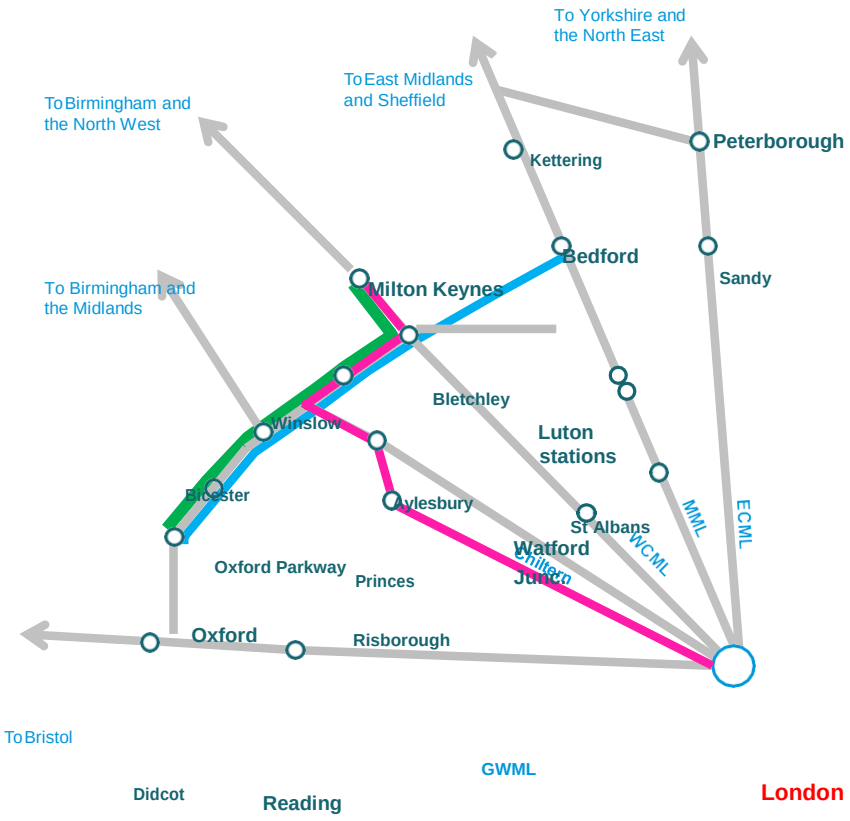
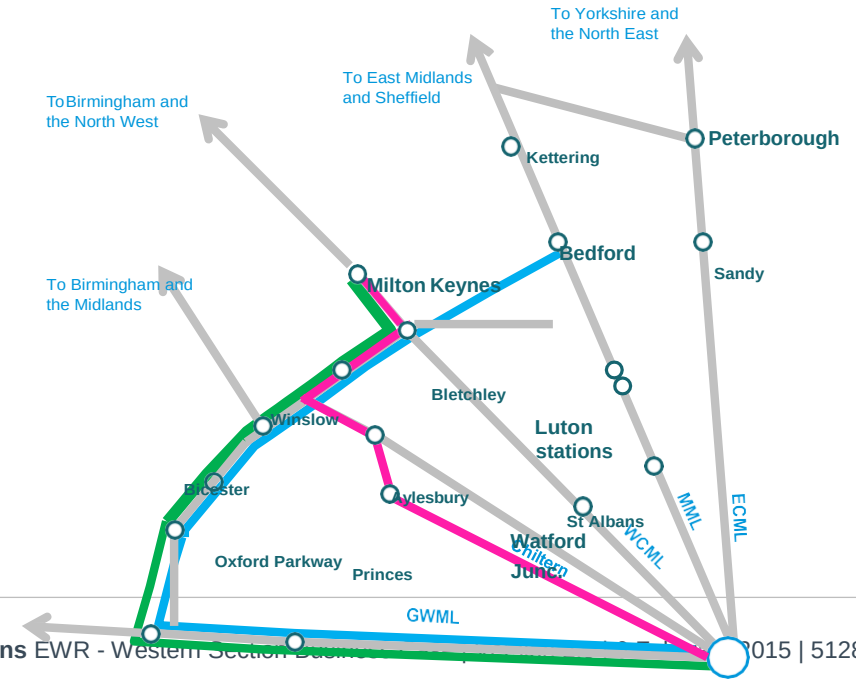


Figure ES-2 EWR Core Scheme, EMU services



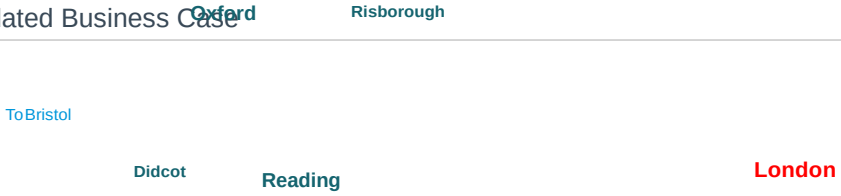

Oxford
Risborough
To Bristol
Didcot
Reading
London

Figure ES-3 EWR enabled additional Bournemouth – Manchester Cross Country service

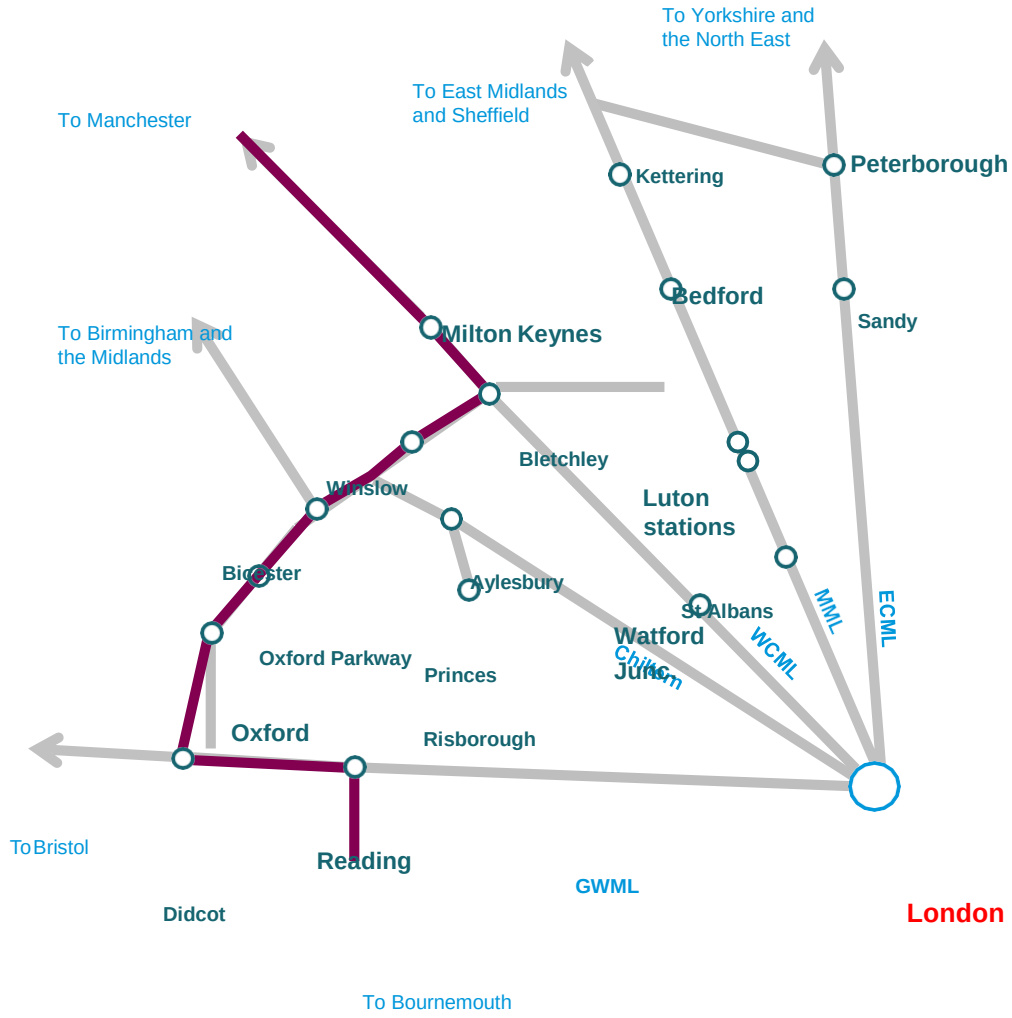
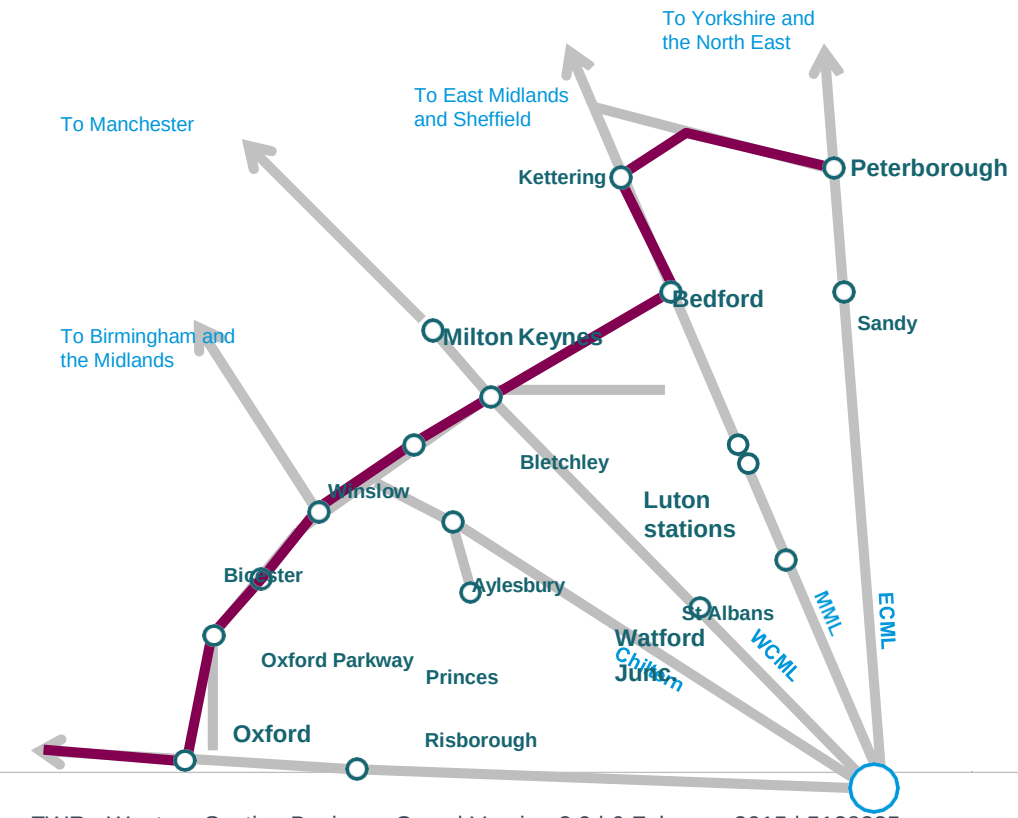
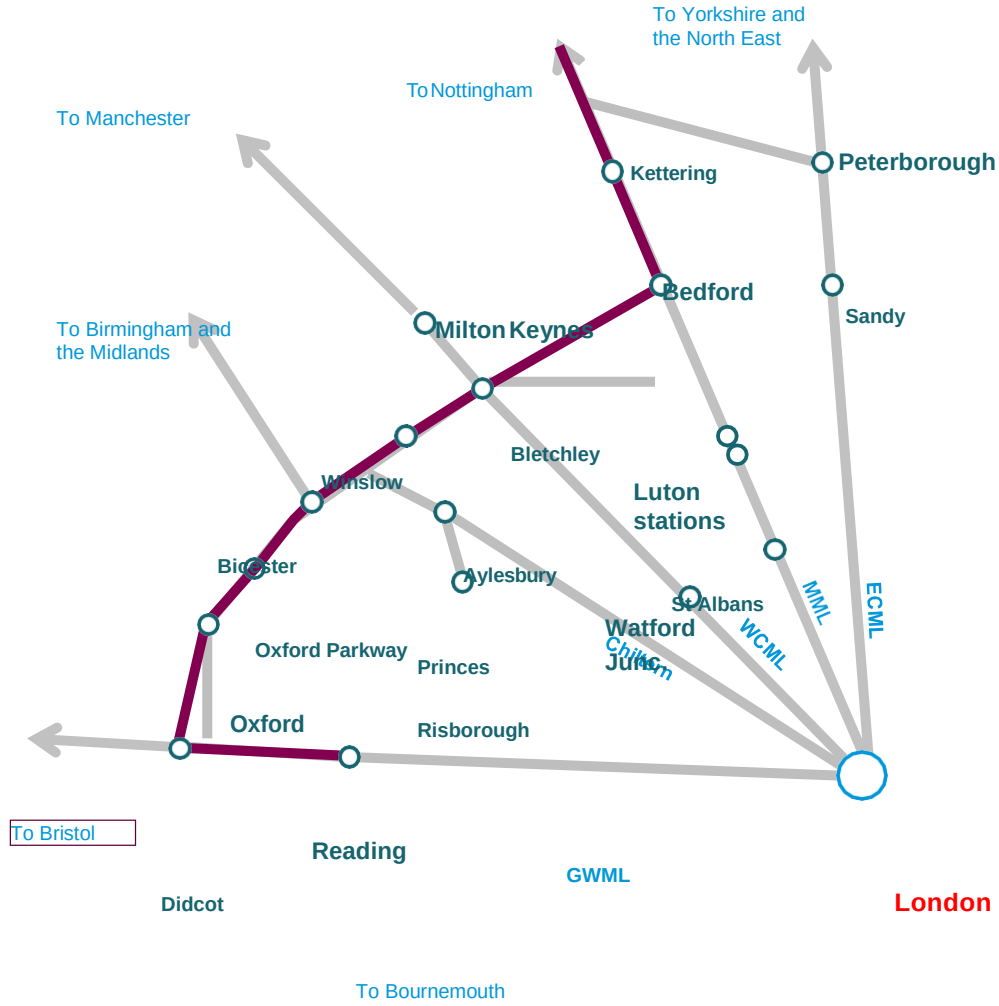


Figure ES-4 EWR enabled additional Bristol – Peterborough Cross Country service




To Bristol
Reading
GWML
Didcot
London
To Bournemouth

Figure ES-5 EWR enabled additional Reading – Nottingham Cross Country Service



Strategic Case

The updated Strategic Case for EWR-WS highlights the following:

Transport market characteristics:

- The expected growth in houses and employment across the study area will lead for increasing demands for travel;
- The car is the current dominant mode of transport across the study area;
- Currently east-west journeys by rail can only be completed by travelling into and out of London;
- A direct east-west link outside of London would enable quicker and more direct services whilst providing more capacity for passengers travelling into and out of London; and that
- Oxford, Bicester, Aylesbury, Bletchley, Milton Keynes and Bedford all have good connections to London, however, very few have links between them.

The role for EWR as part of the rail network:

- EWR-WS has been included within the High Level Output Specification (HLOS) for Network Rail's Control Period 5 (CP5) between 2014 and 2019 and is seen as a key piece of enabling infrastructure to support and enable the planned growth across the study area as well as forming a key pre-requisite for the 'Electric Spine' project and HS2.
- Two options have been developed for the EWR-WS scheme, the 'core' and 'incremental' schemes. The incremental scheme provides for significantly increased route capability, albeit at a significantly increased cost;
- EWR-WS will provide significant benefits in terms of connectivity, linking the Great Western Main Line,

- Chiltern Main Line, West Coast Main Line and Midland Main Line in an east to west arc which allows interchange between routes without having to travel through London providing significant benefits for passenger and freight services; and

- EWR-WS will provide some of the additional capacity required by the rail freight market for freight traffic between Southampton, Midlands and the North as well as provide a diversionary route for freight traffic from Southampton to the Midlands and the North improving operational flexibility

Key constraints and risks:

- There are some limited physical and operational constraints to bringing the scheme forward, but no fundamental obstacles to delivery; and
- There are currently risks to delivery caused by the uncertainty of the route specification, once agreed some of these risks will disappear.

Stakeholder policy fit:

- There is a high level of stakeholder support for the scheme across the study area, with all of the local authorities and LEPs supporting the scheme together with support from the rail industry;
- EWR-WS aligns closely with the organisational and policy aims of the DfT, particularly in terms of the schemes ability to support the growth of the economy by enabling the efficient transportation of passengers and goods;
- EWR-WS also aligns closely with the economic development aims of the LEPs and Local Authorities along the route, particularly in terms of supporting the planned development of jobs and housing in these areas;
- All of this indicates that the EWR-WS project is very well aligned with both national and local policy, particularly in terms of supporting growth and economic development as well as providing additional rail capacity, resilience and reliability.

Demand and Revenue Forecasts

East West Rail (EWR) demand forecasting has adopted a hybrid approach, using three types of model to forecast demand between different origins and destinations. For locations along and near the EWR route, a bespoke Regional Rail Demand Model has been used, combining an elasticity-based and a 'gravity' model. For longer distance journeys, the PLANET Long Distance demand model has been used.

The Regional Rail Demand Model combines an elasticity-based forecasting model, used where generalised journey time (GJT) is expected to change by less than 30% from 2011 base-year levels, and a regression-based gravity model, used where GJT is expected to change by more than 30%. This approach is adopted because solely elasticity based models are not appropriate for use where service levels, and consequently demand, is expected to change markedly from a 2011 base year.

PLANET Long Distance (PLD) is a network model implemented in the EMME transport modelling software. The model is a rail assignment and nested mode choice model (i.e. between highway and public transport and, within public transport, between rail and air), with a supplementary simplified approach to estimating generated demand. PLD is one element of the PLANET Framework Model (PFM).

The forecasting suite incorporates two overlapping model areas:

- PLD covers all long-distance demand within England and Wales, whereas the
- Regional Rail Demand Model covers all rail demand within a defined study area.

The model forecasts a significant increase in demand as a result of East West Rail, suggesting an increase in the region of 1.8m journeys (71m passenger miles) per annum at today's levels of base demand and nearly £11m in additional revenue generated. East West Rail is expected to save around 1.6m hours in travel time for its users.

Comparing scenarios, it is clear that the operational elements have a clear impact on the results e.g. the five minutes dwell time assumed at Didcot parkway for the splitting/joining of EMUs has a significant impact on the overall EMU scenario forecasts.

All scenarios show that EWR-WS core services will lead to significant increases in passenger demand. The Cross Country services which have been modelled also show that they will generate significant demand.

Financial Case - Scheme Costs

The Financial Case presents a range of potential costs for the EWR-WS scheme, based upon differing specifications and input assumptions. Both Atkins and Network Rail (NR) have developed cost estimates for the scheme. The cost estimates prepared by NR have been subject to a more detailed cost analysis. They are consistently higher than the costs prepared by Atkins and represent what can be considered a "worst case" estimate of costs incorporating comprehensive allowances for uncertainties given the early stage of design stage of design beyond EWR Phase 2. Table ES-1 presents the NR cost estimates on which the business case analysis was undertaken.

Table ES-1 Network Rail Cost Estimates (in 2010 prices)

Scheme	Scenario	Cost Estimate (2010 prices)
Electric Spine (OXF - BDM)	*(OLE only)*	*£218,600,000*
Network Rail Core Scheme	100mph (No OLE)	£528,300,000
	100mph (With OLE)	£747,800,000
Network Rail Incremental Scheme	125mph (No OLE)	£1,264,000,000
	125mph (With OLE)	£1,484,000,000

In addition to the capital costs, Atkins has developed a range of operating costs for use in the economic appraisals of the scheme/service options.

In terms of the funding for the scheme, members of the East West Rail Consortium have committed to paying a contribution of £45 million to the overall cost of the scheme.

Economic Case – Economic Value for Money Analysis

The results from the previously described forecasting exercise, together with the cost estimates for the scheme have been combined to ascertain if the revised scheme specifications and scenarios represent economic value for money.

Table ES-2 presents the Value for Money analysis results for the Core Scheme scenarios appraised.

Table ES-2 Economic VfM – EWR-WS Core Services

Core Scenario	PVB [A]	Revenue Growth [B]	Capital Costs [C]	Operating Costs [D]	PVC [E]= [C+D-B]	NPV =[A-E]	BCR =[A/E]
Aylesbury–Milton Keynes, Oxford–Milton Keynes and Oxford – Bedford Non-electrified	1,351	718	783	281	347	1004	3.9
Aylesbury – Milton Keynes, Oxford – Milton Keynes and Oxford – Bedford Non-electrified with high growth	1,484	778	783	281	287	1197	5.2
Aylesbury – Milton Keynes, Oxford – Milton Keynes and Oxford – Bedford Electrified	1,399	701	957	276	532	867	2.6
Aylesbury – Milton Keynes, Oxford – Milton Keynes and Oxford – Bedford	1,537	760	957	276	473	1064	3.2

Core Scenario	PVB [A]	Revenue Growth [B]	Capital Costs [C]	Operating Costs [D]	PVC [E]= [C+D-B]	NPV =[A-E]	BCR =[A/E]
Electrified with high growth							

Table ES-2 shows that the additional benefits provided by the electrified scenario do not offset the additional capital costs associated with electrifying the route. However, this is not a standalone electrification scheme (it is one section of the much larger 'Electric Spine' project) and as such the EWR-WS core services are not expected to justify the electrification of the route. It is of note though that all options are demonstrated to be high value for money.

The Economic Value for Money analysis yielded the following results for the Core plus Cross Country scenarios, which are presented in Table ES-3 (non-electrified, 100mph), Table ES-4 (electrified, 100mph) and Table ES-5 (electrified, 125 mph).

Table ES-3 Economic VfM – Core + XC, 100mph Non-Electrified (£millions)

XC Service Option	PVB	PVC	NPV	BCR
Bournemouth – Manchester	2,131	96	2,034	22.1
Bournemouth – Manchester Reading – Nottingham	2,480	61	2,419	40.8
Bournemouth – Manchester Bristol – Peterborough	2,488	383	2,105	6.5
Bournemouth – Manchester Reading – Nottingham Bristol – Peterborough	2,778	231	2,547	12.0

Table ES-4 Economic VfM – Core + XC, 100mph Electrified (£millions)

XC Service Option	PVB	PVC	NPV	BCR
Bournemouth – Manchester	2,179	436	1,743	5.0
Bournemouth – Manchester Reading – Nottingham	2,528	400	2,128	6.3
Bournemouth – Manchester Bristol – Peterborough	2,536	722	1,813	3.5
Bournemouth – Manchester Reading – Nottingham Bristol – Peterborough	2,826	570	2,256	5.0

Table ES-5 Economic VfM – Core + XC, 125mph Electrified (£millions)

Option	PVB	PVC	NPV	BCR
Bournemouth – Manchester	2,157	1,574	583	1.4
Bournemouth – Manchester and Reading – Nottingham	2,646	1,374	1,272	1.9
Bournemouth – Manchester and Bristol – Peterborough	2,549	1,819	730	1.4
Bournemouth – Manchester, Reading – Nottingham and Bristol – Peterborough	2,952	1,707	1,245	1.7

The analysis presented in Tables ES-3 and ES-4 shows that in both the electrified and non-electrified scenarios that the proposed Core plus Cross Country services represent high value for money. The best performing option in each case is an option which adds new Bournemouth to Manchester and Reading to Nottingham Cross Country services. This comparison also serves to illustrate the impact of the significant capital costs of electrification, where the scheme has a BCR of 40.8 in the non-electrified scenario, with this reducing to a much lower, though still healthy, BCR of 6.3 in the electrified scenario. In both cases the BCR compares favourably to the equivalent Core scheme non-electrified BCR of 3.9.

It should be therefore no surprise that, as shown in Table ES-5, none of the Cross Country options represent high value for money in a scenario where the route is electrified and upgraded for 125 mph operation, given the very substantial increase capital expenditure involved. The gain in benefits and revenue is modest in comparison to 100 mph scenarios. Core plus Cross Country schemes at 125 mph do not meet the DfT's High VfM BCR threshold of 2, though all deliver a BCR well above unity.

We have investigated the Wider Impacts of the EWR-WS for a selection of service scenarios. Our WITA analysis has identified that the overall impact of wider impacts is to add approximately 10 – 15% to conventional benefits and increasing the BCR. For example, a calculation of the wider impacts for the core services DMU scenario increases the PVB of the scheme by 12%, increasing the BCR from 3.9 to 4.3.

The majority of the wider impacts are in terms of agglomeration benefits, particularly focussed around Milton Keynes and Buckinghamshire. This is to be expected given the service pattern under test and confirms that the scheme will help to support the economy of the area.

In conclusion, our analysis demonstrates that EWR-WS is a high value for money scheme. Our analysis shows that the core services on their own represent high value for money and that the additional of Cross Country services enhances the value for money provided by the scheme and that this holds true even if the full costs of electrification of the route are included within the cost estimate and hence PVC.

Economic Case - Regional and Sub-regional Economic Impacts Analysis

This section presents the strategic role of East West Rail in terms of its ability to contribute to the UK's growth objectives via its support for the delivery of growth within the Greater South East, as well as the role improved connectivity can play in facilitating development.

Our analysis suggests that East West Rail will contribute to the following at a national level:

- It will help to unlock higher levels of housing growth that is urgently required in the South East. It will do this by making town centre locations (and other areas with new stations, if developed) more attractive to residential development as a result of their improved connectivity. The impact is likely to be variable at each station location depending on the change in connectivity expected;
- It will help to alleviate labour market constraints in the South East by expanding the size of the potential labour force within an acceptable commuting period. This may have the effect of making some locations more attractive for commercial development, bringing forward additional jobs at some locations;
- It will help to drive agglomeration benefits at key high value clusters by bring businesses closer to each other, thereby increasing business growth in key sectors vital for the UK;
- It will reinforce the image of the 'Golden Triangle' as being a coherent economic entity and could attract further inward investment to key locations along the route; and
- It will help to rebalance some of the growth away from the London economy, which is subject to its own labour market and congestion constraints, towards a series of locations in the South East where there is space to grow.

At the local level, we have assessed the impacts that EWR-WS could have within the LEPs which overlap the scheme.

Thames Valley Berkshire LEP

- East West Rail has a key role to play in increasing the size of the potential labour market to facilitate growth in the LEP;
- The improved connectivity realised by EWR may help to generate additional employment in the city for local residents; and
- EWR has the potential to widen the available labour market catchment area and therefore address the skills gap issue.

Buckinghamshire & Thames Valley LEP

- Transport is likely to remain a significant constraint to growth under a business as usual scenario. East West Rail can help to help to alleviate some of these congestion issues, improving the image of the LEP for further inward investment and job creation;
- The East West rail link to Aylesbury will play a key role in supporting growth at the town;
- EWR may have the effect of increasing out-commuting from Aylesbury Vale to larger regional centres such as Milton Keynes, although it could help to stimulate demand by improving sub-regional connectivity to the town; and
- EWR may provide a stimulus to the redevelopment of town centres sites close to Aylesbury station.

Oxfordshire LEP

- Improved linkages provided by East West Rail may have the effect of helping to concentrate some of these high tech activities (currently dispersed across Oxfordshire) in accessible locations, providing a critical mass for growth; and
- EWR can help to alleviate Oxford's limited labour market supply by widening the labour market catchment of the City and supporting in-commuting by rail.

South East Midlands LEP

- East West Rail has a key role to play in providing links both within and outside of key settlements in the LEP;
- East West Rail could be a key factor in increasing the size of the potential labour catchment and addressing labour market issues in the LEP;
- East West Rail could help to bring forward new homes in key locations (e.g. Milton Keynes, Bletchley and Bedford) where a step change in connectivity is realised.

Overall Economic Impacts

Analysis by Oxford Economics and Arup has identified that EWR-WS can generate significant positive GDP and GVA impacts. Nationally EWR-WS could generate over £1 billion in terms of GVA and over £500 million in direct GDP impacts.

These impacts, when considered together with the results of the conventional transport appraisal, demonstrate that there is a very strong case for implementing the EWR-WS scheme.

Commercial Case

The key commercial consideration is the procurement of the works. Network Rail has informed us that they intend to pursue a Project Alliance Agreement. It is our understanding that this agreement will be a development of the model used for the recent award of the Staffordshire Area Improvements project. The route to procuring the alliance will be as follows:

- **Market Development**: Network Rail will undertake briefings and collaborative development training to brief the market about project scope, timescales and the contracting and procurement strategy; and
- **Link-Up selection, pre-qualification and pre-forming**: A list of 45 suppliers is on Link-Up. They will be able to submit bids for one or more of the work packages apart from OLE & Distribution, as this will be procured under their Electrification Framework. The list will then be refined to a shorter list, approximately 10. The refined list of contractors will then be asked to form pre-formed alliances as part.

Network Rail proposes to manage the project in two distinct phases:

- GRIP 2-3 design development

- GRIP 4-8 project alliance agreement, as described earlier

The contract strategy for GRIP 2-3 design stage has been informed by 'lessons learned' from the Staffordshire Area Improvements Programme and learning from Australian contract experts and their experiences over the last 10 years. Network Rail has learned that the risk for a potential alliance contractor is reduced if land acquisition and planning requirements are better defined, beforehand, as they are large risks for a contractor to take on board. Therefore, Network Rail has decided to develop robust options at GRIP 2 and has internally labelled as GRIP 2+. As part of this process they have decided to develop the various disciplines to different levels during this stage to make more informed decisions during GRIP 4-8.

Management Case

- Network Rail, has a considerable amount of experience in delivering projects of similar size, complexity and nature, including:
  - Northern Hub
  - Staffordshire Area Improvements Programme
  - Airdrie to Bathgate Rail Link
- Network Rail has developed a clear governance structure covering GRIP stages 1 to 3 and is currently developing the proposal for GRIP 4-8 to take into account the proposed alliance approach.
- The detailed project plan is still being developed, but is constrained to be delivered in CP5.
- There are existing Communications and Stakeholder Management strategies in place which are actively being used by Network Rail at the moment.
- Plans for monitoring and evaluation of the project are currently being developed by Network Rail. A tool to track benefits, along with guidance, roles and responsibilities will be issued during CP5.

Conclusions

The update of the Business Case for EWR-WS demonstrates that there is a strong business case for the scheme.

From a strategic perspective, EWR-WS has assumed greater importance due to its ability to provide additional capacity to the network and provide new routes and services for passenger and freight services to help to support the continued growth of the wider economy.

Financially the cost estimates are higher, but more detailed than those used in the previous business case. The scope of and specification of the scheme has also increased which explains part of the cost increases, but not all. There is a significant difference between Atkins and Network Rails cost estimates and it is likely that the final cost will lie somewhere between the two.

From an economic view point the scheme represents high value for money with the ability to generate significant benefits, despite the cost estimates of the scheme being significantly higher that when assessed previously. Additionally, there have also been significant refinements to the approach to forecasting and economic appraisal adopted for this business case update that reflect the latest DfT guidance and reduce the scale and valuation of benefits when schemes are considered on a like for like basis. The impact of these changes is to reduce the BCR calculated for the equivalent Core EWR scheme from over 6:1 to just under 4:1. The Core scheme nevertheless still continues to represent high value for money.

The addition of Cross Country services and associated benefits offset the changes, even accounting for the cost of electrification at 100 mph line speed. By way of example, the electrified scheme with Core plus Cross Country services between Bournemouth – Manchester and Reading to Nottingham will generate a BCR of 6.3 (matching the BCR for the Core EWR scheme as presented in 2010).

However, the strongest economic VfM cases for the scheme are presented in the Core plus Cross Country non-electrified scenarios, reflecting the very significant value the addition of Cross Country services bring regardless of electrification. The scenario of Core plus DMU Cross Country services between Bournemouth – Manchester and Reading to Nottingham delivers a BCR in excess of 40:1, highlighting the significant capital cost saving estimated to be in excess of £200m over electrification against only a modest reduction in forecast transport user and provider economic benefits. The very substantial further cost increases

associated with securing 125 mph line speed mean that these scheme scenarios fail to meet the high economic VfM threshold of a BCR of 2:1 in all instances.

Additional sensitivity testing has shown that the inclusion of rolling stock lifecycle costs, whilst having a change on the absolute appraisal values, does not change the relative performance of the options under consideration, thereby confirming the main conclusions of the analysis (See Appendix J). Furthermore, an estimate of the freight benefits of the scheme (using the MEC approach) are significant (over £800m in the central case – see Appendix K) which are currently excluded from the overall appraisal results.

When wider (WITA) impacts are included the value of benefits increases in the order of 10-15% with a consequential increase in the BCRs associated with the scheme. It should also be noted that at present no quantification of the economic benefits for freight traffic generated by EWR have been captured and these would further enhance the case.

Commercially, Network Rail has a clear strategy to procure and deliver the scheme, using a development of the alliancing model which is currently being successfully used to deliver the Staffordshire Area Improvements project. The fact that such detailed plans and preparation is in place gives confidence that the scheme will be able to move to the implementation phase for delivery within CP5.

In terms of management, Network Rail have established a clear governance structure for the current stage of the project and have set out proposals for how this will be translated into the proposed delivery alliance. Project plans and programme are currently being developed, but Network Rail is currently on track to achieve delivery within CP5. There is an active stakeholder management process in place and strong support from local and industry stakeholders for the scheme. The project interfaces with several other major rail projects including the ‘Electric Spine’ and HS2. The interfaces between these are complicated and will require active management on behalf of Network Rail, HS2 Ltd and the DfT to ensure successful delivery. The current working relationships between these key players provide confidence that these interfaces should not provide an impediment to successful project delivery.

Overall the updated business case confirms that there is strong case for investing in the delivery of the EW R-WS scheme and that it will be able to provide significant transport and wider economic benefits at the sub-regional, regional and national level.

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1. Introduction

1.1. Background

The East West Rail (Western Section) project proposes the introduction of direct rail passenger services between Oxford, Milton Keynes and Bedford, and also between London (Marylebone) and Milton Keynes (via Aylesbury), by reconstructing and upgrading the partially-disused Oxford – Bicester – Bletchley – Bedford, and Princes Risborough - Aylesbury – Claydon Junction lines. The project also includes additional capacity to facilitate the exploitation of potential new passenger and freight markets afforded by the creation of a direct link between the main radial routes from London to the west and north.

The project was promoted for a number of years by the East West Rail Consortium, formed by a partnership of Local Authorities along the line of route, who commissioned a series of studies culminating in 2009 in the issuing of a Project Prospectus, supported by a feasibility report and Business Case. These documents reflected an output specification which delivered the basic pattern of local passenger services plus some additional capacity for new freight and inter-regional passenger services, and is referred to in this document as the “Core scheme”.

In 2012, the Core scheme was included in the High Level Output Specification (HLOS) for Network Rail’s Control Period 5 issued by the DfT. Subsequently, the DfT proposed an enhanced output specification with the objective of exploiting the opportunity offered by the reconstruction of the route to provide sufficient capability to meet potential increased demand over the next 20-25 years. This is referred to throughout this report as the “Incremental scheme”.

In addition to the HLOS decision, the Oxford – Bletchley - Bedford section was also identified as an integral component of the “Electric Spine” proposal to create an electrified network to provide additional capacity, primarily to accommodate freight growth, between the south coast and the East and West Midlands.

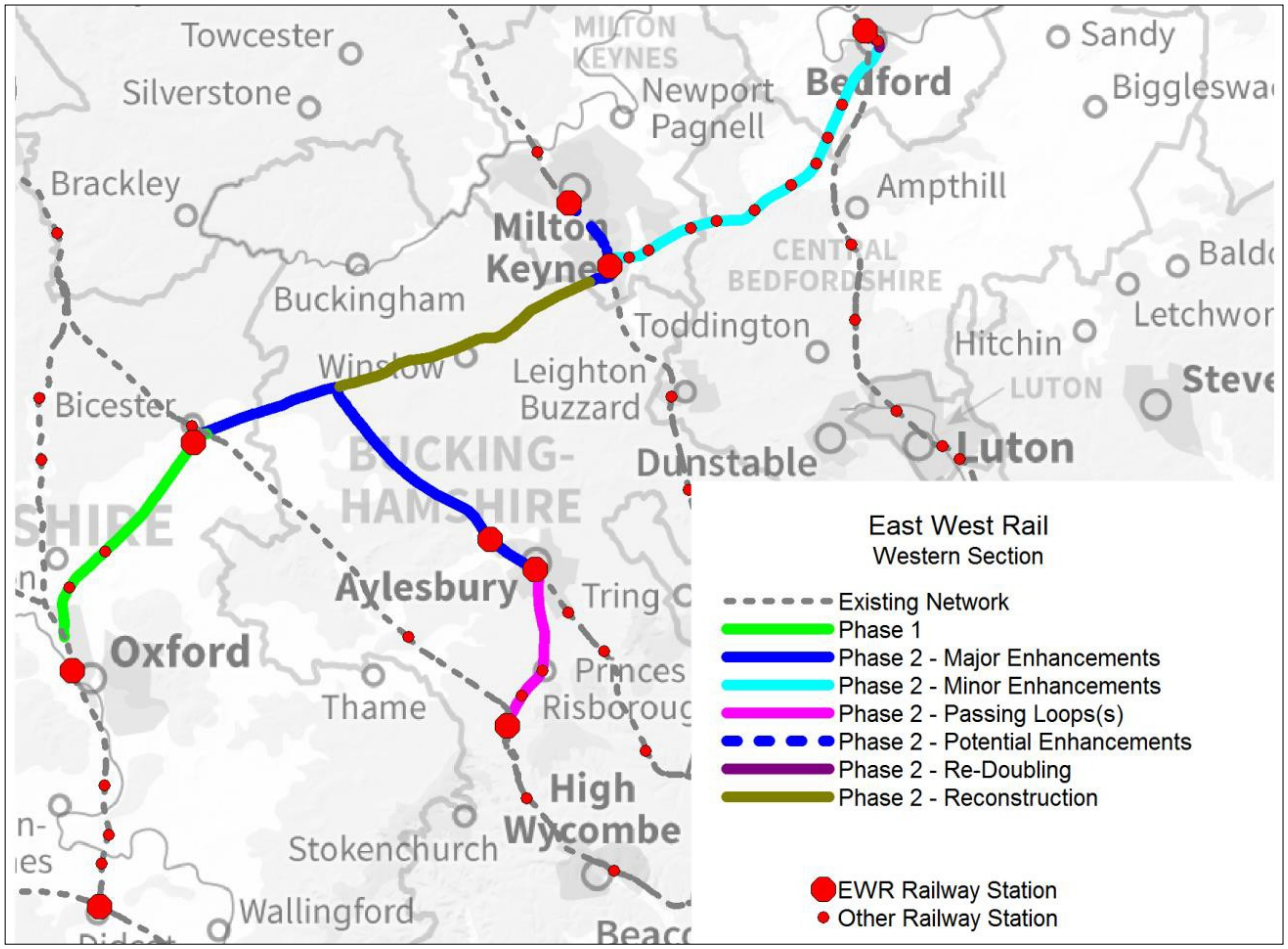
The EWR route intersects the proposed HS2 alignment at a point where a major construction site, later to become the main HS2 Infrastructure Maintenance Depot, is to be built. The HS2 construction programme assumes that capacity will be available on the EWR route for rail-borne construction traffic.

Additional works to accommodate future EWR services between Oxford and Bicester were added to the scope of the Chiltern Railways “Evergreen 3 Phase 2” project to introduce new direct services between London Marylebone and Oxford via Bicester. The combined project is being delivered by Network Rail as “East West Rail Phase 1” under construction contracts let in January 2014. EWR-related works in and around Oxford will be delivered by the Great Western project teams under remit from the EWR project team.

1.2. The Study Area

The study area for the EWR-CS conditional outputs is geographically large; it needs to take into account the extent of the existing Eastern Section of the EWR route, as well as the planned Western Section and the potential benefits and opportunities that it provides.

Figure 1-1 shows the study area and highlights the stations which will be included in the technical analysis.



1.3. Strategic Objectives

The strategic objectives for East West Rail Western Section (EWR-WS) have been refined since the production of the previous business case in 2010. The objectives are now described for the 'Core' scheme (a development of the preferred scheme reported in the previous business case) and the 'Incremental' scheme which adds additional capability to the route, the revised objectives are:

Core scheme:

- To provide a strategic east-west route linking key centres of economic activity, and provide a strategic link from Milton Keynes to Aylesbury and beyond.
- To support local authorities' ambition for substantial economic growth based on the creation of new private sector jobs and the development of major areas of new housing.
- To provide a connection between existing radial routes out of London in order to facilitate journeys without the need to interchange through London.

Incremental scheme:

- To enhance network capacity and flexibility by creating opportunities for alternative routeing of passenger and freight services, and exploit new medium and long distance markets.
- To exploit the opportunity offered by the reconstruction of the route to create an asset that offers sufficient capacity for at least the next 20 years without the need for subsequent enhancement.

These revised objectives build upon those used in the previous objective but still cover the same main areas, i.e:

- Improving connectivity;
- Supporting local economic growth;
- Providing additional capacity; and
- Supporting new freight and longer distance passenger services/routings.

The scheme objectives are being used to define the scope and specification of the scheme and have been formally agreed by the Industry Planning Group.

1.4. Our Approach

Our approach to the updating of the business case for EWR-WS recognises the need to take into account the following changes since the previous document was published in 2010, these include:

- Incorporation of the scheme into the HLOS and now being a committed scheme for delivery in CP5;
- The announcement of the 'Electric Spine' project and the inclusion of EWR-WS as part of that scheme;
- Changes to the scope and specification of EWR-WS as a result of these announcements;
- Changes in government policy, particular with reference to policies for supporting economic growth;
- Changes in government guidance on the contents of the business case for transport schemes; and
- Changes to WebTAG, in both the parameters and methodology, for forecasting and modelling rail schemes.

Taking these changes into account we have undertaken the following tasks to update the business case for EWR-WS:

- Worked closely with Network Rail and the DfT to understand the scope, specification and most importantly the cost estimates for the scheme;
- Undertaken a high level analysis of the operation of the route to determine specimen timetables for use within our modelling processes (which work in terms of not conflicting with services on the WCML);
- Developed an updated operating cost model for EWR services;
- Undertaken high level assessments of the depot requirements, franchise considerations (i.e. within which franchises will the new services best fit); the benefits for freight services;
- Obtained a bespoke version of MOIRA which covers the entire EWR-WS route to enable this to be used within our forecasting process;
- Developed an expanded and updated gravity model to be used in conjunction with MOIRA to develop regional rail demand forecasts for the passenger services;
- Used the PLANET framework model to produce a set of demand forecasts for long-distance rail services using EWR-WS;
- Undertaken a WebTAG compliant appraisal to ascertain the user benefits, wider impacts and passenger revenues associated with the EWR-WS services;
- Produce a five cases business case report, in line with current guidance.

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2. Previous Business Case

2.1. Introduction

Atkins were commissioned by the East West Rail consortium in 2008 to develop the engineering design for the East West Rail scheme to GRIP 4 level and produce the business case for the scheme. The design work and business case was completed in 2010. This section provides a summary of the findings of that report to set into context the revised results of this updated business case.

2.2. Previous Scheme Specification

Three specifications were tested in the previous business case, these were referred to as the 'Core'; Preferred' and Next Best' options. The main differences were in the extent of double track provided between Islip and Bicester and the specification of the route between Aylesbury and Claydon Junction which was dictates by the proposed quantum of services that would be operating..

The previous core scheme was specified to enable the following services:

- **1 tph Oxford – Milton Keynes service** via Bicester Town, Winslow and Bletchley service (41 mins);
- **1 tph direct Milton Keynes – London Marylebone** via High Wycombe (88-91 mins) This consists of a new service between Milton Keynes to Aylesbury Vale Parkway via Bletchley and Winslow and substituting and replicating the Do Minimum Chiltern service between Aylesbury Vale Parkway – London Marylebone service; and
- **1 tph Bletchley - Bedford (semi-fast)** via Woburn Sands and Lidlington (21 minutes) *(Note: Existing local stopping service (Do Minimum) continues to run).*

The previous preferred scheme was specified to enable the following services to operate:

- **1 tph direct Reading – Milton Keynes** via Didcot Parkway, Oxford, Bicester Town, Winslow and Bletchley This consists of a new service as per Core Scheme between Oxford and Milton Keynes and substituting one of the 2 tph Do Minimum FGW local stopping services between Oxford and Reading;
- **1 tph direct Milton Keynes – Marylebone** via High Wycombe (88-91 mins). This consists of a new service between Milton Keynes and Aylesbury Vale Parkway via Bletchley and Winslow and substituting/replicating the Do Minimum Chiltern service between Aylesbury Vale Parkway and London Marylebone; and
- **1 tph direct Reading - Bedford** via Didcot Parkway, Oxford, Bicester Town, Winslow and Bletchley. This consists of a new service between Oxford and Bedford and substituting one of the 2 tph Do Minimum FGW local stopping services between Oxford and Reading.

The previous next best scheme was specified to enable the following services to operate:

- **New 1 tph direct Oxford – Milton Keynes** via Bicester Town, Winslow and Bletchley High Level;
- **New 1 tph Milton Keynes – Aylesbury** via Bletchley High Level, Winslow and Aylesbury Vale Parkway; and
- **New 1 tph Bletchley – Bedford (semi-fast)** via Woburn Sands and Lidlington *(Note: Existing local stopping service (Do Minimum) continues to run).*

2.3. Previous Scheme Costs

In the previous business case the capital costs (in 2010 prices) for the scheme were determined to be as follows:

- Core Scheme - £178 Million
- Preferred Scheme - £211 Million

Both of the cost estimates included allowances for risk.

2.4. Previous Appraisal Results

Over the 60-year appraisal period, it was estimated that both the previous preferred and core scheme options offered high value for money, with BCRs of over 4:1. At the same time, they are likely to have a positive net rail revenue impact (change in UK rail revenue net of changes in operating costs).

Table 2-1 details the key appraisal outputs.

Table 2-1 Previous core and preferred scheme appraisal results, 60-year appraisal period, £million, 2002 PV

Code	Element	Core	Preferred
A	Rail user benefits	318	416
B	Road decongestion benefits	194	271
C	Rail revenue	220	321
D	Rail operating cost	187	268
E = C –D	**Net rail revenue**	**33**	**52**
F	Developer contribution	-	-
G = A+B	**PV of TEE benefits**	**512**	**687**
H	Total Investment cost	136	161
I = H - F	Grant / subsidy	136	161
J	Revenue Clawback	33	52
K	Road infrastructure savings	1	1
L = I – J – K	**Broad Transport Budget**	**103**	**108**
M	Wider Public Finance (loss in indirect taxation)	10	15
N	Noise + local air quality + greenhouse gases + accidents	6	9
O = G + N – M	**PV of Benefits**	**508**	**682**
P = O – L	**Net Present Value (NPV)**	**405**	**574**
Q = O / L	**Benefit Cost Ratio (BCR)**	**4.94**	**6.30**

This analysis showed that both options represented value for money, and further more that the additional investment in the preferred scheme represented high value for money in both an incremental and an absolute sense.

The previous preferred scheme formed the basis of the HLOS submission that was accepted by the government and included in Network Rail's delivery plan for CP5. The remainder of this report therefore considers the scheme as it has been developed by the EWRC, Network Rail and the DfT for delivery.

3. Strategic Case

3.1. Introduction

The strategic case for the Western Section of East West Rail (EWR-WS) sets out why the investment in this scheme is required in terms of the impact that it will have now and into the future in providing a significant enhancement to the capability and capacity of the rail network across an arc which links significant areas of planned housing and employment growth across the Thames Valley and the South Midlands.

The strategic case sets out a clear case for EWR-WS by highlighting the sound rationale for the scheme based upon its sound strategic fit with government and local policy, the benefits that it will provide in terms of connectivity, capability and supporting economic growth at the local and sub-national level.

There is a clear business need for EWR-WS, driven by the increasing amount of freight and passenger traffic being carried by the railway, to provide additional capacity and connectivity on the rail network. In addition the opportunities provided by EWR-WS to provide revised and new passenger services will enable new journeys to e made by rail and provide significant assistance to the economic growth potential of the towns and cities along the route.

The following sections discuss these matters in depth to articulate the key strategic drivers behind the strategic case.

3.2. Problems and Issues

The problems and issues which drive the need for EWR-WS were set out in the previous business case[2]. Those drivers are still relevant, indeed with the renewed focus on growth and economic development across the study area they are more pressing, in summary the key issues are:

- The expected growth in houses and employment across the area will lead for increasing demands for travel which the existing transport networks will struggle to cater for. In particular, rail connectivity is poor and the lack of current east-west links is leading to limitations in the labour markets (as demonstrated by the current in-car and bus journey times between centres of population/employment) in some areas and increasing levels of congestion on the highway networks.

- The car is the current dominant mode of transport across the study area; this is placing pressure on the existing highway networks in terms of increasing congestion and has an environmental cost in terms of localised emissions and greenhouse gases. In the long-term it is unlikely to be sustainable or desirable for increasing travel demand to be almost exclusively met by increasing car use.

- Currently east-west journeys by rail can only be completed by travelling into and out of London with a cross London interchange. This is placing increasing pressure on London terminals and cross London passenger services for movements which could best be served by enabling a direct east-west service. New capacity currently being provided in London through the Thameslink and Crossrail programmes will make interchange trips via London easier, but it is not making the best use of that capacity to use it for trips which do not have an origin or destination in London. A direct east-west link outside of London would enable quicker and more direct services whilst providing more capacity for passengers travelling into and out of London.

- The majority of existing rail infrastructure assets along the EWR corridor are not well utilised. Significant benefits could be realised from bringing them into regular use. A prime example of this is Chilterns Evergreen 3 project. This identified the opportunity to enable Chiltern to run direct services between Oxford and London Marylebone via the section of EWR-WS between Oxford and Bicester Town. This project (now under construction) is also going to deliver Phase 1 of EWR-WS between Oxford and Bicester. In addition, Network Rail's own Freight Route Utilisation Study identified a new link between Bletchley and Claydon Junction and Aylesbury that could help them to efficiently route container freight

[2] EWR Outline Business Case, Atkins, July 2010

trains from the south coast ports to avoid current capacity pinch points in the West Midlands. This has evolved into the Electric Spine project, of which a key pre-requisite is EWR-WS.

Based upon this the key challenges are:

- Transport infrastructure capacity is inadequate in the study area to support planned growth and may curtail growth;
- Significant worsening in network efficiency and resilience of the highway network for cars, goods vehicles and PT (bus and coach);
- PT infrastructure and services poorly configured to providing good access / links within, to and from the area for new opportunities across E-W orbital growth arc;
- Lack of viable PT alternatives result in ongoing dominance of the car as the mode of choice with associated adverse climate, environmental and safety impacts;
- Ongoing use of central London as key interchange location on the rail network for connection between longer distance N-S services (MML / WCML / Chiltern) contributing to crowding and congestion on trains, stations and LU network; and
- Limited utilisation and value to the rail industry being secured from the local rail infrastructure and assets in the study area.

3.3. Target Population

The ultimate long term aim for East West Rail is to re-link the centres of Oxford and Cambridge by rail, providing a direct link between two of the UK's main centres of academic & industrial research and high technology manufacturing. EWR-WS will provide part of the infrastructure required to realise this aim. EWR-WS will provide new transport links between Oxford to Milton Keynes and Bedford, and Aylesbury to Milton Keynes, providing significant improvements to east-west and north-south connectivity across Buckinghamshire and major improvements in connectivity.

Significant growth in housing and jobs is planned across the area including at Oxford, Bicester, Bedford and Milton Keynes. Table 3-1 shows the growth planned at key locations in the study area.

Table 3-1 Planned growth in Housing and Employment

Location	Housing Growth (2011 – 2031)	Employment Growth (2011 – 2031)
Oxford	9,100	12,600
Bicester	5,500	13,800
Aylesbury	8,600	4,000
Bletchley	8,700	3,700
Milton Keynes	31,100	67,700
Bedford	13,200	11,800
TOTAL	76,200	113,600

It is anticipated that the levels of growth shown in Table 3-1 will drive a demand for increased travel across the study area across all modes of transport. EWR-WS will provide new travel options between the key centres of growth facilitating faster journey times and enabling increased rail passenger traffic and significantly improved levels of connectivity with the rest of the UK.

3.4. Existing Services

The existing services serving the key locations along EWR-WS are shown in Table 3-2.

Table 3-2 Existing rail services in the study area

Station	Existing Operator(s)	Services to/from
Oxford	First Great Western	London (Paddington) / Slough / Reading / Banbury / Worcester / Hereford
	Cross Country	South Coast/Midlands/North West
	Chiltern	London (Marylebone)[Post EG3] / Bicester
Bicester(*)	Chiltern	London (Marylebone)[Post EG3] / Banbury / Warwick / Birmingham
Aylesbury(#)	Chiltern	London (Marylebone)
Bletchley	London Midland	London (Euston) / Bedford / Milton Keynes / Northampton / Birmingham
	Southern	South Croydon / Balham / Watford Junction / Milton Keynes
Milton Keynes	London Midland	London (Euston) / Northampton / Coventry / Birmingham
	Southern	South Croydon / Balham / Watford Junction / Bletchley
	Virgin	London (Euston) / Birmingham / Wolverhampton / Chester / Holyhead / Liverpool / Manchester / Scotland
Bedford	East Midlands Trains	London (St Pancras) / Nottingham / Derby / Sheffield
	Thameslink	Brighton / Gatwick / London (St Pancras) / Luton

(*) Bicester North & Bicester Town
(#) Aylesbury & Aylesbury Vale Parkway

Table 3-2 shows that all of the locations have good connections to London, however, very few have links between them. EWR-WS will provide new links between these locations, and as can be seen will also provide significant connectivity to other parts of the UK as well providing significant additional benefits, particularly for business or leisure travel.

3.5. Why Now?

The government has launched a significant programme of capital investment in infrastructure to both address the previous deficit in investment and also to provide new and enhanced capacity and capability to support and drive economic growth across the UK.

It is within this context that EWR-WS was included within the High Level Output Specification (HLOS) for Network Rail's Control Period 5 (CP5) between 2014 and 2019. The scheme is seen as a key piece of enabling infrastructure to support and enable the planned growth across the study area as well as forming a key pre-requisite for the 'Electric Spine' project and HS2.

3.6. Objectives

The current objectives for EWR-WS have been agreed by the Industry Planning Group (IPG). The objectives cover the 'Core' scheme (which is based upon the recommended scheme in the previous business case) and an incremental scheme (which adds additional capability in terms of capacity and line speeds). These objectives are reproduced below:

The Core scheme has three main objectives:

- To provide a strategic east-west route linking key centres of economic activity, and provide a strategic link from Milton Keynes to Aylesbury and beyond.

- To support local authorities' ambition for substantial economic growth based on the creation of new private sector jobs and the development of major areas of new housing.

- To provide a connection between existing radial routes out of London in order to facilitate journeys without the need to interchange through London.

The Incremental scheme has the following additional objectives:

- To enhance network capacity and flexibility by creating opportunities for alternative routeing of passenger and freight services, and exploit new medium and long distance markets.

- To exploit the opportunity offered by the reconstruction of the route to create an asset that offers sufficient capacity for at least the next 20 years without the need for subsequent enhancement.

3.7. Previous Schemes

A comparable recent scheme was Network Rail's reopening of the Airdrie to Bathgate route. This project reinstated the railway line between Airdrie and Bathgate which had been finally closed in 1982. The £375 million, 'fixed price' project was approved by the Scottish Parliament in May 2007. The scheme opened in December 2010, with the full services commencing in May 2011.

The scope of the scheme was to:

- Build new double track electrified railway between Drumgelloch and Bathgate
- Electrify from Haymarket to Newbridge and on to Bathgate
- Redouble and electrify track between Airdrie and new Drumgelloch
- Provide 3 new stations: Armadale, Blackridge and Caldercruix and relocate Bathgate and Drumgelloch stations; and
- Provide a new Train Servicing Depot.

The scheme involved the reinstatement of 15 miles with a new double track electrified railway, together with the upgrade and electrification of a further 18 miles of track. The scheme went from approval to opening in 2½ years.

The scope and specification of the scheme is similar to what is required for EWR-WS. This recent successful project demonstrates Network Rail's track record in delivering schemes of this type.

Network Rail is currently delivering the Borders Railway, also in Scotland. This is reopening 30 miles of the former Waverley Route between Edinburgh, Gorebridge, Galashiels and Tweedbank. The scheme is due to open in summer 2015, with an expected cost of £294 million. The route will be mostly single track with sections of double track and will be operated by diesel trains. Trains will operate at a 30 minute frequency over the route with an end to end journey time of 55 minutes.

3.8. Stakeholder Support

There is a significant level of stakeholder support for the EWR-WS. The local authorities along the route are members of the East West Rail Consortium (EWRC) who have been promoting this scheme for a number of years, including the commissioning of the previous business case for the scheme.

The EWRC is also represented in the Industry Planning Group (IPG). The IPG was set up to gain broad cross-industry consensus regarding the project's aims and objectives, and comprises representatives from:

- EWR Consortium;
- Department for Transport (DfT);
- Office of Rail Regulation (ORR);
- Passenger and freight Train Operators with interests on routes connecting with EWR;
- The Network Rail Electric Spine project;
- The High Speed 2 (HS2) project; and
- Network Rail London North Western & Western Routes.

3.9. Options

The previous business case undertook a significant sifting exercise to identify the preferred scheme to take forward. This was the EWR3a scheme which provided the following capability:

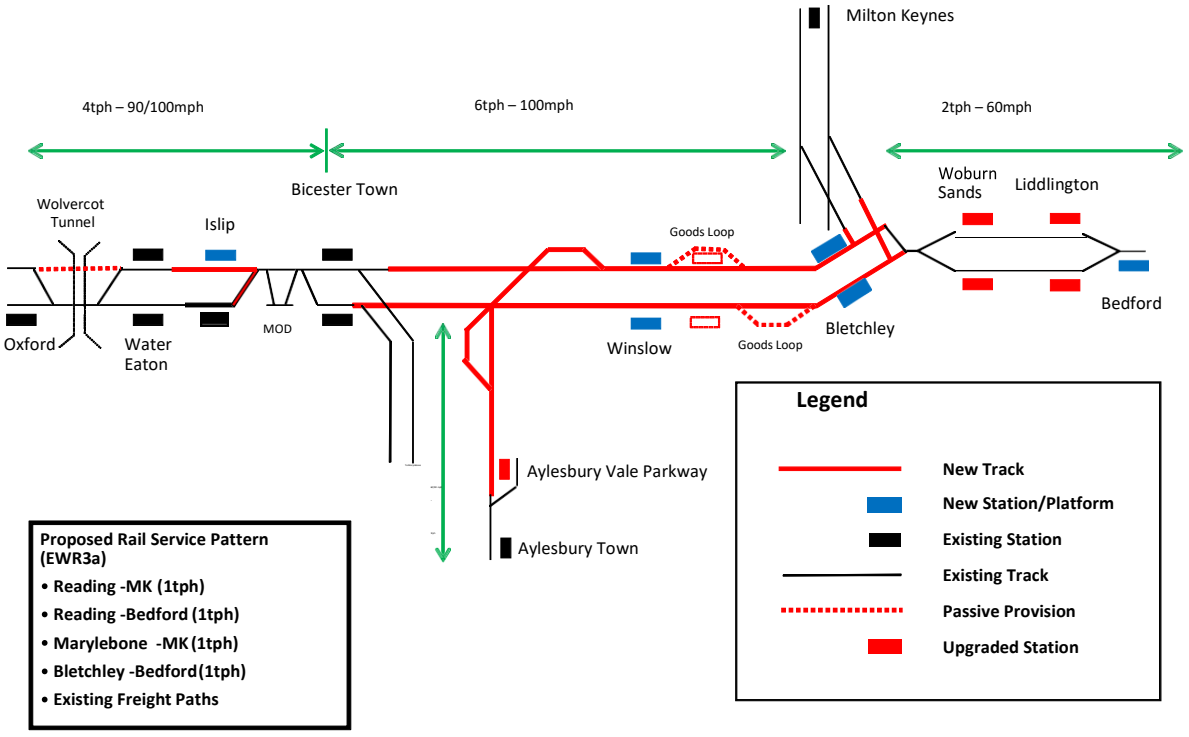
- Existing freight paths;
- Bletchley – Bedford (1 tph);
- Reading – Milton Keynes (1 tph);
- Reading – Bedford (1 tph); and
- London (Marylebone) to Milton Keynes (via Aylesbury) (1 tph).

The following infrastructure works was identified as being required to enable the implementation of the Preferred (EWR3a) scheme services:

- New bay platform at Bedford Midland Station;
- New high level platforms at Bletchley Station & remodelled double junction;
- New double track railway between Claydon Junction and Bletchley;
- Double existing single track section between Claydon Junction and Bicester Gavrey Junction;
- Double existing single track section between Islip and Bicester MOD depot;
- Renew existing single line to 90mph running between Claydon Junction and Aylesbury Vale Parkway;
- Extend Marylebone IECC to control Aylesbury-Bicester Town-Bletchley;
- New station at Winslow;
- New platform at Aylesbury Vale Parkway;
- Upgrade Woburn Sands and Lidlington Stations;
- Expansion of car park at Water Eaton Parkway sufficient to accommodate additional demand; and
- Oxford Area Resignalling.

The Preferred scheme is shown diagrammatically in Figure 3-1.

Figure 3-1 EWR Western Section Option EWR3a Scheme Infrastructure



Development of the scheme specification

Following the completion of the work which led to the production of the previous business case and outline design for the scheme, further development work has been undertaken by Network Rail. This work has

refined the scope of what is now referred to as the 'core' scheme which is a development of the preferred option which was identified in the previous business case. Key changes in the core scheme include:

- Double Track throughout between Oxford and Bletchley;
- 100mph capability between Oxford and Bletchley and Bletchley & Bedford;
- 90mph capability between Claydon Junction and Princess Risborough;
- Loops or double tracking on a section of the Aylesbury to Princess Risborough route;
- The requirement to provide a capacity enhancement on the WCML between Denbigh Hall Junction and Milton Keynes;
- Double tracking through Bedford St John's Station;
- Provision of electrification between Oxford and Bletchley on the behalf of the Electric Spine Project;

In addition to the 'core' scheme a further variant, known as the 'incremental' scheme has been developed. This specification includes all of the 'core' scheme plus the following:

- Requirement for enhanced track & signalling throughout the route to deliver the Incremental target capability specification, with a high degree of performance reliability, equivalent to or better than similar routes elsewhere.
- A new chord linking the Up EWR line with the Down Fast WCML line to accommodate northbound inter-regional passenger services (Southbound inter-regional services would use the existing flyover to avoid conflict with the WCML Fast Lines);
- Target line speed between Oxford – Bletchley - Bedford to be raised to 125mph;
- Target line speed between Claydon Junction and Princes Risborough raised to 100mph
- Major enhancement at Bedford Station to address capacity and operational constraints with the Midland main Line Electrification, Thameslink, Electric Spine and EWR Central Section projects

The additional capability and capacity provided by the 'incremental' scheme enables more trains paths to be provided for both passenger and freight services. The following two diagrams, produced by Network Rail, highlight the difference between the two specifications.

Figure 3-2 EWR-WS - Core Scheme Capacity Specification

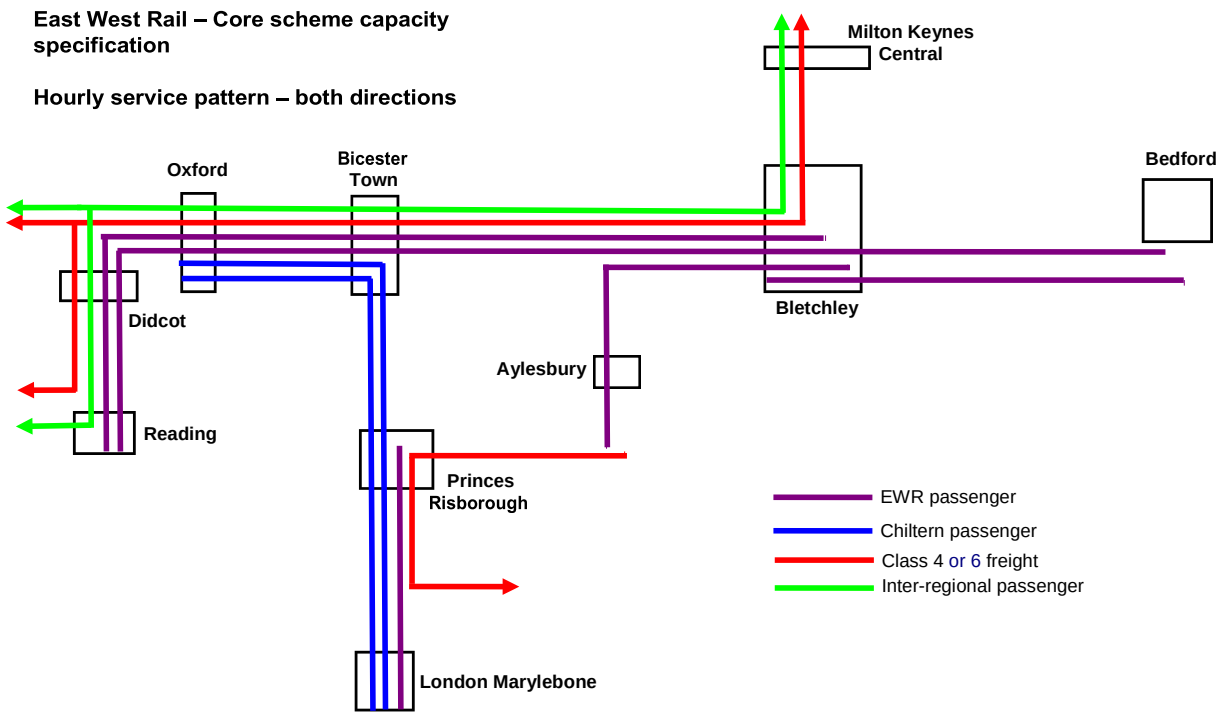
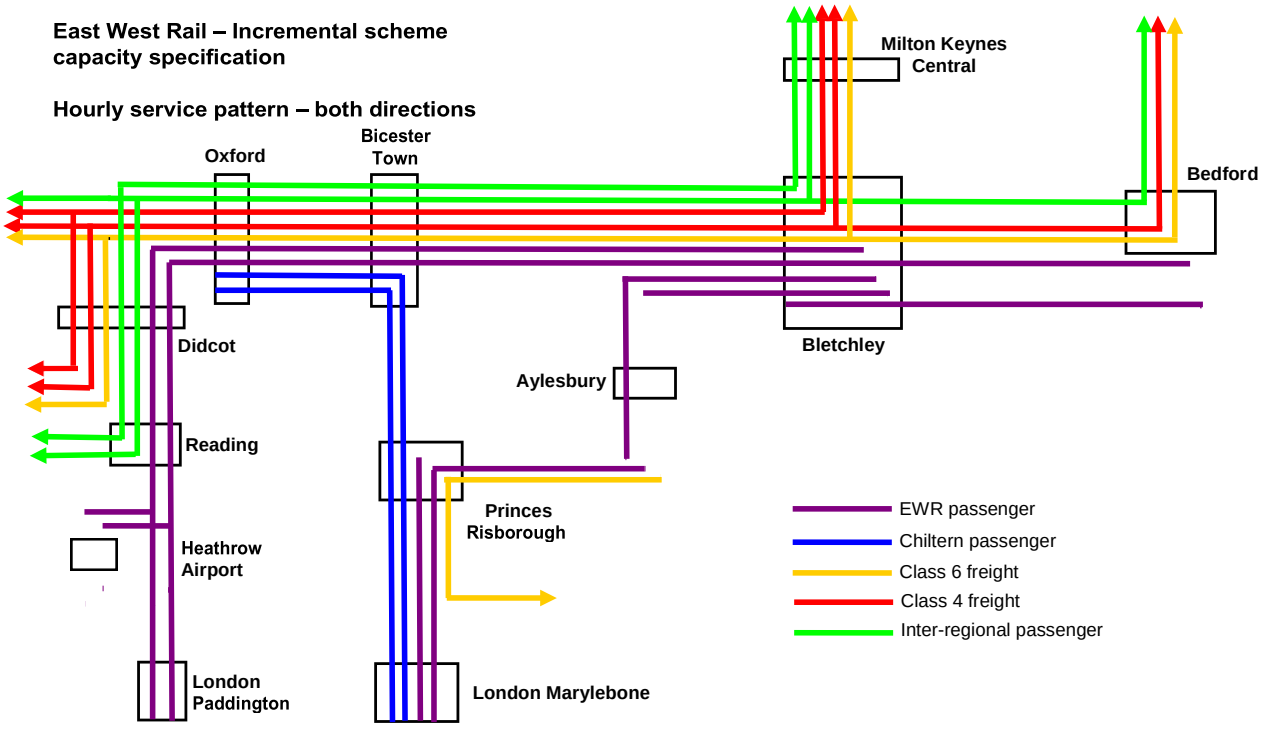


Figure 3-3 EWR-WS - Incremental Scheme Capacity Specification



A visual; comparison of the core and incremental scheme highlights the difference in the number of paths per hour which can be accommodated on each scheme with a maximum of 5 trains per hour (per direction) on the core scheme and 9 trains per hour on the enhanced scheme. This represents a significant enhancement form the core scenario. The business case for both of these schemes is being considered as part of this report.

Phasing of the scheme

The EWR-WS overlaps with Chiltern Railways project to provide a new Oxford to London service by providing a new chord linking the EWR-WS with the Chiltern Main Line at Bicester. This project, known as Evergreen 3, will upgrade the EWR-WS route from just east of Bicester Town station to Oxford, including restoring much of the double track, that was removed many years ago, and installing new signalling and safety systems. In addition, Bicester Town and Islip stations will be rebuilt and additional platforms provided at Oxford, whilst a new station will be constructed near Water Eaton to serve Kidlington and North Oxford.

The Evergreen 3 scheme received Transport & Works Act Order (TWAO) consent in October 2012, this was held up by a subsequent legal challenge, which was dismissed in May 2013. Work on the scheme commenced during the summer of 2013, with the route between Oxford and Bicester closed for reconstruction in February 2014.

Following the inclusion of EWR-WS in the HLOS for CP5, it was determined that it would be more cost effective to undertake the work required for EWR-WS between Oxford and Bicester at the same time and as part of the Evergreen 3 works. This means that the route is being rebuilt as double track throughout, together with works to provide additional clearances for electrification which will be delivered as part of the wider EWR-WS project. The works between Oxford and Bicester and now referred to as EWR Phase 1.

The project cost for Phase 1 currently stands at £322million[3]. The project includes building a new one kilometre section of railway to connect the Bicester Town to Oxford line to the Chiltern main line. It also involved widening the existing track bed; doubling over 18km of track; increasing line speed to100mph; constructing new overbridges, underbridges and footbridges; closing 37 level crossings; building a new

[3] Source: Network Rail

Oxford Parkway station at Water Eaton; upgrading Bicester Town and Islip stations; and installing a new signalling system.

Phase 2 of EWR-WS includes all work to the East of Bicester, including:

- Bicester – Bletchley;
- Bletchley – Milton Keynes;
- Bletchley – Bedford; and
- Claydon Junction – Princess Risborough.

The costs for this element of the scheme are discussed in the Financial Case.

Phase 1 of the scheme is planned to open between Water Eaton and Oxford in 2015 and open to services from London (Marylebone) and Oxford in 2016.

3.10. Constraints

Physical Constraints

One of the main drivers behind the whole EWR project is that it involves the reopening of a section of railway infrastructure which is mostly intact. Following the closure of the through route between Oxford and Cambridge for passenger services in 1967 the infrastructure between Oxford and Bedford has remained mostly intact. The Bletchley to Bedford section retained a local rail service and a rail service between Oxford and Bicester Town was reinstated in 1987. The section between Claydon junction and Bletchley was formally mothballed in 1993.

All of this means that there are limited physical constraints to reopening the route to allow for the planned EWR-WS services. However, the revised specification of the 'core' scheme, which includes electrification, means that overhead structures and the amount of level crossings do provide a degree of constraint which will have to be resolved through the design process.

The delivery of Phase 1 of EWR-WS via the Evergreen 3 project tackles some of the main physical constraints, in particular Wolvercote Tunnel, where the track is being lowered to allow for the reinstatement of double track and overhead line equipment (OLE).

The route does provide a constraint in terms of increasing line speeds, where studies[4] for Network Rail have shown that land outside of the current alignment would be required for 125mph line speeds. It is believed that speeds up to 100mph can be provided throughout without the need for additional land requirements.

Operational Constraints

The proposed 'core' and 'incremental' schemes provide a specified level of rail capacity within the route, however where the EWR services interface with other routes, such as at Oxford, Bletchley/Milton Keynes and Bedford there is the potential for conflict. These are being addressed as follows:

- The EWR-WS phase 1works, together with the Oxford area resignalling project should address the issues in the Oxford area;
- The potential conflicts on the WCML between Denbigh Hall Junction and Milton Keynes are assumed to be addressed by electrifying the fifth line north from the junction and extending it to Milton Keynes. In the incremental scheme the potential of providing a new chord from the Up EWR line to the Down Fast WCML is being investigated.
- The previous EWR-WS scheme assumed that a new platform would be required at Bedford Station, this is now not included within the project, but the remodelling of Bedford Station area is included in the Electric Spine project, which should address the potential conflict issues at this point.

HS2

The proposed route of HS2 closely follows the route for the former Great Central Main Line between Calvert and Claydon junction. EWR-WS is considered to be a key piece of enabling infrastructure for HS2 as it provides access to the proposed construction and maintenance depot at Calvert and will also provide a route

[4] Mott MacDonald Report, Ref: 331606-WTD-MID-010-A Permanent Way Alignment Report Draft 04/03/14

for the transport of spoil during HS2's construction. Discussions with Network Rail have indicated that it is likely that the alignment of the EWR route from Calvert to Claydon will have to be moved to the east by approximately 100m. This would be funded form the HS2 project as this is a key enabler of both the HS2 route and the planned maintenance depot at Calvert. In this respect EWR-WS is a potential constraint on the development of HS2 as it is assumed that the scheme is in place to enable the construction of HS2.

3.11. EWR Service Specifications and Scenarios

In order to enable selection of a preferred option a range of service scenarios have been developed. These scenarios fall into two broad categories:

- Core Scheme and
- Core plus Cross Country Services.

Core services include:

- Oxford - Milton Keynes
- Oxford - Bedford; and
- Aylesbury to Milton Keynes

These are assumed to be either DMU or EMU operated depending on whether the route is assumed to be electrified or not.

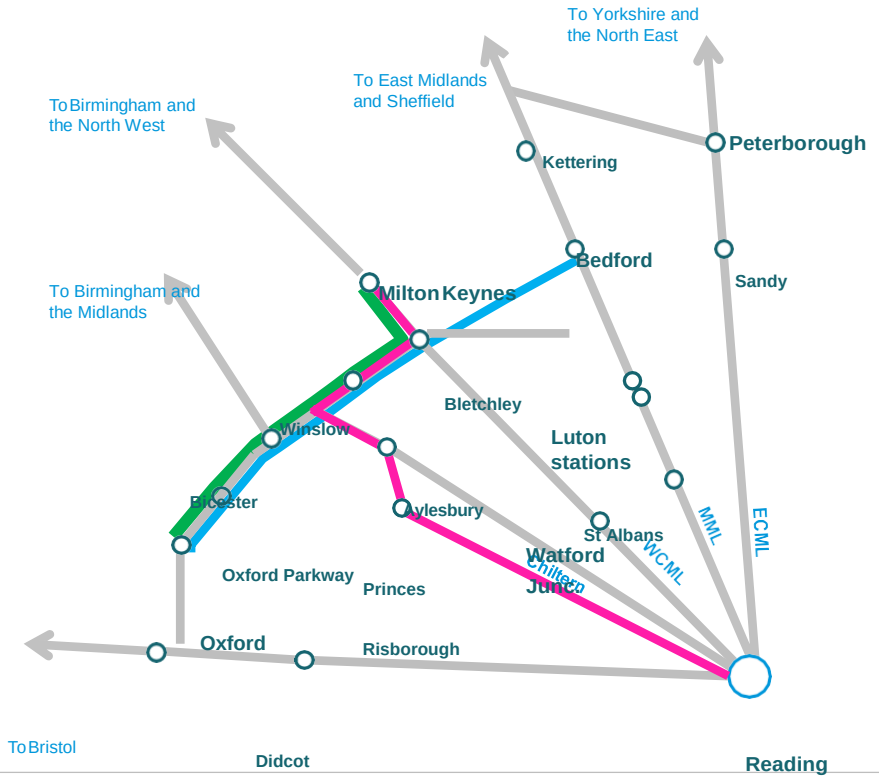
The addition of Cross Country services considered both individually and in combination were:

- Bournemouth to Manchester
- Reading to Nottingham; and
- Bristol to Peterborough

Again, these are assumed to be either DMU or EMU operated depending on whether the route is assumed to be electrified or not.

Figures 3-4 to 3-8 present schematics representing the Core and Cross Country services considered for this business case.

Figure 3-4 EWR Core Scheme, DMU services




GWML
London

Figure 3-5 EWR Core Scheme, EMU services

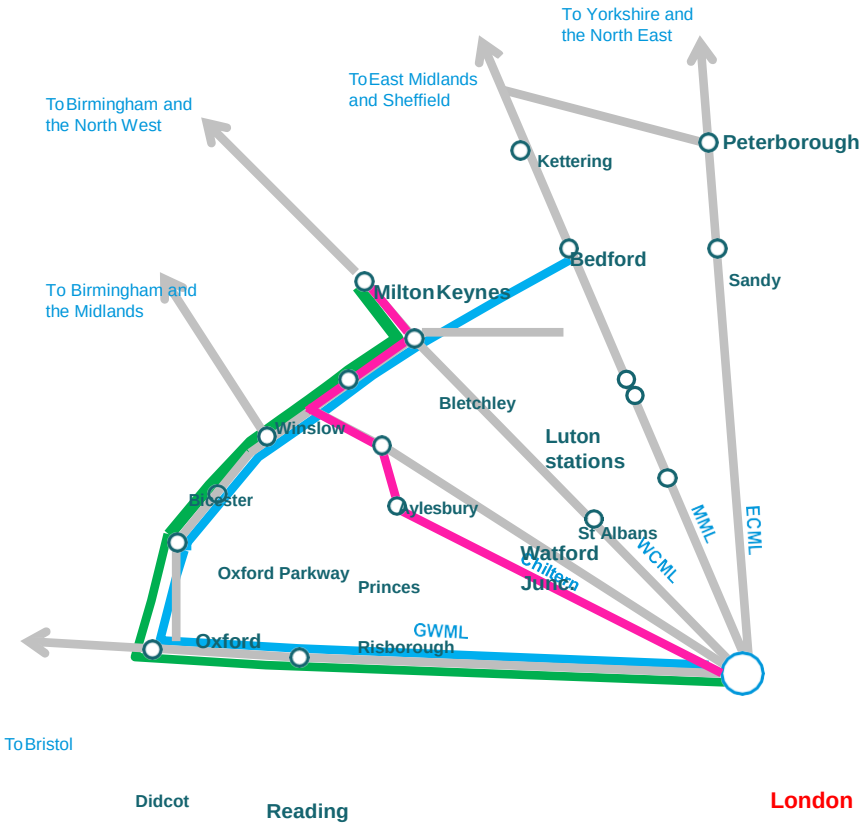
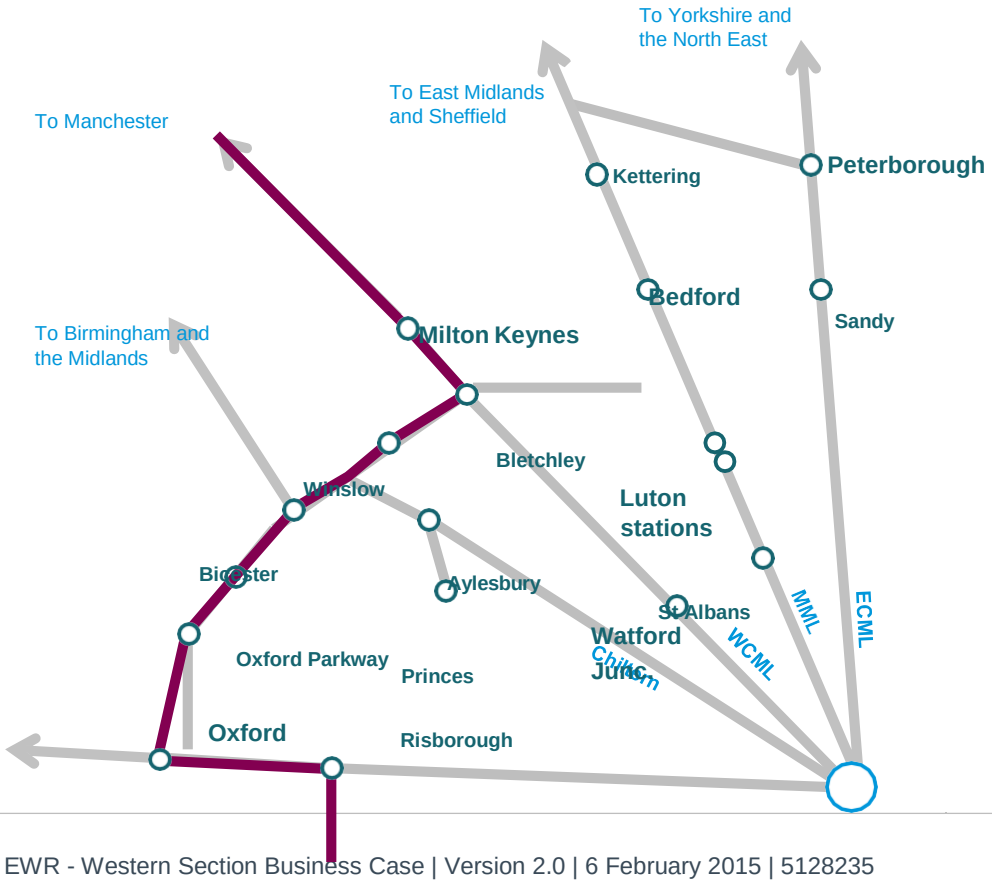
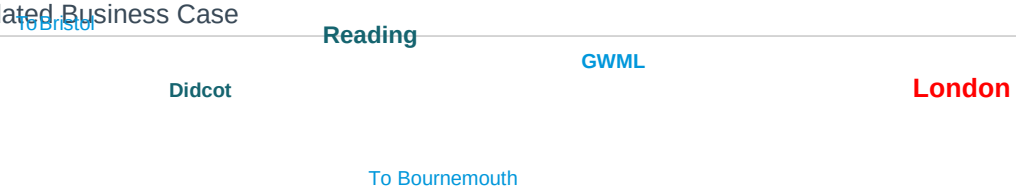


Figure 3-6 EWR enabled additional Bournemouth – Manchester Cross Country service





To Bournemouth

Figure 3-7 EWR enabled additional Bristol – Peterborough Cross Country service

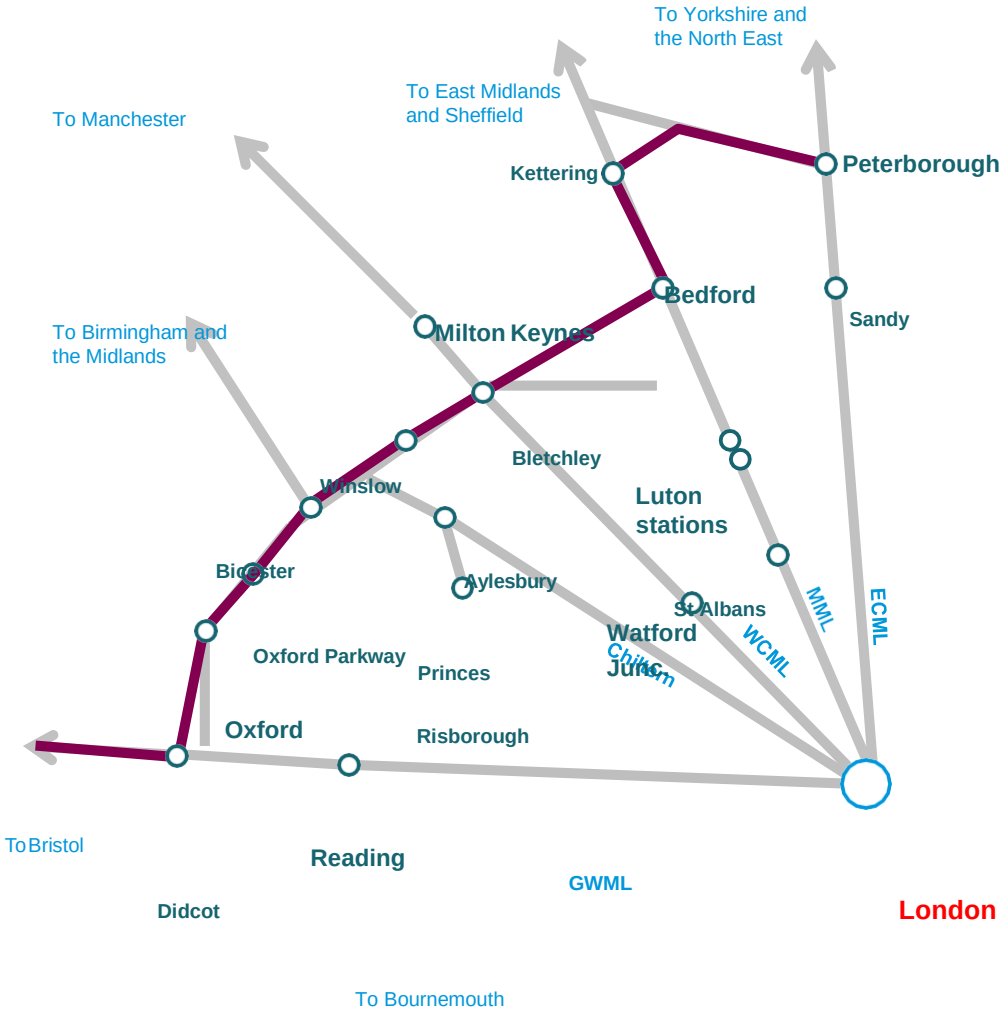
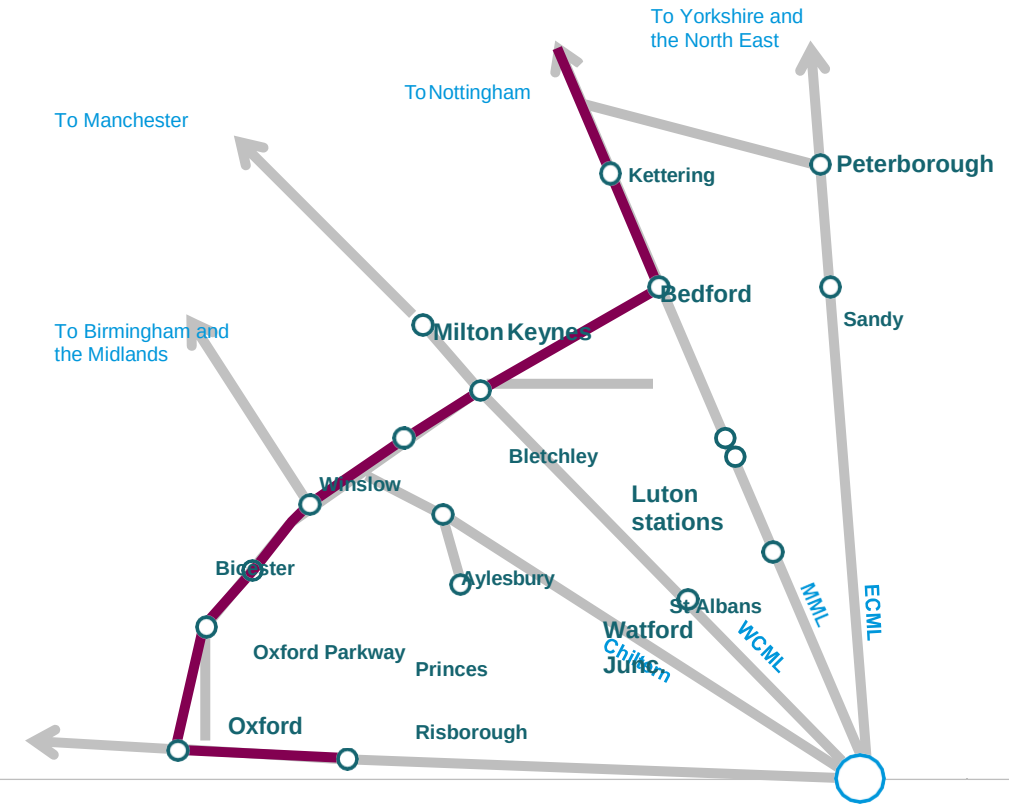


Figure 3-8 EWR enabled additional Reading – Nottingham Cross Country Service




To Bristol
Reading
GWML
Didcot
London
To Bournemouth

3.12. Strategic and Operational Benefits

EWR-WS will provide an orbital link between three of the UK's main railway lines, this will provide significant benefits in terms of connectivity, capacity and resilience as well as providing new routing opportunities for passenger and freight services. The inclusion of EWR-WS in the Electric Spine project means that the route will form a key link in a new electric route linking the south coast and the deep sea port at Southampton with the Midlands and South Yorkshire.

The benefits for passenger services will be covered in detail in the Economic Case. The following section considers the freight benefits of EWR-WS.

Freight Analyses

The purpose of this section is to undertake a qualitative assessment of the potential impacts of East West Rail Western Section on freight traffic and the freight market. The assessment will largely draw upon the "Freight Market Study" published by Network Rail in October 2013 and revisit the 'EWR GRIP 4 Outline Business Case' (July 2010) and make any required updates.

It is widely accepted that the rail freight market has changed considerably in the last few decades. Historically, road dominates the freight market in the UK followed by water. However, since the mid 90's rail has increased its market share from around 8% to 11%. The Strategic Freight Network Steering Group, in 2010, updated their freight forecasts up until 2030 in the Freight Route Utilisation Study. An annual average growth rate of 3% per annum is forecast.

The manufacturing industry, in Great Britain, has declined significantly and as a result Britain has become an importing economy. Therefore:

- Demand for bulk material such as coal and steel have declined; and
- Major ports around the UK are experiencing large increases in the demand for containerised traffic, particularly from the Far East.

As a result, the intermodal sector has and will experience the highest growth while a decline in coal is expected. Additionally, biomass is likely to demonstrate significant growth with the 'Freight Market Study' indicating a growth of approximately 25% for the period 2011-2023. However, there are uncertainties around this as the benefits of biomass against other fuel sources are yet to be fully understood.

The movement of deep sea containers to and from ports remains as the most significant growth market for rail freight, as rail is particularly suited to the efficient movement of containers over long distances. In order to successfully compete with other modes, freight operating companies have had to change from a mode carrying largely low value goods to a mode serving the fast moving consumer goods market, by lowering their operating costs and increasing productivity.

Table 3-3 Summary of domestic intermodal rail freight demand forecasts[5] (billion tonne kilometres)

Forecast Years	Forecast Compound Annual Growth
2011 – 2023	9.0%
2011 – 2033	7.2%
2011 – 2043	6.1%

The Department for Transport report 'Delivering a Sustainable Transport System' (2008) highlights Southampton Port as one of only 10 key international gateways to the UK. The port handles most of the containerised traffic from the Far East to the UK. The report also identified 14 strategic national corridors, one of which is the corridor between South Coast Ports (Southampton and Portsmouth) and the Midlands.

The Port of Southampton handles approximately one fifth of the UK's container traffic and handles the majority of container traffic from the Far East. Associated British Ports (ABP) report 'Port of Southampton Master Plan 2009-2030' stated that, historically, 35% of the ports trade was handled by rail and had declined

[5] Source: Table 4.30, Freight market Study, Network Rail, October 2013

to around 25% due to increase in the use of larger containers, which the railway was not able to accommodate. However, the rail link between Southampton Port and the ABP terminal in Birmingham has now been upgraded to W10 gauge, which now allows the freight route to handle the larger containers.

The majority of the containerised freight traffic to and from the Port of Southampton is from the Midlands and the North. The predominant route from the port is via Basingstoke, Reading, Didcot and Leamington Spa. The rail link then branches at Birmingham and Nuneaton to join the West Coast Mainline to move further north.

The Port of Southampton has an aspiration to increase rail's share of the container traffic to more than 40% by 2030. This aspiration is also supported by forecasts made be the rail freight industry. The forecast growth will inevitably lead to capacity and operational flexibility concerns on this nationally important freight route. Non-domestic containerised traffic is forecasted to grow as follows:

- 4.4 million TEU handled in 2005; to
- 8.1 million TEU in 2020; and
- 11.2 million TEU by 2030

In summary, it can be concluded that rail freight will grow considerably and the corridor between the Port of Southampton and Birmingham will continue to be a nationally significant transport corridor and heavily used. Therefore, investments are required on the route to increase capacity and flexibility.

Network Rail and the DfT already realise the importance of developing an efficient rail freight network. In 2007, the DfT in their High Level Output Specification committed £200m to develop the Strategic Freight Network (SFN). Key objectives include:

- Optimise freight trunk routeings to minimise passenger/freight conflicts
- Make the network available 24 hours all day, all year round
- Eliminate pinch points, and
- Upgrade network capability.

Furthermore, Network Rail is undertaking large programmes of work including Network Operating Strategy (NOS), ERTMS and the Electric Spine Project. One of the key objectives of all these programmes is to develop the rail freight network.

The continuation of the SFN was confirmed in the Final Determination by the ORR in response to Network Rails Strategic Business Plan. It committed £206m in England and Wales in CP5 for Freight Enhancements. The western section of East West Rail can provide some of that extra capacity and flexibility required by the SFN.

The western section of East West Rail will allow trains from Oxford, to connect with the West Coast Mainline at Bletchley or with the Midland Main Line at Bedford. Hence, the London & Southeast Route Utilisation Strategy, produced by Network Rail, has considered freight routeing options from the port of Southampton via East West Rail.

The route utilisation strategy considered a number of options and the primary option, where East West Rail provides the shortest possible route, is discussed in this section. The western section of East West Rail provides a diversionary route for traffic to and from the Port of Southampton to the Midlands and the North.

The 'Freight Market Study' has forecast the average paths per off peak hour in one direction in the East West Rail Section between Oxford and Bedford. Some of the freight traffic from Southampton to the Midlands and the North is re-routed via East West Rail. The following forecasts are made:

- In 2023 there is an average of 0.25 to 0.5 paths per off peak hour via EWR-WS;
- In 2033 there is an average of 0.5 to 1.5 paths per off peak hour via EWR-WS; and
- In 2043 there is an average of 0.5 to 1.5 paths per off peak hour via EWR-WS.

The Freight Market Study highlights that EWR-WS will be a key route for intermodal traffic and this is likely to be the dominant freight use of the line.

Network Rail's 'Output Specification' for the western section of East West Rail, the following freight services are outlined in the core scheme. Note that the figures describe the theoretical capacity of the route, once constraints elsewhere on the Network have been removed. They are not, necessarily, the services that will be run once the route is commissioned.

- Oxford to Milton Keynes – This service will consist of 1 train per hour either class 4 or 6. Class 4 is a 75mph intermodal service and Class 6 is 60mph bulk freight service
- Princes Risborough to Claydon Junction – The service will consist of 1 train per hour, either Class 4 or 6. This will primarily be for Claydon / Calvert waste traffic. However, extension east or west of Claydon Junction can be accommodated by using the Oxford to Milton Keynes / Bletchley paths.

The 'Output Specification' also outlines the following services in the incremental scheme:

- Oxford to Milton Keynes – This service will consist of 3 trains per hour (2 x Class 4 and 1 x Class 6)
- Bletchley to Bedford – This service will consist of 2 trains per hour (1 x Class 4 and 1 x Class 6).
- Princes Risborough to Claydon Junction – The service will consist of 1 train per hour, either Class 4 or 6. This will primarily be for Claydon / Calvert waste traffic. However, extension east or west of Claydon Junction can be accommodated by using the Oxford to Milton Keynes / Bletchley paths.

The Freight Traffic Forecasts, highlight that over the longer term more freight capacity than that specified in the 'core scheme may be required. Conversely, the incremental scheme may be over specified in terms of freight, indicating that the optimal infrastructure specification lies somewhere between the two. However, in the shorter term an enhanced freight capability may be required to cater for the expected number of Class 6 freight trains associated with the construction of HS2. This is because Calvert is proposed to be a major depot in terms of construction and the disposal of spoil from sites in London. Following the opening of HS2 there may be a further requirement for continuing Class 6 trains to cater for future maintenance activities on HS2 as engineering access to the new line is proposed to be via Calvert.

Table 3-4 Summary of benefits to freight provided by EWR-WS

Item	Description
1	A significant increase in rail freight and in particular intermodal traffic is forecast and is widely accepted by the industry. East West rail will provide some of the additional capacity required by the rail freight market for freight traffic between Southampton, Midlands and the North. This additional capacity can be utilised to address the constraints on the existing freight routes.
2	East West rail will provide a diversionary route for freight traffic from Southampton to the Midlands and the North improving operational flexibility. The added operational flexibility will allow the rail network to better deal with the day to day incidents and planned engineering works, therefore, improving network performance.
3	Intermodal freight services from Southampton to Leeds and other parts of North East are routed via Birmingham and Tamworth. Currently, three trains per day from Southampton to the North East via the Midlands. East West Rail will provide alternative paths via the Midland Main Line at Bedford. Therefore, traffic to these destinations can avoid the Birmingham area, releasing capacity for other passenger and freight services.
4	There are proposals for the development of public freight terminal at MOD Bicester and a new terminal near Junction 13 on the M1. These will help accommodate the increased demand for rail freight and enable more efficient distribution of freight across the UK network.
5	Intermodal freight services from Southampton to the North West and Scotland are routed via Coventry and Nuneaton, having to cross the heavily congested London to Birmingham passenger route at Coventry and freight traffic in the opposite direction do the same at Nuneaton. East West Rail will provide alternative paths via the West Coast Main Line at Bletchley. Therefore, traffic to these destinations can avoid the Coventry and Nuneaton area, releasing capacity for other passenger and freight services.

In summary, the forecasts in the 'Freight Market Study' and Network Rail's output specification signify the importance of East West Rail for the rail freight market and how it can be utilised to develop the SFN. The key qualitative benefits of the western section of East West Rail is summarised in Table 3-4

As a sensitivity test a calculation of the potential freight benefits of EWR-WS has been calculated, the results of which are shown in Appendix K. The appraisal model applies a Marginal External Cost (MEC) approach to estimating the potential benefits of the additional rail freight paths. The analysis shows that there could be significant benefits from operating additional freight paths via EWR-WS.

Connectivity

EWR-WS will provide significant benefits in terms of connectivity, linking the Great Western Main Line, Chiltern Main Line, West Coast Main Line and Midland Main Line in an east to west arc which allows interchange between routes without having to travel through London. For passengers this provides a significant benefit as in the majority of cases it allows a journey to be undertaken without having to interchange in London. This in turn will provide a knock-on benefit for capacity into and across London.

EWR-WS also provides the potential to provide new longer-distance/Cross Country links, such as Bristol to Peterborough or Reading to Nottingham as well as enabling some existing services to be re-routed to enable significantly faster end to end journey times, for example Bournemouth to Manchester.

EWR-WS is also proposed as a key access route for the transporting of materials for the construction of HS2 and the ongoing maintenance of the new line.

Routing

From an operation perspective it also allows many additional routing opportunities, including as a diversionary route which provides more flexibility when planning major renewal/enhancements work on other parts of the network and opportunities to deal with incidents, adding significantly to the overall resilience of the network. In combination with the Electric Spine project, EWR-WS provides many new opportunities for new freight services and new routing opportunities for existing freight movements (as discussed previously).

3.13. Key Risks

There are many risks associated with a project of this size. The following sections provide a summary of the likely main risk areas for this project. A detailed project risk register will be developed by Network Rail, in advance of that we provide an overview of the likely main areas of risk.

Technical

There are many technical risks which could potentially occur on a scheme of this scale. At this stage we consider that some of the key ones are:

- ***The specification/scope of the scheme*** – this is yet to be finalised with two schemes, the 'core' and 'incremental' schemes under consideration. The specification and scope of the two schemes are significantly different in terms of capability; in addition the electrification of the route needs to be considered in addition to the core and incremental schemes. It is likely to be some time before the scope and specification of the scheme are finalised (the NR delivery plan identified November 2015 for the end of GRIP 3 – Option Selection). The ongoing uncertainty around the final specification of the scheme could lead to increased costs particularly in some of the parallel workstreams where late changes to specification could lead to abortive work/

- ***The design of the scheme*** – The design of the scheme follows on from the specification. Uncertainty in the specification leads to similar issues within the design process. Significant technical exercises are needed during GRIP stages 2 – 3 to develop the technical solutions and cost estimates for the scheme. Network Rail are following efficient design processes in undertaking these tasks, but there is the potential for specification changes, or physical/practical issues discovered on site to lead to potentially abortive work and increased costs.

- ***Interfaces with other routes/schemes*** – EWR-WS has been developed to provide a nominal capacity along the route with the assumption that the services using EWR-WS can also be accommodated upon the wider rail network. There is also the assumption that other projects, such as Oxford area re-signalling and Midland Main Line Capacity Improvements/Electrification will provide solutions to issues

that have already been identified on the approach to Oxford and at Bedford Station in terms of capacity. In addition it is assumed that there is a deliverable solution for the perceived capacity issue on the WCML between Bletchley and Milton Keynes Central. The main risk in this area is that the EWR-WS project is assuming that problems outside of the scheme will be resolved to enable services to operate via EWR. This is a reasonable assumption to make at this stage, but changes to the scope or timing of these projects could impact upon the delivery of EWR-WS which is a key risk which therefore needs to be managed.

Procedural/Regulatory

There are many procedural and regulatory hurdles which need to be passed to enable the scheme to be implemented. These need to be included within the EWR-WS programme and successfully completed to enable the scheme to be delivered on schedule, key risks include:

- **Transport & Works Act Order/*Development Consent Order*** – Network Rail's current proposal is to seek TWA powers for:

  a. Two short sections of route which were constructed in 1846 outside the authorised limits of deviation; and
  b. Any works requiring additional land take (e.g. Winslow station and car park, electrification feeder stations etc.).

  Network Rail have allowed 18 months in the current programme (mid-2015 to late 2016) to obtain the necessary powers to enable the route to be constructed.

  The sections on both the Oxford to Bletchley and Aylesbury to Claydon Junction lines in the Steeple Claydon area, which are proposed to be realigned to accommodate HS2, are included in the HS2 Hybrid Bill now going through Parliament. Due to this process it is currently unclear whether EWR-WS will be initially constructed on the existing or the new alignments, as current Hybrid Bill timescales, with Royal Assent due in November 2017, do not appear to be compatible with a March 2019 EWR-WS completion date.

  In addition, new powers will be needed for the following sections of the route:

  - TWA or DCO process to enable a section of double track/passing loops to be built on the Aylesbury to Princess Risborough Route. This route was originally constructed as a single track line and hence widening of the original route will be required to accommodate a section of passing loop/double track along it;.
  - TWA or DCO process to enable additional capacity to be provided (the 'fifth' line) between Denbigh Hall Junction and Milton Keynes. Significant overbridge reconstruction and land take would be required for this section (if it proved to be the right solution) meaning new powers would be required.

  All other works along the route are planned to be undertaken under Permitted Development Rights. However, Network Rail has concerns about whether this strategy is appropriate, and is currently seeking further legal advice before a final decision is made. All of these process import the risk of delay into the project and will therefore have to be closely managed throughout the scheme development process.

- ***Network Rail / ORR processes*** – Throughout the development of the project Network Rail will have to follow their own internal process to enable the scheme to progress through the various GRIP stages. Key activities will include obtaining authorisation to proceed from Network Rail's investment panel, completing the network change process as well as the ORR's Enhancements Cost Adjustment Mechanism (ECAM)[6]. All of these processes take time to prepare for and undertake and hence any issues which arise during these processes could lead to potential delays to the project as well as scope and cost changes. The risks arising from these processes need to be managed to ensure that the project remains on programme for delivery within CP5.

[6] See Appendix A1 for further details

Financial

- ***Scheme Costs*** – The current cost estimates for the scheme are significantly higher than those assumed in the previous (2010) business case for the scheme. If the scheme costs, particularly for the 'incremental' are deemed to be unaffordable within Network Rail's funding for CP5 there is a risk that the scheme will have to be re-scoped to obtain an acceptable scheme cost. This will need to be managed throughout the scheme development process and this business case will provide an important part of the future consideration of the scheme.

3.14. Organisational Aims

Rail Policy

The Department for Transport has a specific transport policy for the rail network called "Expanding and improving the rail network". The key issue for this policy is stated as being:

> *Rail is vital to the UK's economic prosperity. If rail services are inefficient and do not meet people's needs for routing or frequency, business and jobs suffer. Rail links with airports and ports are business opportunities for travel, tourism and the transportation of goods.*
>
> *Encouraging people to use trains rather than cars, and reducing carbon emissions from trains and stations themselves, can also contribute to the UK's carbon reduction targets.*

The actions that have been announced under this policy are as follows:

- **Fares** – The government are aiming to reduce the costs of running rail services so that we can bring an end to above-inflation fare increases.
- **Developing and improving rail services** – improving industry leadership and co-operation through the Rail Delivery Group
- **Upgrading rail tracks and stations (HLOS)** – The £9 billion High Level Output Specification programme provides railway upgrades across England and Wales including: As part of this programme, the government are:
  - Upgrading stations and tracks
  - Increasing train capacity
  - Completing the Northern Hub
  - New rail link between the Great Western Main Line and Heathrow
- **Electrifying important railway routes** – To cut down on CO_2 emissions, reduce operating costs and speed up journeys, the government is electrifying important railway routes to phase out the use of diesel trains. By 2020, the government expect that around three-quarters of all passenger miles will be by electric train. The routes being electrified are:
  - Great Western Main Line
  - North West Triangle
  - North Transpennine, including Selby
  - the 'Electric Spine' from Southampton to South Yorkshire via the East Midlands
- **Crossrail** – This will be a new railway linking Maidenhead and Heathrow to Shenfield and Abbey Wood running through tunnels under central London, services are expected to begin in late 2018
- **Thameslink** – This programme will dramatically increase capacity on the cross London Thameslink route. The project is due to be completed in 2018
- **Intercity Express Programme (IEP)** – This will replace Britain's fleet of Intercity 125 High Speed Trains with faster, higher capacity, more comfortable and more environmentally friendly services, supporting the growth of some of Britain's busiest intercity rail routes.
- **Major main line and station upgrades** – Through the HLOS process upgrades of major main lines and some major stations to enable longer, faster trains to operate more frequently are being made. In addition alternative routes are being provided which will enable growing freight traffic to stay clear of the fast intercity trains. The following lines are being upgraded:

- East Coast freight alternative
- Great Western Main Line
- Transpennine
- Midland Main Line
- East Coast Main Line

Even with this extra capacity, the West Coast Main Line will be full by the mid 2020s. Therefore the government are also proposing to build High Speed 2 to provide more north-south rail capacity.

- **Rail passenger franchises** – The rail franchising programme provides long-term certainty to the market and will support major investments in the network. The programme emphasises an open approach to engaging with stakeholders and industry. As part of this new programme the Department will seek innovative bids that provide value-for-money for taxpayers and put passengers at the heart of the railways.

National Planning Statement

The government issued its National Planning Statement on National Networks in December 2014. NPS's are used to sets out the government's vision and policy for the future development of nationally significant infrastructure projects on the national road and rail networks. They also provide guidance for promoters of nationally significant infrastructure projects, and provide the basis for the examination by the Examining Authority and decisions by the Secretary of State.

The vision and strategic objectives for the National Networks are defined as follows:

> ***Vision*** *– The Government will deliver national networks that meet the country's long-term needs; supporting a prosperous and competitive economy and improving overall quality of life, as part of a wider transport system. This means:*
>
> ***Objectives****:*
>
> - *Networks with the capacity and connectivity and resilience to support national and local economic activity and facilitate growth and create jobs.*
> - *Networks which support and improve journey quality, reliability and safety.*
> - *Networks which support the delivery of environmental goals and the move to a low carbon economy.*
> - *Networks which join up our communities and link effectively to each other..*

Wider Policy/Objectives

In the context of the Government's vision for the transport system as a driver of economic growth and social development, the railway must:

- offer a safe and reliable route to work;
- facilitate increases in both business and leisure travel;
- support regional and local public transport to connect communities with public services, with workplaces and with each other, and
- provide for the transport of freight across the country, and to and from ports, in order to help meet environmental goals and improve quality of life.

It is the transport networks key role in enabling the growth of the economy which is one of the main reasons why the government has committed to investing significant sums in both the road and rail networks over the coming years. In this vein, EWR-WS has significant potential to support and help to sustain economic growth at the local and national levels.

For example, in Milton Keynes, plans have been made for an additional 31,000 new homes and up to 68,000 new jobs over the coming years. EWR-WS will provide significantly improved East-West rail connections and services increasing the size of the effective labour market for Milton Keynes whilst also enabling more efficient business travel to more destinations. In addition, anecdotal evidence indicates that the increased certainty of EWR-WS following its inclusion within the HLOS and NR's strategic business plan for CP5 has

increased developer interest in areas along the route, in particular Bicester, which the potential for development and hence growth to occur sooner than would be the case without EWR.

All of the Local Authorities along the route of EWR-WS support the scheme, viewing it as a key part of their economic development and growth aspirations. For example, the Local Enterprise Partnerships covering Oxfordshire and South East Midlands respectively, together with Buckinghamshire Business First are among many who recognise and welcome the important support East West Rail could give to economic growth.

In addition, the Local Transport Plan (LTP), of Buckinghamshire County Council, Oxfordshire County Council, Central Bedfordshire Council, Bedford Borough Council and Milton Keynes Council – all feature East West Rail as a priority transport infrastructure scheme to help deliver their local transport and planning objectives.

All of this indicates that the EWR-WS project is very well aligned with both national and local policy, particularly in terms of supporting growth and economic development as well as providing additional rail capacity, resilience and reliability.

3.15. Summary

The Strategic Case has highlighted the following:

Transport market characteristics:

- The expected growth in houses and employment across the study area will lead for increasing demands for travel;
- The car is the current dominant mode of transport across the study area;
- Currently east-west journeys by rail can only be completed by travelling into and out of London;
- A direct east-west link outside of London would enable quicker and more direct services whilst providing more capacity for passengers travelling into and out of London; and that
- Oxford, Bicester, Aylesbury, Bletchley, Milton Keynes and Bedford all have good connections to London, however, very few have links between them.

The role for EWR as part of the rail network:

- EWR-WS has been included within the High Level Output Specification (HLOS) for Network Rail's Control Period 5 (CP5) between 2014 and 2019 and is seen as a key piece of enabling infrastructure to support and enable the planned growth across the study area as well as forming a key pre-requisite for the 'Electric Spine' project and HS2.
- Two options have been developed for the EWR-WS scheme, the 'core' and 'incremental' schemes. The incremental scheme provides for significantly increased route capability, albeit at a significantly increased cost;
- EWR-WS will provide significant benefits in terms of connectivity, linking the Great Western Main Line, Chiltern Main Line, West Coast Main Line and Midland Main Line in an east to west arc which allows interchange between routes without having to travel through London providing significant benefits for passenger and freight services; and
- EWR-WS will provide some of the additional capacity required by the rail freight market for freight traffic between Southampton, Midlands and the North as well as provide a diversionary route for freight traffic from Southampton to the Midlands and the North improving operational flexibility

Key constraints and risks:

- There are some limited physical and operational constraints to bringing the scheme forward, but no fundamental obstacles to delivery; and
- There are currently risks to delivery caused by the uncertainty of the route specification, once agreed some of these risks will disappear.

Stakeholder policy fit:

- There is a high level of stakeholder support for the scheme across the study area, with all of the local authorities and LEPs supporting the scheme together with support from the rail industry;

- EWR-WS aligns closely with the organisational and policy aims of the DfT, particularly in terms of the schemes ability to support the growth of the economy by enabling the efficient transportation of passengers and goods;
- EWR-WS also aligns closely with the economic development aims of the LEPs and Local Authorities along the route, particularly in terms of supporting the planned development of jobs and housing in these areas;
- All of this indicates that the EWR-WS project is very well aligned with both national and local policy, particularly in terms of supporting growth and economic development as well as providing additional rail capacity, resilience and reliability.

4. Demand and Revenue Forecasting

4.1. Introduction

This section gives a brief description of the EWR-WS forecasting approach and sets out the assumptions that have been applied to it.

This section is structured into:

- An overview, giving a brief high level description of the forecasting model
- A description of the geographical scope of the models in the model suite
- Details of the scenarios tested and the service assumptions associated with each scenario
- A description of the bespoke Regional Rail Demand spreadsheet Model, split into model inputs and model calculations
- A description of the application of PLANET Long Distance for EWR-WS
- A brief summary of the results of the scenarios tested

4.2. Model suite overview

East West Rail (EWR) demand forecasting has adopted a hybrid approach, using three types of model to forecast demand between different origins and destinations. For locations along and near the EWR route, a bespoke Regional Rail Demand Model has been used, combining an elasticity-based and a 'gravity' model. For longer distance journeys, the PLANET Long Distance demand model has been used.

EWR Forecasting Regional Rail Demand Model

The Regional Rail Demand Model combines an elasticity-based forecasting model, used where generalised journey time (GJT) is expected to change by less than 30% from 2011 base-year levels, and a regression-based gravity model, used where GJT is expected to change by more than 30%. This approach is adopted because solely elasticity based models are not appropriate for use where service levels, and consequently demand, is expected to change markedly from a 2011 base year.

The model produces demand, revenue and passenger mile forecasts as well as journey time and user charges and user benefits at a station to station level within the study area.

Generalised journey times have been generated using modelled timetables in MOIRA. For each scenario, GJTs are input for the base year, a 'Do Minimum' timetable reflecting relevant committed schemes other than East West Rail, and a 'Do Something' timetable reflecting the scenario under consideration.

This model applies estimates of exogenous growth to the resulting forecasts to generate forecast year outputs for 2016, 2021, 2026 and 2031. Amongst the exogenous growth factors, we have taken National Trip End Model (NTEM) growth factors for population and employment as the central case and the growth factors derived from the local plan projections as a 'high growth' sensitivity test.

PLANET Long Distance

PLANET Long Distance (PLD) is a network model implemented in the EMME transport modelling software. The model is a rail assignment and nested mode choice model (i.e. between highway and public transport and, within public transport, between rail and air), with a supplementary simplified approach to estimating generated demand. PLD is one element of the PLANET Framework Model (PFM).

4.3. Geographical Scope

The forecasting suite incorporates two overlapping model areas:

- PLD covers all long-distance demand within England and Wales, whereas the
- Regional Rail Demand Model covers all rail demand within a defined study area.

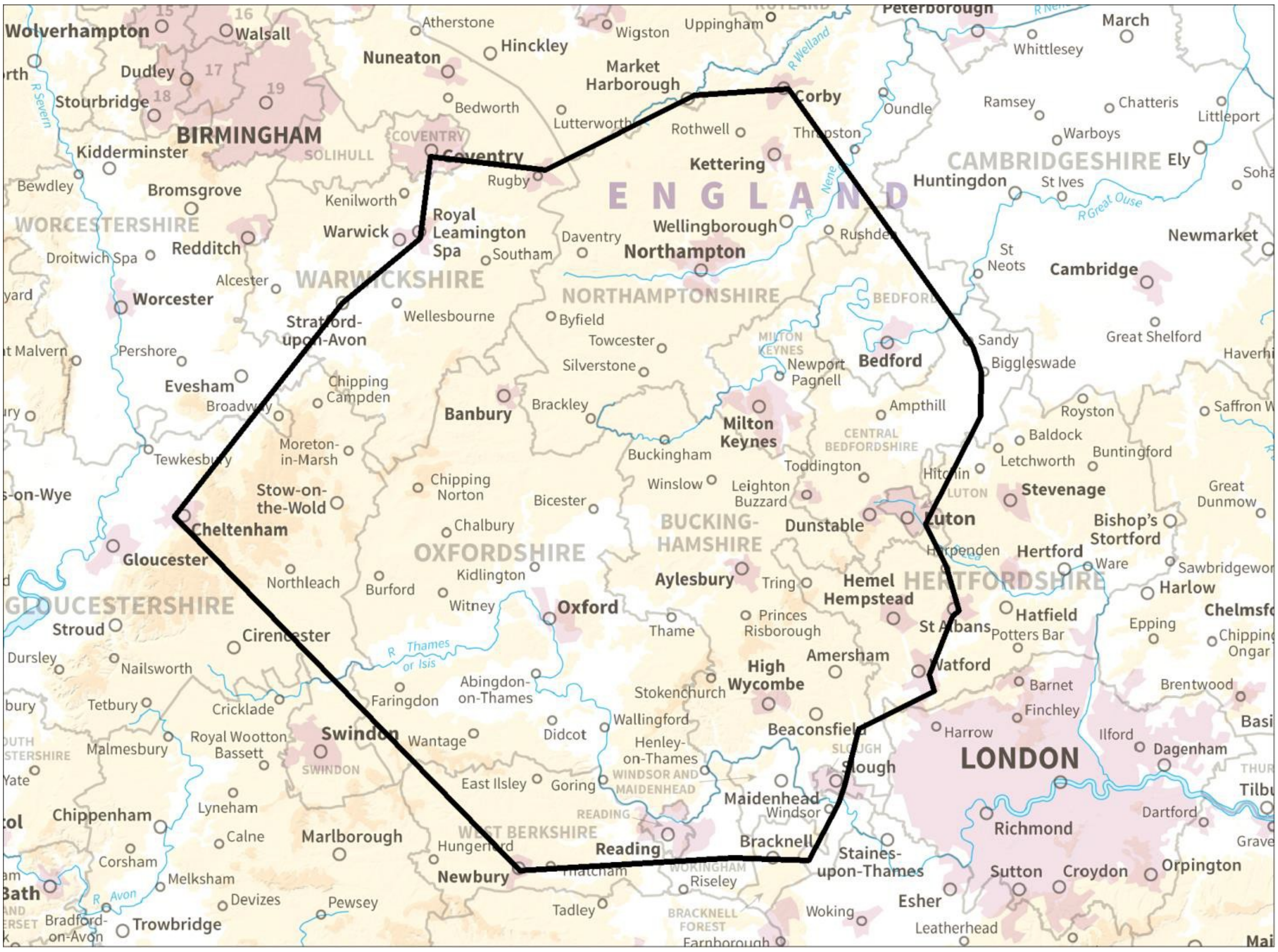
This has been determined through consideration of the impact of the EWR Core scenario on origin-destination (OD) flows. This has resulted in identification of eighty-six stations, as listed in Table 4-1. These are stations either directly on the EWR western section or considered to be significantly impacted by the EWR western section services.

Table 4-1 Study Area Stations

Study Area Stations			
Amersham	Corby	Leighton Buzzard	Sandy
Appleford	Coventry	Lidlington	Saunderton
Apsley	Culham	Little Kimble	Slough
Arlesey	Didcot Parkway	Long Buckby	St Albans
Ascot Berks	Fenny Stratford	Luton	St Albans Abbey
Aspley Guise	Flitwick	Luton Airport Parkway	Stewartby
Aylesbury	Gerrards Cross	Maidenhead	Stoke Mandeville
Aylesbury Vale Parkway	Goring & Streatley	Market Harborough	Stratford Upon Avon
Banbury	Great Missenden	Millbrook (Bedfordshire)	Tackley
Beaconsfield	Haddenham & Thame Parkway	Milton Keynes	Tilehurst
Bedford Midland	Harlington (Bedfordshire)	Monks Risborough	Tring
Bedford St Johns	Harpenden	Moreton In Marsh	Twyford
Berkhamsted	Hemel Hempstead	Newbury	Watford Junction
Bicester North	Heyford	Northampton	Wellingborough
Bicester Town	High Wycombe	Oxford	Wendover
Biggleswade	Islip	Pangbourne	Windsor & Eton
Bletchley	Kempston Hardwick	Princes Risborough	Winslow
Bow Brickhill	Kettering	Radley	Woburn Sands
Bushey	Kings Langley	Reading	Wokingham
Cheddington	Kings Sutton	Reading West	Wolverton
Cheltenham Spa	Leagrave	Ridgmont	
Cholsey	Leamington Spa	Rugby	

The study area covered by the Regional Rail Demand model is shown graphically in Figure 4-1.

Figure 4-1 Geographic Scope of Regional Rail Demand Model



In order to avoid double counting of demand within the EWR study area, an equivalent area was defined for PLD, and journeys made entirely within this area were excluded from the results.

4.4. Scenario definition and services

Service assumptions are common to both models but have been implemented separately. A brief description of the service enhancements is provided in the following sections.

4.4.1. Do Nothing

The Do Nothing scenario is as per the MOIRA December 2013 timetable.

4.4.2. Do Minimum scenario

The Do Minimum timetable is required to provide a basis for comparison with the appraisal timetables, taking into account committed schemes. The service upgrades included in the Do Minimum scenario specification are as follows:

- **Chiltern Evergreen 3**. Existing services between London Marylebone and Bicester North extended to Oxford, calling at Bicester Town (instead of Bicester North), Oxford Parkway and Oxford. Additionally, further services added to bring the overall level from the existing (approx.) 1tph to 2tph. Eight trains per day also call at Islip, in the peaks. It is assumed that journey times to Bicester Town are the same as those for the current services to Bicester North, with further inter-station journey times as follows:
  - Bicester Town – Islip: 4 minutes
  - Islip – Oxford Parkway: 2 minutes
  - Oxford Parkway – Oxford: 8 minutes

- **Thameslink Midland Main Line service frequency improvements**. An additional 3tph peak and 1tph inter-peak as per the TSGN Franchise Business Case (August 2013).

The effects of the GreatWestern refranchising and the MML electrification schemes were also considered for inclusion within the Do Minimum scenario, however as no committed timetabling changes were in place at the time of demand modelling no timetable amendments are included for these service changes.

4.4.3. Do Something scenarios

4.4.3.1. EWR Core scenario

Six scenarios were modelled for the Core EWR services. These were three versions of the Core scenario considered for both electrified (EMU) and not electrified (DMU) rail. The scenarios are as follows:

- **Core scenario (DMU)**
  The Core scenario assumes the following service changes:
  - Existing London Marylebone – Aylesbury (via High Wycombe and Princes Risborough) services (approx. 1tph in each direction) extended to Milton Keynes, stopping at Winslow and Bletchley.
  - A new service between Oxford and Milton Keynes (1tph in each direction) stopping at Bicester Town, Winslow, and Bletchley.
  - A new service between Oxford and Bedford (1tph in each direction) stopping at Bicester Town, Winslow, Bletchley, Woburn Sands and Lidlington.
  - Removal of existing Oxford – Bicester Town service.
  - Retention of existing Bedford – Bletchley service (approx. 1 tph).

- **Core scenario (DMU) – Bletchley to Bedford 60mph**
  This scenario is a sensitivity test on the Core scenario with a lower, 60mph, line speed on the existing route between Bletchley and Bedford.
- **Core scenario (DMU) – Increased regional growth**
  This scenario is another sensitivity test on the Core scenario using exogenous growth rates derived from local plans.
- **Core scenario (EMU)**
  This is the Core scenario as described for the DMU but instead of two new services, one between Oxford and Milton Keynes and the other between Oxford and Bedford, they are extensions of existing stopping services between London Paddington and Oxford which alternate between the two destinations (stopping at the same intermediate stations). These services are assumed to split/join at Didcot Parkway, requiring a 5 minute dwell time.
- **Core scenario (EMU) – Bletchley to Bedford 60mph**
  This is a sensitivity test analogous to the DMU version but based on the EMU scenario service pattern.
- **Core scenario (EMU) – Increased regional growth**
  This is a sensitivity test analogous to ‘EWR 1.0 DMU ST HG’, but based on the EMU scenario service pattern.

Journey time assumptions used in the modelling, as shown in Table 4-2, were either taken from RailSys modelling of the EWR route or, in the case of Bletchley to Woburn Sands and Woburn Sands to Lidlington in the 60mph sensitivity test, were calculated from the assumed journey times with the required reduction from the service speed reduction. A dwell time of 30 seconds was assumed for each station stop with the exception of Didcot Parkway where a 5 minute dwell time was modelled for to allow for splitting and joining of stock.

Table 4-2 Journey time assumptions

Station from	Station to	60 mph sensitivity test	All other scenarios
Oxford	Bicester Town	10	10
Bicester Town	Winslow	10	10
Winslow	Bletchley	7	7
Bletchley	Milton Keynes	6-7	6-7
Bletchley	Woburn Sands	6	6
Woburn Sands	Lidlington	7	6
Lidlington	Bedford	10	8
Aylesbury	Winslow	15	15

4.4.3.2. Cross country scenarios

A number of longer distance services using the EWR infrastructure have been tested in the modelling suite. These scenarios all build on the Core scenario (EMU) and in every case the service frequency is 1tph in each direction. These are:

- **Bournemouth – Manchester via EWR**
  This scenario tests the diversion of the current Cross Country services between Bournemouth and Manchester at Oxford to run via the EWR infrastructure and the West Coast Main Line calling at Milton Keynes, Crewe, Wilmslow, and Stockport. As this removes services between Oxford and Birmingham and Birmingham and Manchester, additional 'replacement' services were included between Paddington and Birmingham New Street (an extension of the existing Paddington – Oxford fast services) and between Birmingham New Street and Manchester Piccadilly.
- **Bournemouth – Manchester plus Reading – Nottingham**
  This scenario builds on the 'Bournemouth – Manchester via EWR' by adding a long-distance service between Reading and Nottingham via Bedford. To facilitate this, EWR Core services between Oxford and Bedford (extensions of the London – Paddington stopping services) were removed (EWR services between Oxford and Milton Keynes were unchanged). In this scenario the Reading – Nottingham service stops at Oxford, Bletchley, Bedford, Kettering, Leicester, and East Midlands Parkway.
- **Bournemouth – Manchester plus Bristol - Peterborough**
  This scenario builds on the 'Bournemouth – Manchester via EWR' by including a long-distance service between Bristol and Peterborough, with stops at Bath Spa, Swindon, Oxford, Bicester Town, Bletchley, Bedford, Kettering and Corby.
- **Bournemouth – Manchester plus Reading to Nottingham & Bristol to Peterborough**
  This scenario builds on the 'B-M plus Reading - Nottingham' by including the long-distance service between Bristol and Peterborough described in B-M plus Bristol - Peterborough.

The Cross Country services were modelled using a maximum line speed of 100mph, as per the Core scenario (EMU) and at an increased line speed of 125mph over the EWR infrastructure. The inter-station journey times for the sections of route outside of the EWR infrastructure were inferred from the December 2013 timetable and a summary of these is shown in Table 4-3. On existing sections of line the original station dwell times were retained and a 30 second dwell time was assumed along EWR sections of line.

Table 4-3 Journey time assumptions

Station from	Station to	100 mph on EWR	125 mph on EWR
Bournemouth – Manchester			
Bournemouth	Stations to Oxford	As per Dec '13 timetable	As per Dec '13 timetable
Oxford	Milton Keynes	28	25
Milton Keynes	Crewe	64	64
Crewe	Wilmslow	16	16
Wilmslow	Stockport	9	9
Stockport	Manchester	12	12
Reading – Nottingham			
Reading	Oxford	20	18
Oxford	Bletchley	22	19
Bletchley	Bedford	15	14
Bedford	Kettering	17	17
Kettering	Leicester	21	21
Leicester	East Midlands Parkway	16	16
East Midlands Parkway	Nottingham	13	13
Bristol – Peterborough			
Bristol	Bath Spa	11	11
Bath Spa	Swindon	27	27
Swindon	Oxford	29	29
Oxford	Bicester Town	10	9-10
Bicester Town	Bletchley	15	13
Bletchley	Bedford	15	14
Bedford	Kettering	17	17
Kettering	Corby	10	10
Corby	Peterborough	35	35

4.5. Regional Rail Demand Model

As described above, a Regional Rail Demand Model was developed for the defined EWR study area, combining an elasticity-based approach where GJTs are forecast to change by more than 30% between the Do Nothing scenario and the EWR Core scenario (EMU).

4.5.1. Inputs

Generalised journey times

Generalised journey times (GJTs) were obtained from the MOIRA rail modelling program. A bespoke version of MOIRA covering the stations in-scope for East West Rail services was obtained, with aggregated stations outside of the study area. This software contains the current rail timetable (Dec 2013) and includes functionality to modify the current rail timetables i.e. adding/removing a service, changing the service frequency etc. In the case of East West Rail, this involved adding entirely new rail services to reflect the proposed service provision.

Fares

Future revenue is estimated as the demand between two stations multiplied by the fare between those two stations. For Do Something scenarios the current fare structure was not applicable since in many cases the current fares reflect journeys made via London and are logically constrained by the fare to and from London. This means that these fares are uncompetitive compared to similar local journeys in the area and compared

to alternative modes. Instead, where the GJT is estimated to change by more than 30% in the EWR Core scenario (EMU) (i.e. for OD pairs where the gravity model is used) an average fare per mile was estimated from existing journeys, and applied to estimates of the highway distance between station pairs, so as to reflect the car competitive journey. An average fare per mile of £0.21/mile for Season and £0.28/mile for Non Season journeys was derived, calculated from the base MOIRA output for Season and Non Season journeys where Season refers to journeys made with a season ticket and Non Season refers to those made without one.

Distance

Station-to-station distance estimates are required to derive the future fares structure as outlined above, and to provide outputs in terms of passenger miles. Furthermore the factors required to estimate demand according to journey purpose (business, commute and other) from demand segmented by ticket type (full, reduced and season) differ depending on the distance travelled. Distances for Do Nothing and Do Minimum scenarios have been obtained from MOIRA, while distances for the Do Something scenarios have been obtained from MOIRA where the change in GJT is less than 30% or driving distances between stations have been adopted as a proxy where the change in GJT is greater than 30%.

Base rail demand

The base rail demand is taken from MOIRA (2013) – this demand is treated as 2011 base year demand.

Exogenous growth factors

Exogenous growth factors are used to forecast future year demand for 2016, 2021, 2026 and 2031. The sources of these factors are detailed in Table 4-4.

Exogenous growth factors for population, employment and non-car ownership are obtained from the NTEM 6.2 forecast at the district level. As the NTEM forecast is last updated in 2009 and the district level is not station specific, we have also created a 'high growth' sensitivity test with the population and employment growth rates that have been collated from current local plans at the station level for the year 2031. They have then been interpolated between 2011 and 2031 to obtain the growth rates for the years in between.

Table 4-4 Sources of exogenous growth inputs and growth factors from 2011

Growth factor	Source	2016	2021	2026	2031
Population	National Trip End Model (NTEM) version 6.2	Differs by district	Differs by district	Differs by district	Differs by district
Employment	National Trip End Model (NTEM) version 6.2	Differs by district	Differs by district	Differs by district	Differs by district
Non-car ownership	National Trip End Model (NTEM) version 6.2	Differs by district	Differs by district	Differs by district	Differs by district
Fares growth	PDFH 5.1	1.05	1.10	1.16	1.22
GDP per capita	WebTAG Databook May-14	1.06	1.18	1.30	1.44
Road journey times	PDFH 5.1	1.02	1.04	1.06	1.08
Population (alternative 'HG' scenario)	Atkins estimates based on review of Local Authority planning policies	Differs by station	Differs by station	Differs by station	Differs by station
Employment (alternative 'HG' scenario)	Atkins estimates based on review of Local Authority planning policies	Differs by station	Differs by station	Differs by station	Differs by station

4.5.2. Calculations – Elasticity approach

For OD pairs where the percentage change in GJT is less than 30%, an elasticity approach is used. Whether an elasticity approach is used is defined by the difference between the Do Minimum and Do Something GJTs for the Core scenario (EMU) and the same modelling approach is then applied to all Do Minimum and Do Something forecasts for that OD pair. This is done in order to ensure that changes in demand can always be attributable to changes in GJT, rather than changes in modelling approach from one scenario to another.

The elasticity equation is shown below:

$$Forecast\ demand = Base\ Demand \times (1 + \Delta GJT)^e$$

where *e* is the elasticity of demand to changes in GJT, which is assumed to be -0.9 for both Season and Non Season journeys.

4.5.3. Calculations - Gravity approach

The gravity model forecast for Season journeys is a function of:

$$Forecast\ demand = GJT^a \times OriginPopulation1^b \times OriginPopulation2^c \times DestinationEmployment^d \times £/mile^e$$

Where *a, b, c, d, e* are gravity model parameters:

- GJT (a)
- the number of population within 2km of origin (b)
- the number of population between 2km and 5km of origin (c)
- the number of jobs between 500m and 2km of destination (d)
- £/mile (e)

The model parameters for Season are shown in Table 4-5.

Table 4-5 Gravity model parameters - Season

	a	*b*	*c*	*d*	*e*
Season	-1.54	0.59	0.09	0.64	-1.41

The gravity model forecast for Non Season journeys is a function of:

$$Forecast\ demand = GJT^a \times OriginEmployment^b \times DestinationEmployment^c \times £/mile^d$$

Where *a, b, c, d* are gravity model parameters:

- GJT (a)
- the number of jobs within 2km of origin (b)
- the number of jobs within 2km of destination (c)
- £/mile (d)

The model parameters for Non Season are shown in Table 4-6.

Table 4-6 Gravity model parameters – Non Season

	a	*b*	*c*	*d*
Non Season	-2.62	0.79	0.93	-1.85

Gravity model parameters calibration

The gravity model was calibrated on the top 20% percentile by demand of existing origin-destination pairs within the study area for non-seasons journeys and the top 10% percentile by demand of origin-destination pairs for Season journeys. A broad range of station pairs were considered to maximise the coverage of the calibration sample for:

- Areas of low and high population;
- Areas of low and high employment;
- Journey lengths;
- Levels of low and high rail accessibility

For each origin-destination pair used for model calibration:

- MOIRA was used to extract: the existing bi-directional demand and revenue by Full\Reduced\Season ticket types, the generalised journey time, the average rail yield (fare), and the rail distance;
- Typical highway distances and journey times were obtained from Transport Direct;
- Population and employment were extracted from 2011 Census and 2011 Business Register and Employment Survey data around each station in buffers ranging from 0.5km to 5km.

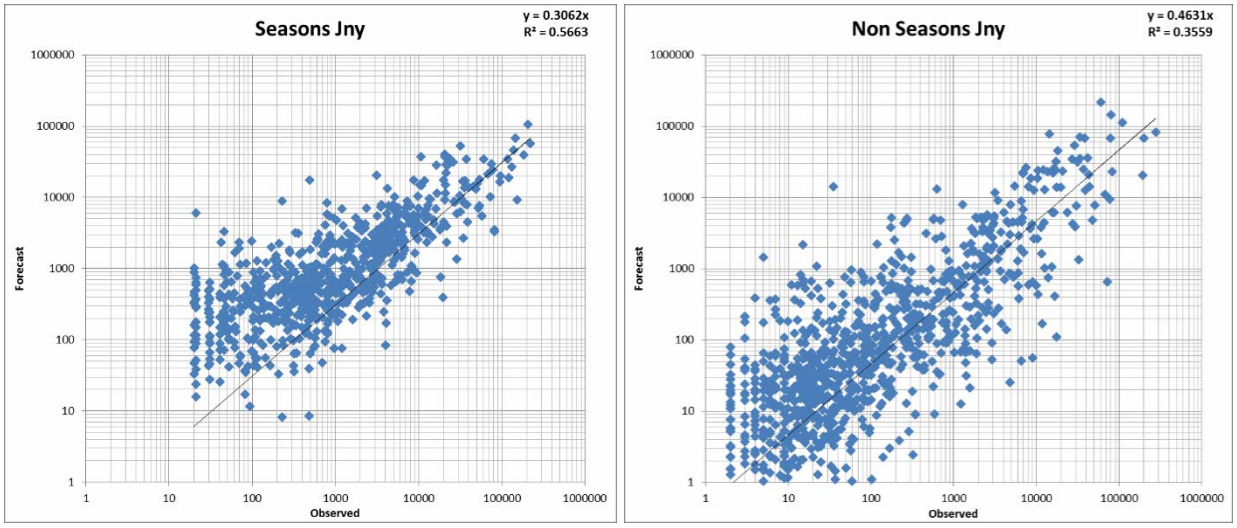
The above provided the input dataset for calibration where the single dependent variable (rail demand) is affected by the multiple independent variables (e.g. population, employment, fare/km, generalised journey time, relative levels of accessibility by rail and highway).

A log transformation was conducted to both dependent and independent variables to allow a least squared multiple linear regression to be carried out to provide a best fit regression between demand and the set of explanatory variables.

A large number of possible gravity model structures were tested separately for season and non-season journeys. The chosen models provided the best fit to the calibration data and provided an intuitive model structure and parameters, recognising that parameters should be independent so as not to distort the results.

Figure 4-1 shows observed flows against forecast flows for all OD pairs within the study area for Season and Non Season journeys.

Figure 4-2 Gravity model calibration



The graphs in Figure 4-1 show that the gravity model explains a considerable amount of the variation between station pairs although considerable variation remains and with a systematic tendency to forecast demand lower than the observed demand as indicated by the trend line coefficients of below 0.5. This conservative model structure is considered suitable for forecasting demand between O-D pairs where step changes in rail accessibility make forecasting an incremental change via GJT elasticity unreliable. Factors which are not considered within the gravity model, but which may account for some of the remaining variation in demand between O-D pairs, include:

- Varying catchment areas – for instance stations may attract passengers from varying areas depending on the direction of travel, or on the total length of the journey.
- Socio-economic factors – for instance the University associations.
- The spatial setting of each station – for example relatively isolated areas may attract a higher number of trips than station within an urban conglomeration.

4.5.3.1. Calculations - exogenous growth

Exogenous growth has been applied both to forecasts using the elasticity-based and to those produced using the gravity model. The impact of projected growth in GDP per capita, population, employment, car ownership, fares and road journey times has been estimated by applying an elasticity-based approach. The elasticity values in Table 4-7 have been adopted for the Regional Rail Demand Model from PDFH 5.1 following the non-London South East parameters.

Table 4-7 Elasticity values

	Non London South East	
	Non Season journeys	**Season journeys**
GDPpc	1.20	n/a
Population	1.00	1.00
Employment	0.00	1.00
Car Ownership	0.71	0.00
Fares	-1.00	-0.60
Road Journey Times	0.30	0.30

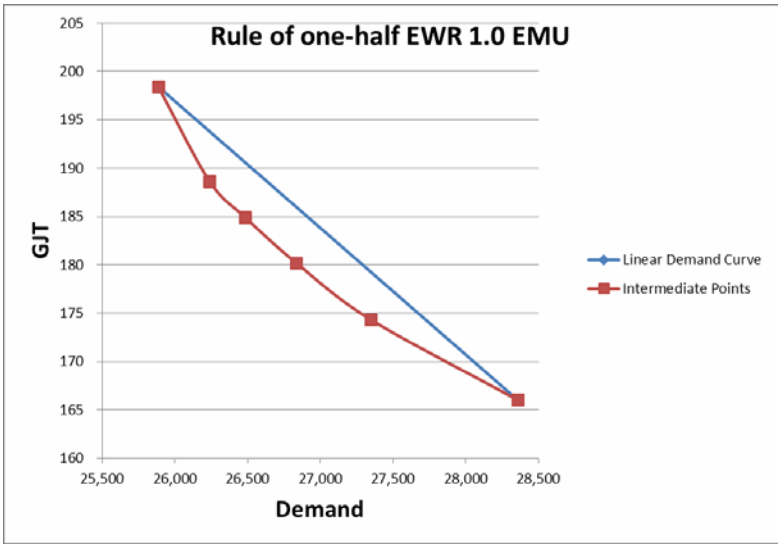
4.5.4. Calculations - benefits

The key outputs from the gravity model which input to the economic appraisal are change in revenue, change in passenger miles (which is used to estimate highway vehicle miles removed) and user benefits, both time-saving benefits due to reductions in real and perceived journey time savings and benefits arising from different fares between the Do Something and Do Minimum scenarios. User benefits are calculated using the 'rule of a half', which can be expressed as follows:

$$Benefits = \left(\frac{old\ demand + new\ demand}{2}\right) \times (new\ GJT - old\ GJT)$$

Due to the large changes in GJT for some OD pairs, the rule of a half was modified for the appraisal. This is because the demand function is typically not linear but the linear function (inherent in the rule of a half) serves as a reasonable approximation where the changes to costs (in this case, perceived journey times) are small. However when changes are large, the assumption that a straight line can approximate a non-linear demand function is not valid and the normal rule of a half tends to overstate benefits. The modified approach, which is in line with WebTAG guidance, involves calculating demand at intermediate points of cost change. Benefits are estimated between each consecutive pair of intermediate points using the conventional rule of a half and summed over all the intermediate points to give the total benefit as illustrated in Figure 4-2. For the EWR appraisal, intermediate points were defined at the Do Something GJT plus 20, 40, 60 and 80 minutes. In each case, demand was calculated using the same elasticity/gravity model approach with the Do Something GJT set to equal the MOIRA-derived GJT plus an additional amount (with the Do Minimum GJT serving as a maximum to provide a backstop).

Figure 4-3 EWR non-linear demand function



The appraisal outputs are disaggregated by journey purpose using the factors defined in Table 8 as the values of time used to assign monetary values to the perceived journey time benefits differ for business, commute and other journey purposes.

Table 4-8 Ticket type to journey purpose demand conversion factors[7]

Journey purpose	Full	Reduced	Seasons	Total
PDFH 5.1 Table B0.6 (Journeys <20 miles excluding within PTE areas)				
Commuting	17.9%	18.7%	28.1%	64.7%
Business	2.0%	3.1%	0.9%	6.0%
Leisure	6.9%	20.8%	1.6%	29.3%
PDFH 5.1 Table B0.7 (Journeys 20-100 miles excluding within PTE areas)				
Commuting	9.7%	4.1%	22.4%	36.2%
Business	5.0%	6.7%	0.9%	12.6%
Leisure	7.4%	42.9%	0.9%	51.2%
PDFH 5.1 Table B0.8 (Journeys >100 miles excluding within PTE areas)				
Commuting	1.7%	2.1%	0.2%	4.0%
Business	8.6%	12.9%	0.3%	21.8%
Leisure	9.1%	65.0%	0.1%	74.2%

4.6. PLANET Long Distance

PLANET Long Distance (PLD) has been used to provide estimates of future demand with and without East West Rail, and in particular to forecast changes to long-distance demand, as a result of amended or additional Cross Country services.

The PLD model forms part of the PLANET Framework Model (PFM) and uses the EMME transport modelling software. Further information on PFM can be found on the HS2 Ltd. website[8].

[7] The values for outside the South East were used, given the likely location and nature of EWR demand.
[8] PLANET Framework Model (PFM V4.3) - Model Description

4.6.1. Inputs

Modelled network and services

The scenarios outlined in 4.4.3 were coded within the PLD model, with the journey time assumptions as outlined in Table 2 andTable 3.

4.6.2. Outputs

Once run, the following output OD matrices were generated for input to economic appraisal:

- Rail demand
- Rail in-vehicle-time
- Uncrowded rail in-vehicle-time
- Rail access/egress Time
- Wait Time
- Boardings
- Fares
- Passenger-km

Matrices were exported for each trip purpose (business, commuting, and other purposes, for car available and car-not available demand). Additionally, a Control Matrix was produced to remove from the matrices all short distance Origin Destination Pairs, which had been analysed by the Regional Rail Demand Model.

4.7. Results

4.7.1. EWR Core scenarios

4.7.1.1. Regional Rail Demand Model results

Using the Regional Rail Demand Model, Table 4-9 details the results from the model tests for the Core scenarios both electrified (EMU) and not electrified (DMU). The model forecasts a significant increase in demand as a result of East West Rail, suggesting an increase in the region of 1.8m journeys (71m passenger miles) per annum at today's levels of base demand and nearly £11m in additional revenue generated. East West Rail is expected to save around 1.6m hours in travel time for its users.

The electrified scenario gives similar results to the DMU scenario. The results are likely to be impacted by the assumed additional dwell time inserted at Didcot Parkway for splitting/joining, which offsets the benefit of not having to interchange at Oxford for services on EWR, and also impacts on existing demand between locations such as Reading, Didcot and Oxford. The increase in revenue is considerably higher than the increase in demand. This is likely to be partly the result of the EMU scenario benefiting longer journeys with higher fares, and partly an artefact of the proxy distance-based fares structure as described in 4.5.1. The significant decrease in average benefit per user has been calculated based on Do Minimum demand experiencing a change in GJT and is therefore reflective of the much broader range of journeys benefiting from the extended services in the EMU scenario.

Table 4-9 Core scenario (EMU) vs Core scenario (DMU) (2011)

	DMU	EMU	% difference
Total change in demand (million)	1.86	1.81	(3%)
Total change in revenue (£m)	10.8	16.8	+56%
Average fare per journey	5.8	9.3	+60%
Total change in passenger miles (million)	71	75	+5%
Average fare per passenger mile	0.15	0.22	+48%
Total travel time saving benefits (2016) (million hours)	1.6	1.6	+3%
Average benefit per user (2016) (minutes)	50	13	(74%)

Table 4-10 details the ten station origin-destination pairs in Core scenario (EMU) with the greatest change in demand. The top then journeys typically show a very low level of demand in the Do Minimum and a high level of generated demand in the Do Something. This is consistent with a gravity-model approach.

In addition there is a high overlap between those journeys with the largest journey time benefits and those with the greatest increase in demand, as would be expected.

Table 4-10 Journey pairs with greatest increase in demand for Core scenario (EMU) (2011)

Origin station name	Destination station name	Do Minimum Demand	Do Something Demand	Change in demand	Benefits (hours)	Average benefit per user (minutes)	DM GJT	DS GJT
Bletchley	Oxford	15	34,833	34,818	26,017	89.59	216	54
Milton Keynes	Oxford	217	30,397	30,180	21,047	82.50	188	68
Aylesbury	Milton Keynes	23	23,835	23,812	19,689	99.03	237	67
Oxford	Milton Keynes	413	24,193	23,780	12,865	62.74	149	67
Bedford	Oxford	87	23,541	23,454	23,028	116.95	266	82
Bicester Town	Oxford	112,663	136,058	23,395	24,712	11.92	39	31
Milton Keynes	Aylesbury	15	22,930	22,915	18,913	98.91	237	61
Oxford	Bletchley	42	21,486	21,444	14,933	83.24	202	55
Bletchley	Bicester Town	462	20,921	20,458	18,190	102.08	256	42
Bletchley	Aylesbury	4	19,684	19,680	16,133	98.33	244	56

Table 4-11 shows the results of the sensitivity test with increased journey times between Bedford and Bletchley. This was to test the impact of not increasing the line speed in this area from current levels and the results show a 1-3% reduction on all measures. A minority of services are impacted in this scenario, and the impact is modest given the proportion of time that a full line speed is reached in the Core scenario (EMU).

Table 4-11 Core scenario (EMU) with and without the Bletchley to Bedford 60mph limit (2011)

	Core scenario (EMU)	Bletchley - Bedford 60mph	% difference
Total change in demand (million)	1.8	1.8	(2%)
Total change in revenue (£m)	16.8	16.2	(3%)
Average fare per journey	9.3	9.2	(1%)
Total change in passenger miles (million)	75	73	(3%)
Average fare per passenger mile	0.22	0.22	(1%)
Total travel time saving benefits (2016) (million hours)	1.6	1.6	(2%)
Average benefit per user (2016) (minutes)	13.0	12.8	(2%)

Table 4-12 shows the results (for 2011 and a 2031 forecast year) of the sensitivity test with growth rates determined by examination of local plans (Core scenario (EMU) – Increased regional growth). This shows a 10-12% increase in demand, passenger miles, benefits and revenue (with no growth in average yields assumed).

Table 4-12 Core scenario (EMU) with and without the Increased regional growth (2011 and 2031)

	Core scenario (EMU) (2011)	Core scenario (EMU) (2031)	% difference	Increased regional growth (2011)	Increased regional growth (2031)	% difference
Total change in demand (million)	1.8	2.5	37%	2.5	2.8	12%
Total change in revenue (£m)	16.8	23.7	42%	23.7	26.1	10%
Average fare per journey	9.3	9.6	3%	9.6	9.5	(2%)
Total change in passenger miles (millions)	75	103	37%	103	114	11%
Average fare per passenger mile (£)	0.22	0.23	3%	0.23	0.23	(0%)
Total travel time saving benefits (2016) (million hours)	1.6	2.1	29%	2.1	2.3	12%
Average benefit per user (2016) (minutes)	13.0	13.4	3%	13.4	14.0	5%

Table 4-13 shows the OD pairs with the largest increase in demand when considering the increased regional growth. All of the most affected journey pairs by additional change in demand begin or end in Milton Keynes which is in line with growth plans for this area.

Table 4-13 Journey pairs with the greatest increase in demand between the Do Minimum and Do Something for the Core scenario EMU with Increased regional growth (2031)

Origin station name	Destination station name	Do Minimum demand (2031)	Do Something demand (2031)	Change	Do Minimum demand for Increased regional growth (2031)	Do Something demand for Increased regional growth (2031)	Change
Milton Keynes	Oxford	378	46,236	45,858	623	70,697	70,074
Milton Keynes	Aylesbury	26	34,966	34,940	43	54,266	54,223
Milton Keynes	Bicester Town	904	25,465	24,561	1,500	42,144	40,644
Aylesbury	Milton Keynes	41	35,986	35,945	50	49,305	49,255
Bletchley	Bicester Town	615	29,028	28,413	839	38,534	37,694
Milton Keynes	Reading	5,339	21,066	15,727	8,029	32,010	23,981
Didcot Parkway	Milton Keynes	119	10,505	10,386	189	17,322	17,133
Bicester Town	Milton Keynes	799	22,907	22,108	1,111	29,727	28,616
Milton Keynes	High Wycombe	471	13,499	13,028	772	20,226	19,453
Milton Keynes	Didcot Parkway	113	9,689	9,575	187	15,898	15,711

4.7.1.2. PLANET model results

Although longer-distance services are not directly enhanced by the EWR Core scenario, this has been run through the PLD model in order to provide a basis for comparison with scenarios with enhanced Cross Country services. This scenario shows a demand increase of up to 100,000 journeys per annum for a 2026 forecast year and a benefit of around 270,000 hours per annum.

4.7.2. Cross Country scenarios

4.7.2.1. Regional Rail Demand Model results

Using the Regional Rail Demand Model, Table 4-14 details the results from the model tests for the Core scenario (EMU) compared with the Cross Country scenarios (detailed in 4.4.3.2). This shows comparatively modest benefits for regional rail demand (mainly between Reading, Oxford and Milton Keynes, between which there would be non-stop services.

Table 4-14 Cross Country scenarios compared with Core scenario (EMU) (2011)

	B–M via EWR (100mph)	B–M via EWR (125mph)	B-M plus R-N (100mph)	B-M plus R-N (125mph)	B-M plus B-P (100mph)	B-M plus B-P (125mph)	B-M plus R-N & B-P (100mph)	B-M plus R-N & B-P (125mph)
Total change in demand (million journeys)	0.1	0.1	0.2	0.4	0.5	0.6	0.6	0.8
Total change in revenue (£m)	1.4	1.7	5.1	8.6	7.7	8.6	9.9	13.8
Average fare per additional journey (£)	14.0	13.9	22.2	20.8	14.1	14.4	16.5	17.1
Total change in passenger miles (millions)	5	6	17	29	28	31	34	47
Average fare per passenger mile (£)	0.27	0.27	0.30	0.30	0.28	0.28	0.29	0.29
Total travel time saving benefits (2016) (hours)	0.0	0.1	0.1	0.3	0.5	0.6	0.5	0.7
Average benefit per user (2016) (minutes)	2.4	2.7	1.4	4.1	7.6	8.0	6.5	9.0

4.7.2.2. PLANET summary results

Table 4-15 details the change in demand and journey time benefits associated with the Cross Country scenarios, relative to the Core scenario (EMU). Results are shown for the first forecast year (2026). The results show an increase in demand of around one million additional trips and around two million hours in journey time savings. The incremental benefit of Bristol – Peterborough services is relatively small compared to the incremental benefit of Reading – Nottingham services, probably reflecting a stronger existing demand for travel between the stations served by a Reading – Nottingham service. Modelling higher line speeds on the EWR infrastructure appear to bring little additional benefit.

Table 4-15 Change in demand and benefits of Cross Country scenarios (2026)

	Change in demand (million)	Benefits (million hours)
Bournemouth – Manchester (B-M) via EWR (100mph)	0.8	1.8
Bournemouth – Manchester (B-M)via EWR (125mph)	0.8	1.9
B-M plus Reading – Nottingham (100mph)	1.1	2.5
B-M plus Reading – Nottingham (125mph)	1.1	2.5
B-M plus Bristol – Peterborough (100mph)	0.8	2.0
B-M plus Bristol – Peterborough (125mph)	0.9	2.1
B-M plus Reading – Nottingham & Bristol – Peterborough (100mph)	1.1	2.6
B-M plus Reading – Nottingham & Bristol – Peterborough (125mph)	1.1	2.6

Table 4-16 shows the top ten origin-destination zone pairs for the Bournemouth – Manchester via EWR scenario, ordered by perceived journey time benefits. As would be expected, journeys between Manchester and Oxford and Reading show the highest benefit, with a significant journey time saving and a strong existing demand. Journeys between Crewe or Birmingham and Manchester would also benefit as a result of additional services and crowding relief.

Table 4-16 Top ten ODs by benefits for Bournemouth – Manchester via EWR (2026)

#	Origin Zone	Destination Zone	Benefits (million minutes)	Change in demand (thousand journeys)	DM GJT (minutes)	DS GJT (minutes)	% change in GJT
1	Manchester	Oxford	12.8	13	343	277	-19%
2	Oxford	Manchester	12.7	13	343	278	-19%
3	Manchester	Reading	9.8	10	366	293	-20%
4	Reading	Manchester	9.5	10	366	293	-20%
5	Crewe	Manchester	6.6	7	155	147	-5%
6	Manchester	Crewe	6.2	6	158	150	-5%
7	Manchester	Birmingham	8.4	8	215	208	-3%
8	Birmingham	Manchester	8.4	8	216	209	-3%
9	Congleton	Manchester	4.9	5	175	170	-3%
10	Stoke-on-Trent	Birmingham	6.2	6	196	190	-3%

For the Bournemouth – Manchester plus Reading – Nottingham scenario, the highest benefitting OD pairs compared to the Core scenario (EMU) are almost identical to the Bournemouth – Manchester scenario. Table 4-17 therefore presents the top ten OD pairs relative to the Bournemouth – Manchester scenario. Journeys between Leicester or Nottingham and Bedford or Oxford show the highest additional benefit. It is likely that this reflects journey time and frequency improvements to an already significant market.

Table 4-17 Top ten ODs by benefits for B–M plus Reading – Nottingham (2026)

#	Origin Zone	Destination Zone	Benefits (million minutes)	Change in demand (thousand journeys)	DM GJT (minutes)	DS GJT (minutes)	% change
1	Leicester	Bedford	1.5	10.5	255	199	-22%
2	Bedford	Leicester	1.5	10.4	255	198	-22%
3	Nottingham	Oxford	0.9	4.6	333	245	-26%
4	Nottingham	Bedford	0.8	5.1	293	234	-20%
5	Oxford	Nottingham	0.8	4.1	334	248	-26%
6	Bedford	Nottingham	0.8	5.0	291	234	-20%
7	Oxford	Leicester	0.5	2.6	303	219	-28%
8	Leicester	Oxford	0.5	2.9	301	217	-28%
9	East Northamptonshire	Leicester	0.4	1.7	224	200	-11%
10	Leicester	East Northamptonshire	0.4	1.5	229	204	-11%

For the Bournemouth – Manchester plus Bristol - Peterborough scenario, the highest benefitting OD pairs compared to the Core scenario (EMU) are almost identical to the Bournemouth – Manchester scenario. Table 4-18 therefore presents the top ten OD pairs relative to the Bournemouth – Manchester scenario. The results show relatively small levels of additional demand and benefits, compared to other scenarios. Many of the top ten benefitting journeys appear to be interchanging journeys to and from Oxford onto inter-city services on the East Coast Main Line, many of which would benefit in with the Reading – Nottingham services. However, the absence of journeys to and from Peterborough and to and from locations on the Great Western Main Line in the highest benefiting OD pairs does suggest that PLD may not be adequately representing such journeys, and further investigation is required as part of optioneering for Cross Country services via EWR infrastructure.

Table 4-18 Top ODs by benefits for B-M plus Bristol – Peterborough (2026)

#	Origin Zone	Destination Zone	Benefits (million minutes)	Change in demand (thousand journeys)	DM GJT (minutes)	DS GJT (minutes)	% change
1	Leicester	Bedford	0.2	1.1	255	247	-3%
2	Bedford	Leicester	0.2	1.1	255	247	-3%
3	Oxford	City of Edinburgh	0.2	0.8	547	530	-3%
4	City of Edinburgh	Oxford	0.2	0.8	548	531	-3%
5	York	Oxford	0.1	0.5	367	348	-5%
6	Oxford	York	0.1	0.5	364	345	-5%
7	Gateshead	Oxford	0.1	0.6	457	438	-4%
8	Leeds	Oxford	0.1	0.7	358	345	-4%
9	Oxford	Gateshead	0.1	0.6	458	440	-4%

4.8. Summary

East West Rail (EWR) demand forecasting has adopted a hybrid approach, using three types of model to forecast demand between different origins and destinations. For locations along and near the EWR route, a bespoke Regional Rail Demand Model has been used, combining an elasticity-based and a ‘gravity’ model. For longer distance journeys, the PLANET Long Distance demand model has been used.

The Regional Rail Demand Model combines an elasticity-based forecasting model, used where generalised journey time (GJT) is expected to change by less than 30% from 2011 base-year levels, and a regression-based gravity model, used where GJT is expected to change by more than 30%. This approach is adopted because solely elasticity based models are not appropriate for use where service levels, and consequently demand, is expected to change markedly from a 2011 base year.

PLANET Long Distance (PLD) is a network model implemented in the EMME transport modelling software. The model is a rail assignment and nested mode choice model (i.e. between highway and public transport and, within public transport, between rail and air), with a supplementary simplified approach to estimating generated demand. PLD is one element of the PLANET Framework Model (PFM).

The forecasting suite incorporates two overlapping model areas:

- PLD covers all long-distance demand within England and Wales, whereas the
- Regional Rail Demand Model covers all rail demand within a defined study area.

The model forecasts a significant increase in demand as a result of East West Rail, suggesting an increase in the region of 1.8m journeys (71m passenger miles) per annum at today's levels of base demand and nearly £11m in additional revenue generated. East West Rail is expected to save around 1.6m hours in travel time for its users.

Comparing scenarios, it is clear that the operational elements have a clear impact on the appraisal results. E.g. the five minutes dwell time assumed at Didcot parkway for the splitting/joining of EMUs has a significant impact on the overall EMU scenario.

All scenarios show that EWR-WS core services will lead to significant increases in passenger demand. The Cross Country services which have been modelled also show that they will generate significant demand.

5. Financial Case

5.1. Introduction

The objective of the financial case is to assess the affordability of the East West Rail – Western Section Project. In order to undertake this activity successfully the financial capital costs have been assessed along with operating costs. The section will discuss the financial profile of the project and the parties who will bear the costs of the project.

5.2. Scheme Costs

5.2.1. Capital Infrastructure Costs

When this study was commissioned Network Rail did not have revised cost estimates for the EWR-WS scheme. Therefore Atkins were commissioned as part of this study to undertake a high level review of the infrastructure required for the range of different scheme options. For this review one of Atkins senior Railway Engineers and a senior Quantity surveyor reviewed the outputs required, in terms of line speed and electrification, and estimated the likely work required and hence the cost for undertaking the project.

A detailed review was undertaken for the Bicester- Bletchley and Bletchley – Bedford sections of the route. Based upon these unit rates (i.e. cost per/mile) were derived and used to generate cost estimates for the other sections of the route.

In parallel to this task Network Rail have been developing the Anticipated Final Costs (AFCs) for the core and incremental schemes together with a coarse estimate for the electrification of the route as part of the electric spine project.

Atkins costs are shown below in Table 5-1.

Table 5-1 Atkins latest estimates of EWR-WS scheme Costs

Scenario	Cost Estimate (2010 prices)
100mph Line Speed – No Electrification	£494,900,000
110mph Line Speed – No Electrification	£523,600,000
125mph Line Speed – No Electrification	£584,500,000
100mph Line Speed – With Electrification	£602,900,000
110mph Line Speed – With Electrification	£671,600,000
125mph Line Speed – With Electrification	£686,800,000

Network Rail's cost estimates for the EWR-WS are shown in Table 5-2, these are based upon the latest AFCs for the scheme options (July 2014) and are expressed in 2010 prices for comparison with Atkins own values.

Table 5-2 Network Rail latest estimates of EWR-WS scheme costs

Scheme	Scenario	Cost Estimate (2010 prices)
Electric Spine (OXF - BDM)	*(OLE only)*	*£218,600,000*
Network Rail Core Scheme	100mph (No OLE)	£528,300,000
	100mph (With OLE)	£747,800,000
Network Rail Incremental Scheme	125mph (No OLE)	£1,264,000,000
	125mph (With OLE)	£1,484,000,000

A comparison of the estimates shows that the estimates for the core scheme (without electrification) are within approximately 10% of each other, but this difference diverges significantly as the specification of the scheme increases. These differences are illustrated graphically in Figure 5-1.

Figure 5-1 Comparison of Atkins and NR Cost Estimates

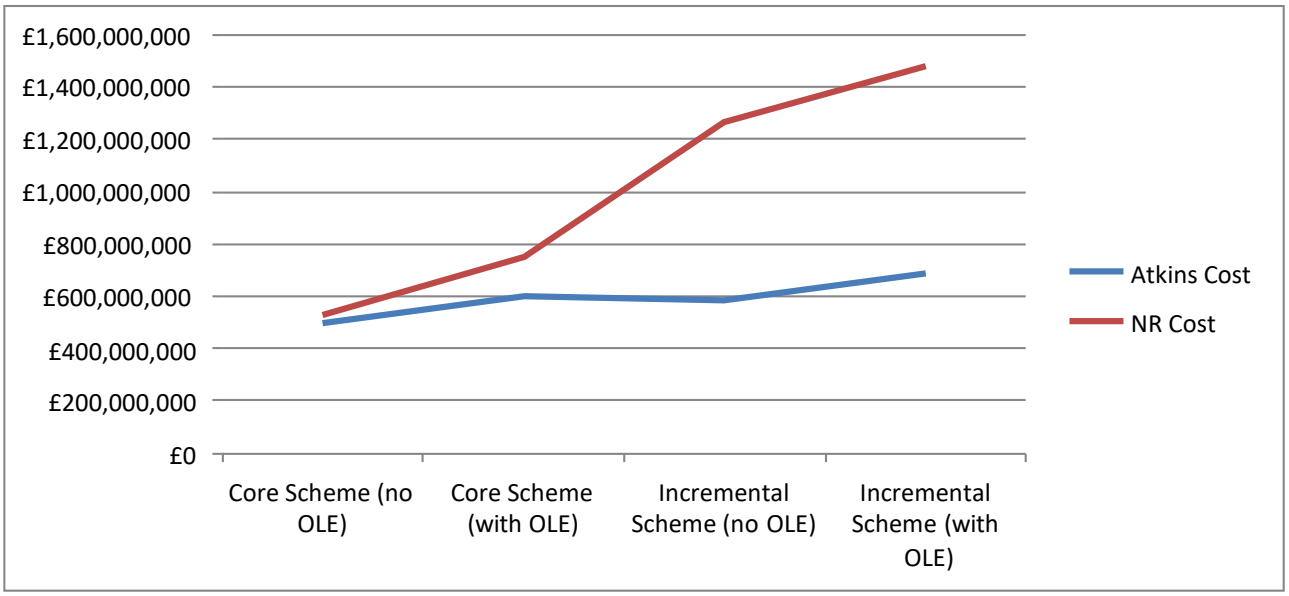


Figure 5-1 shows that there is a major divergence in the cost estimates for the 'incremental' scheme. At this stage both estimates must be considered to be at a level commensurate with GRIP 0. The main difference between the estimates is the level of detail and disaggregation in NR's estimates compared to Atkins. However, the assumptions made in both Atkins and NR's estimates are significant. Atkins has drawn upon Faithful and Gould's recent experience of producing cost estimates for major rail enhancements. Network Rail has drawn upon outturn and emerging costs of major enhancement projects.

It is Atkins view that Network Rail's cost estimates represent a worst case scenario whereas our estimates represent an optimistic scenario, taking into account the limited information that was available to us to undertake this analysis.

However, of more significance than the difference between Atkins and NR's costs is the significant increase in the absolute cost estimate of the scheme from the previous business case in 2010. There are two reasons behind this, an increase in scope and an increase in unit rates. These are discussed in the following sections.

Scope Changes

There are four major changes in scope which are driving the increase in scheme costs, these are;

- The perceived need to provide additional capacity on the WCML between Denbigh Hall Junction and Milton Keynes Central Station;
- The need for a more extensive upgrade of the line between Claydon and Aylesbury than previously assumed, and
- The need to upgrade the Aylesbury to Princes Risborough route through the provision of limited doubling or provision of passing loops.

The equivalent cost of the preferred scheme (excluding Phase 1) was £205 million in 2010 prices.

Atkins cost estimates that the addition of work on the WCML adds between £29 and £42 million to the scheme (depending upon line speed and electrification requirements); NR's estimate is that this will add £96 million to the scheme cost (all in 2010 prices).

The original cost estimate for the Claydon to Aylesbury section was approximately £27 million in 2010 prices. The latest estimates cost this from £86 to £105 million (depending upon line speed assumptions). The cost for this work has tripled from the previous estimate. This is due to this section requiring more extensive work

that was previously assumed. NR's view is that this section needs practically rebuilding to provide a reliable section of infrastructure. In the absence of any further detailed information we have made the same assumption for this section and arrived at a significantly increased cost than previously provided.

The addition of improvements to the Aylesbury – Princes Risborough route adds £19 – 33 million to the cost of the scheme. Work to this section was not included in the previous scheme specification. It has been included to ensure the reliability of the London (Marylebone) to Milton Keynes services which will run via this section of route.

These changes in the scope of the scheme add between £107 to £207 to the cost (in 2010 prices) of the EWR-WS scheme and account for a significant proportion in the overall cost increase since the previous business case. These changes in scope have, in the most extreme case, doubled the cost of the scheme. However, this increase only explains approximately half of the overall scheme cost increase.

Cost Increases

The cost assumptions and rates being used by both Atkins/Faithful and Gould and Network Rail are informed by both industrial trends and experience from previous projects. Atkins/Faithful and Gould are working on many major projects for Network Rail including major enhancements and electrification and so have recent experience of the design and costing of schemes. Network Rail are currently delivering major enhancements across the county and therefore have a good understanding of the outturn cost of schemes.

For example Network Rail is currently delivering Phase 1 of EWR-WS as part of the Bicester to Oxford enhancements for Chiltern Railways Evergreen 3 project. The current value of that project is £322 million, equivalent to a cost of £27.5 million per mile. The scope of works for this section is very similar to that required throughout the route (in terms of rebuilding and re-signalling a double track railway for 100mph capability), but also includes the creation of a new chord line for the new Chiltern Oxford to London (Marylebone) services. The current costs of the Phase 1 scheme are, we believe, the reason that Network Rail's cost estimates are higher than Atkins own estimates for the scheme, reflecting both the time and cost to complete the statutory procedures and the current outturn costs currently being incurred on site.

5.2.2. East West Rail Operating Costs

As part of the business case update, the EWR Operating Cost Model was also updated. The objective of the model is to calculate the annual operating cost for a number of train services, which have been identified. Operating costs were calculated by service to present different scenarios for operating costs. I.e. services can easily be taken in or out services scenarios and options. In brief the following were taken into consideration and or estimated to produce the operating costs.

- Monthly 'dry' leasing cost for per vehicle. (obtained from published sources and Atkins own knowledge of the Rolling Stock market)
- Energy costs per vehicle mile and maintenance costs per vehicle mile – Estimated using the 'Rolling Stock Strategy February 2013', ATOC.
- Train staff costs were estimated by using advertised jobs on train operating company websites, using suitable uplifts to take into account employment costs etc.
- Variable track access charges were estimated using the published prices on the Office of Rail Regulation (ORR) and Network Rail websites for CP5.
- Fixed track access charges were calculated using the current fleet for London Midland, First Great Western, Chiltern Railways and Cross Country as well as published schedule of fixed charges for each of these operators for CP5.
- Capacity charges for Midland Main Line, West Coast Main Line and the Oxford to Reading line were calculated, as some EWR rail services used these sections of track, using published capacity charges for CP5 on the ORR and Network Rail websites.
- Station operating costs for the new two platform station at Winslow, two additional platforms at Bletchley and the new platform at Aylesbury Vale were estimated using the CP5 price list and Atkins own knowledge in this area.

Furthermore, track mileages were calculated using sectional appendix diagrams obtained from Network Rail and journey times were estimated using the National Rail – Journey Planner for the existing network and Sectional Running Times which we calculated for EWR-WS using Railsys. Table 5-3 shows all of the service operating costs. They are grouped into various scenarios based upon the different infrastructure and rolling stock assumptions.

Table 5-3 Annual operating cost by service

Option	Service	Rolling Stock	Annual Op. Cost	Total Cost
Do Minimum	Oxford to Bicester Shuttle	165 (2 Car)	£1,425,070	£44,138,741
	Bletchley to Bedford Shuttle	153 (1 Car)	£2,230,832	
	Bournemouth to Manchester	220 (4 Car)	£40,254,236	
	Annual Stations Cost	N/A	£228,604	
EWR Core	Aylesbury to Milton Keynes	165 (3 Car)	£3,942,253	£64,262,351
	Oxford to Bedford	165 (3 Car)	£5,300,933	
	Oxford to Milton Keynes	165 (3 Car)	£4,442,370	
	Bournemouth to Manchester (Existing Route)	221 (5 Car)	£50,348,192	
	Annual Stations Cost	N/A	£228,604	
EWR Core 110/125mph	Aylesbury to Milton Keynes	220 (4 Car)	£5,016,273	£67,282,267
	Oxford to Bedford	220 (4 Car)	£6,931,600	
	Oxford to Milton Keynes	220 (4 Car)	£4,757,598	
	Bournemouth to Manchester (Existing Route)	221 (5 Car)	£50,348,192	
	Annual Stations Cost	N/A	£228,604	
EWR Core Electrified	Aylesbury to Milton Keynes	165 (3 Car)	£3,942,253	£64,045,851
	Oxford to Bedford	319 (4 Car)	£5,145,650	
	Oxford to Milton Keynes	319 (4 Car)	£4,381,153	
	Bournemouth to Manchester (Existing Route)	221 (5 Car)	£50,348,192	
	Annual Stations Cost	N/A	£228,604	
EWR Core 110/125mph Electrified	Aylesbury to Milton Keynes	220 (4 Car)	£5,016,273	£65,598,266
	Oxford to Bedford	387 (4 Car)	£5,384,717	
	Oxford to Milton Keynes	387 (4 Car)	£4,620,480	
	Bournemouth to Manchester (Existing Route)	221 (5 Car)	£50,348,192	
	Annual Stations Cost	N/A	£228,604	
Cross Country (Non - Electrified)	Bournemouth to Manchester via EWR	221 (5 Car)	£53,453,564	£53,453,564
Cross Country (Electrified)	Bournemouth to Manchester via EWR	390 (5 Car)	£57,493,430	£110,567,698
Bristol to Peterborough	Bristol to Peterborough via EWR	390 (5 Car)	£28,925,738	
Oxford to Nottingham	Oxford to Nottingham via EWR	390 (5 Car)	£24,148,530	
Backfill Cross Country Services	Oxford to Birmingham	165 (3 Car)	£10,302,846	£20,560,307
	Birmingham to Manchester	350 (4 Car)	£10,257,461	

5.2.3. Electric Spine Project

The electric spine project will see a series of routes electrified to provide an electrified route from the south coast to the Midlands, North West, and South Yorkshire. The electric spine route includes the western section of EWR. It is anticipated that the Oxford to Bletchley Section will be electrified in Control Period 5 and the Bletchley to Bedford Section electrified in early CP6.

The cost of electrifying the EWR Western Section is currently estimated by Network Rail to be £225 million. The development of the Electric Spine project is currently at an early stage with implementation of the EWR-WS section programmed for the latter half of CP5. Therefore, until more design and development work is completed it is not possible to provide a more detailed cost estimate for this scheme.

5.3. Budgets/Funding Cover

The EWR-WS was confirmed as a scheme for implementation in the High Level Output Specification in July 2012. Subsequently, following the determination of the Office of Rail Regulation, Network Rail has published its CP5 Delivery Plan. The CP5 Delivery Plan identifies a budget of £11.5 billion for England and Wales (in 2012/13 prices). EWR-WS, as well as all of the other committed schemes, needs to be delivered within this budget envelope.

Third Party Contributions

In November 2013 the East West Rail Consortium confirmed their commitment to providing a significant contribution in funding towards the scheme. In a letter to the DfT, the consortium confirmed that they would provide £45million towards the cost of the scheme. The breakdown of this contribution is shown in Table 5-4. A copy of the letter is provided as Appendix I.

Table 5-4 EWRC Funding Contribution

EWRC Member	Contribution (£ million)
Aylesbury Vale District Council	5.36
Buckinghamshire County Council	10.16
Milton Keynes Council	7.65
Bedford Borough Council	2.6
Central Bedfordshire Council	4.2
Cherwell District Council	4.35
Oxfordshire County Council	11.06
TOTAL	**45.38**

The securing of this funding demonstrates the commitment of the EWRC to seeing the scheme implemented and also provides a significant contribution towards the overall cost of the scheme.

5.4. Summary

The Financial Case presents a range of potential costs for the EWR-WS scheme, based upon differing specifications and input assumptions. Both Atkins and Network Rail have developed cost estimates for the scheme and a summary of the cost ranges is shown in Table 5-5.

Table 5-5 Comparison of cost estimate ranges (in 2010 prices)

	100mph No OLE Cost (£, Million)	125mph With OLE Cost (£, Million)
Atkins	495	687
Network Rail	528	1,484

In addition to the capital costs, Atkins has developed a range of operating costs for use in the economic appraisals of the scheme/service options.

In terms of the funding for the scheme, members of the East West Rail Consortium have committed to paying a contribution of £45 million to the overall cost of the scheme.

6. Economic Case – Value for Money Analysis

6.1. Introduction

This section uses the results from the previously described forecasting exercise, together with the cost estimates for the scheme to ascertain if the revised scheme specifications and scenarios still represent value for money. The following sections describe how we have taken into account the user benefits, operator revenues and wider economic impacts to arrive at our overall assessment of the scheme and scenarios under test.

6.2. Scenarios

In order to enable selection of a preferred option a range of scheme scenarios have been developed. These scenarios fall into two broad categories:

- Core Scheme; and
- Cross Country Services.

6.2.1. Core Scheme

The Core Scheme focuses on improving services within the local area, bounded by Milton Keynes Central, Oxford, Bedford and Aylesbury. A number of service improvements have been modelled incrementally either in addition to or extending existing services.

The service changes modelled as part of the Core service area are set out in Table 6-1.

Table 6-1 Core Scenario Definitions

Scenario Ref	Description
EWR 1.0.1 EMUDMU	Aylesbury – Milton Keynes (extension of Marylebone – Aylesbury service): DMU operated in electrified and non – electrified scenarios
EWR 1.0.2 DMU	Oxford – Milton Keynes (new service): non – electrified scenario
EWR 1.0.2 EMU	Oxford – Milton Keynes (extension of stopping Paddington – Oxford service): electrified scenario
EWR 1.0.3 DMU	Oxford – Bedford (new service): non-electrified scenario
EWR 1.0.3 EMU	Oxford – Bedford (extension of stopping Paddington – Oxford service): electrified scenario
EWR 1.0.DMU	1.0.1 EMUDMU + 1.0.2 DMU + 1.0.3 DMU
EWR 1.0.DMU HG	EWR 1.0.DMU with High Growth assumption
EWR 1.0.DMU ST 60mph	Same as EWR 1.0 DMU but includes a 60mph track speed between Bletchley and Bedford
EWR 1.0 EMU	1.0.1 EMUDMU + 1.0.2 EMU + 1.0.3 EMU
EWR 1.0.EMU HG	EWR 1.0.EMU with High Growth assumption
EWR 1.0 EMU ST 60mph	Same as EWR 1.0 EMU but includes a 60mph track speed between Bletchley and Bedford

6.2.2. Cross Country Scenarios

In addition to the improvements set out in the Core scenarios a number of alterations to longer distance services have been tested, referred to as the Cross Country scenarios. The improvements within the Core Area enable more efficient journeys for specific routes, with the electrified track allowing trains to run more

directly than is currently possible. These service improvements have again been modelled incrementally to each other, with the service improvements tested as set out in Table 6-2.

Table 6-2 Core + Cross Country scenarios

Scenario Ref	Description
EWR 1.5.0-2	Bournemouth – Manchester diverted to EWR via Milton Keynes + Two replacement services: Paddington – Birmingham New Street (an extension of Paddington – Oxford fast services) and Birmingham New Street – Manchester Piccadilly
EWR 1.5,6.0	1.5.0-2 + Reading – Nottingham via Bedford + removal of 1.0.3 EMU
EWR 1.5,7.0	1.5.0-2 + Bristol – Peterborough via EWR
EWR 1.5,6,7.0	1.5.0-2 + 1.6.0 + 1.7.0

These Cross Country scenarios have been tested based on maximum vehicle speeds set at the current limit of 100mph and also with the increased speed limit of 125mph. This increased speed limit would require improvements to the existing infrastructure and the costs involved in installing this have been included in the appraisal.

Over the shorter distance movements involved within the Core Area vehicles would not be able to make use of the increased speed limit even if the infrastructure were able to support it. For this reason the increased speeds have only been tested for Cross Country scenarios.

6.3. Modelling

6.3.1. User Benefits and Operator Revenues

The modelling of impacts the EWR WS scheme is forecast to have on user benefits and operator revenues has been carried out using a multi-tiered approach, in order to accurately assess local impacts whilst also capturing the effects on longer distance movements.

Trips contained within the EWR WS Core area have been assessed using a MOIRA base and demand elasticity or gravity modelling, while longer distance movements have been modelled using PLANET.

6.3.2. Core Area Modelling

The primary assessment of the EWR WS Core Area has been carried out using a MOIRA base with a combination of demand elasticity and gravity modelling. MOIRA has been used to provide an accurate forecast of the Do-Minimum (DM) demand and generalised journey times (GJTs) for both DM and Do-Something (DS) scenarios.

The impacts of the scheme on changes to demand have been measured in one of two ways:

- Where the change in GJT is less than 30% of the DM GJT a simple elasticity function has been applied, using the elasticity of demand to journey time for season and non-season ticket holders, based on PDFH guidance;

- For trips experiencing a change to GJT of more than 30%, the simple elasticity function may not be appropriate as other factors become more relevant to changes in trip numbers. For these movements changes in demand have been forecast using a gravity model. The gravity model has made use of population and employment data at the origin and destination stations involved, in addition to journey time and fares for the relevant trip, to determine what growth in demand can be expected to result from the improved level of services.

As a significant proportion of benefits generated within the Core Area related to movements for which the cost of travel changed significantly, there was a likelihood of a distortion in benefits resulting from approximating the demand curve in the rule of a half calculation with a straight line. To compensate for this

distortion a series of intermediate cost points have been used, giving a closer representation of the demand curves.

6.3.3. Regional Modelling

In addition to the assessment of movements within the Core Area the effect on trips travelling into, out of or through the Core Area has been measured using PLANET.

PLANET Long Distance has been used to measure the effect beyond the relatively short distance trips contained within the Core Area. The Core Area itself has been defined to be reasonably broad, with a range of almost 100 miles, stretching as far as Corby and Coventry in the north and Newbury and Ascot in the South, in order to accurately capture the majority of benefits. Therefore only the longer distance trips modelled by PLANET have been considered in addition to the impacts of the gravity model. PLANET North, PLANET Midlands and PLANET South have thus not been used within the appraisal as these cover medium ranged movements within the respective regions and only very minor peripheral impacts would be expected.

The PLANET Long Distance assessment has excluded all OD pairs already covered within the gravity model to avoid any double counting.

6.3.4. Benefit and Revenue Assessment

Using the modelling structure described above the following network properties have been assessed:

- Trip numbers
- Journey time including:
  - In-vehicle time (IVT)
  - Waiting time
  - Interchanges/boarding penalties
  - Access/egress time (PLANET model only)
  - Fares
  - Crowding (PLANET model only)
  - Passenger kilometres

Based on these modelled properties the following economic impacts have been captured:

- Generalised journey time benefits
- User charge benefits
- Crowding benefits
- Operator revenue benefits
- Marginal external costs
- Wider economic impacts

User benefits have been assessed separately for business, commuting and leisure trips. All values have been calculated in market prices and resultant impacts on indirect taxation have been included in the benefit totals. Benefits have been assessed at an OD level over a 60 year period from the proposed opening date of the Core Scheme and discounted to 2010.

6.3.5. Price Bases and Inflation

Journey time benefits from the elasticity and gravity modelling have been exported to the appraisal in terms of minutes saved and values of time have been applied directly from WebTAG in 2010 prices. MOIRA uses a 2012/13 price base and the values of fares used in the calculation of user charge impacts and operator revenues have been converted into 2010 prices.

As for the gravity modelling, journey time impacts measured in PLANET have been exported to the appraisal in units of time and converted into monetary values in 2010 prices directly. The price base used for fares in PLANET is 2002 prices set at 2010/11 financial year values. Again user charge benefits and operator revenues have been converted into 2010 prices, with real inflation in fares from 2010/11 up to 2014 applied based on ORR data.

All fares have been assumed to increase at a rate of 1% p.a. in real terms throughout the appraisal period. Value of time growth rates have been applied based on the WebTAG databook.

6.3.6. Fares

The new services introduce result in a large number of trips being made possible via a direct route, rather than the best option being to travel via London. This results not only in generalised journey time savings, but also in much shorter journey distances. The modelling of fares for such movements has been based on the assumption that the existing relationship between distances travelled and fares charged is retained, resulting in some large reductions in fare prices for individual OD pairs. Alternative fare policies may be considered for these trips and sensitivity testing could be used to determine the optimal level of fare changes for both passengers and operators. However, such tests have not been included as a part of this analysis.

6.3.7. Intermediate Points

Within the Core Area a large number of journeys benefit from having relatively direct services made available where currently the quickest option is to travel via London. These result in some large cost changes for individual trips, which would result in an overestimation of benefits if using the standard "rule of a half" approach to calculation, as the straight line approximation to the demand curve used in that method becomes unreliable when costs change by a large proportion.

In order to minimise this over-estimation of benefits, a number of intermediate cost points have been modelled, giving a staggered approach to benefit calculation and so a better approximation to the demand curve. Intermediate points at cost intervals of 20 minutes from the DS generalised journey time have been modelled with up to 4 separate points used in between the DM and DS scenarios, depending on the level of time saved.

This process has been applied only to the gravity modelling. Trips outside of this area are considered unlikely to experience such large changes as a proportion of the overall journey cost.

6.4. Wider Impacts Estimation

The wider economic impacts of three selected scenarios (EWR Core DMU, EWR Core EMU and EWR 1.5.0-2 + Cross Country) have also been estimated, to illustrate the potential scale of the impacts on the Value for Money assessment of the scenarios tested.

In line with advice in WebTAG Unit A2-1[9], the focus of the assessment was on those wider economic impacts which form part of a scenario's net impact on welfare and the economy at the national level but are not captured in the assessments of conventional user benefits described above (due to the underlying theoretical assumptions about the way in which the economy operates[10]).

WebTAG identifies three key Wider Impacts to be estimated in relevant appraisals:

- **WI1 – Agglomeration** i.e. the increase in productivity benefits that arises from increased clustering of firms. Clustering is assessed through the measure of 'effective density' which identifies the degree of accessibility (in travel cost terms) of firms to other firms and to workers. The greater the density or clustering levels, the greater the productivity benefits firms receive from effects such as improved information transfer, access to wider input and labour markets and the development of higher quality input markets nearby.

- **WI2 – Output change in imperfectly competitive markets** - conventional appraisal also fails to capture the fact that in real (imperfect) markets, the benefits of increased economic activity exceed the costs to the firms involved. DfT research suggests that the additional benefit associated with this effect can be estimated as 10% of business travellers' user benefits.

- **WI3 – Tax revenues arising from labour market impacts** - changes in commuting costs due to a transport scheme can influence the labour market choices of the work force in a number of ways. In

[9] WebTAG Unit A2-1, Wider Impacts
[10] Conventional assessment is based on the assumption that transport using markets behave in a theoretically perfect manner with the implication that the economic impacts of schemes can be fully quantified by estimating the direct impacts of the scheme on transport users and providers. In reality, markets are imperfect and consequently the conventional approach omits some scheme impacts, termed the 'wider impacts'

particular, the improvements in accessibility may cause some non-workers to choose to participate in the labour markets. The tax impacts of any resultant increases in productivity are omitted from conventional appraisal (which estimates benefits on the basis of post tax income) and so are estimated for inclusion as Wider Impacts.[11]

The modelled scenarios are also likely to affect the local economy and GVA by attracting additional and/or different types of job to the study area as a result of improved accessibility. When considered at the local level only, these impacts are likely to be larger than the national Wider Impacts identified above. However, the majority of the benefit would be offset at the national level by losses in the area losing the jobs attracted to the study area. In line with WebTAG, this assessment has therefore focussed on net national impacts which can be considered as part of an overall national value for money assessment of the scenarios assessed.

The influences on the scale of wider impacts are similar to the influences on the scale of user benefits (i.e. driven primarily by the size of changes in journey cost and the number of passengers affected). However the requirements for representing Wider Impacts differ from those for representing user benefits. In particular, the estimation of agglomeration benefits depends on a representation of travel costs in all directions and by all modes to and from the study area, to enable an estimate to be derived of the effective density of the area (i.e. how well connected firms are to other firms and potential employees) and the extent to which it is altered by the scenarios being tested.

The gravity model developed to provide additional detail in the calculation of user benefits cannot provide this information as it focus on the trips directly affected by the changes (as required for user benefit estimates). This meant that an alternative approach was required for Wider Impact calculation.

The approach adopted has been to represent the selected schemes in as much detail as possible in the PLANET suite of modes (PLANET Long Distance, South, North and Midlands) and use the outputs from the scenario model runs and a reference case to identify:

- An estimate of user benefits for each scenario as forecast by PLANET (broadly consistent with the approach above but not benefiting from the additional detail provided by the gravity model); and

- An estimate of Wider Impacts – calculated using the DfT's WITA calculation programme[12] and an approach established for HS2 Ltd to use PLANET outputs along with other economic and travel assumptions to calculate the wider impacts of HS2 (following the WebTAG approach). Benefits were estimated for the study area identified for the gravity model only.

The scale of Wider Impacts and user benefits calculated using this PLANET based approach were then compared to identify the scale of agglomeration (WI1) and labour market effects (WI3) as a proportion of rail user benefits estimated from the model. The proportions identified were then applied to the more detailed estimate of user benefits calculated using the multi-tiered modelling approach outlined above to provide an estimate of agglomeration and labour market impacts. The value of the impact of increased output in imperfectly competitive markets (WI2) competition was calculated as 10% of business user benefits (directly as recommended in WebTAG).

6.5. Cost Modelling

Capital and operating costs have been assessed for the Core Scenario, allowing for running at top speeds of either 100mph or 125mph. The additional cost of electrification has also been assessed.

6.5.1. Capital Cost

To provide the most robust assessment of the scheme we have used the capital costs that have been developed by Network Rail. The details of these cost estimates are set out in the Financial Case. For use in

[11] The WebTAG unit also refers to tax revenue impacts from jobs moving to more or productive locations as a result of a transport scheme but states that this can only be estimated where land use transport interaction models are available
[12] Wider Impacts Transport Assessment – programme developed on behalf of DfT to apply the approach to estimating Wider Impacts set out in WebTAG.

the Economic Case these values have been converted into real, present value 2010 market prices with an optimism bias uplift of 66% applied.

6.5.2. Operating Costs

A simple operating cost model has been developed to capture the impacts of proposed service changes. As a number of services would be replaced, both the operating cost of the existing services and new services have been modelled in order to evaluate the incremental costs of replacements, upgrades and additions. Costs account for rolling stock upgrades, lengthening of vehicles, changes to journey times and distances and all of the relating costs which result from these changes.

Additional ongoing operating costs relating to the addition of new platforms at Winslow, Aylesbury Vale Parkway and Bletchley stations have also been assessed.

As for capital costs, operating costs have been converted into 2010 present value market prices, with a 1% optimism bias uplift applied.

As a sensitivity test, a more detailed operating cost model has been developed which takes into account the rolling stock life cycle as well as the impact of future demand on fleet size requirements. This is reported in Appendix J.

6.6. Value for Money Assessments

The value for money (VfM) case has included assessment of benefits for a range of potential options for the Core Scenario which have been evaluated incrementally to each other. These options include different configurations of infrastructure improvements and related service enhancements along with the assumption of electrification either being included as part of the package or excluded.

Of these options only two have been fully costed – the full Core Scenario either with or without electrification. These two scenarios have also both been tested under the assumption of a “High Growth” scenario, in which population and employment growth rates that have been collated from current local plans at the station level for the year 2031. These have then been interpolated between 2011 and 2031 to obtain annual growth rates.

In addition the value for money of a range of Cross Country services has been calculated based on either the electrified or non-electrified Core and with maximum vehicle speeds either set at the current 100mph limit or allowing for track improvements to allow 125mph top speeds. Both benefits and costs for these scenarios have been prepared to allow full VfM assessments of each.

6.6.1. Core Scenario

Option Testing

Summarised in Table 6-3 are the user benefits, non-user benefits and operator revenues generated by each of the assessed scenarios. Marginal external costs include indirect impacts of the scheme such as highway congestion relief resulting from a mode shift from car to rail and the related impacts on accidents, infrastructure and the environment, revenue losses for other public transport services and the combined effect of these factors on indirect taxation.

Table 6-3 Core Scenario Benefits and Revenues (£m, 2010 PV)

Scenario Name	Generalised Journey Time Benefits	User Charge Benefits	Indirect Taxation	MECs	Revenue Growth	NPV
Aylesbury–Milton Keynes, Oxford–Milton Keynes and Oxford – Bedford Non-electrified	694	561	- 84	181	718	2,069
Aylesbury – Milton Keynes, Oxford – Milton Keynes and Oxford – Bedford Non-electrified with 60mph track speed between Bletchley and Bedford	519	515	- 78	131	450	1,538
Aylesbury – Milton Keynes, Oxford – Milton Keynes and Oxford – Bedford Non-electrified with high growth	660	637	-96	152	593	1,946
Aylesbury – Milton Keynes Electrified or Non-electrified	156	228	-36	37	86	470
Oxford – Milton Keynes Non-electrified	235	289	-43	70	230	781
Oxford – Bedford Non-electrified	375	317	-47	101	446	1,193
Aylesbury – Milton Keynes, Oxford – Milton Keynes and Oxford – Bedford Electrified	715	584	-88	188	701	2,100
Aylesbury – Milton Keynes, Oxford – Milton Keynes and Oxford – Bedford Electrified with 60mph track speed between Bletchley and Bedford	697	575	-87	183	679	2,048
Aylesbury – Milton Keynes, Oxford – Milton Keynes and Oxford – Bedford Electrified with high growth	789	647	-97	198	760	2,297
Oxford – Milton Keynes Electrified	276	296	-45	86	311	925
Oxford – Bedford Electrified	489	390	-58	78	521	1,419

This table indicates that the configuration generating the highest benefit is the Core scenario, whether electrified or non-electrified (1.0 EMU or 1.0 DMU respectively) while the high growth assumptions applied to the same infrastructure and service improvements (1.0 EMU HG and 1.0 DMU HG) result in higher benefits still.

Taking an overall VfM perspective on these scenarios, by bringing in assessments of changes in the required capital and operating costs for each yields the results set out in Table 6-4.

The present value of benefits (PVB) is comprised of the values set out in Table 6-3 excluding revenue. Any increases in operator revenue, less the increases in operating costs required to achieve those gains, are assumed to be transferred to central government as part of the terms of future franchise agreements, through subsidies or revenue clawback as appropriate. This results in a zero impact on the TOCs with the net difference between operating cost and revenue thus being included within the present value of cost (PVC).

Table 6-4 Core Scenarios Value for Money (£millions)

Scenario Name	PVB [A]	Revenue Growth [B]	Capital Costs [C]	Operating Costs [D]	PVC [E]= [C+D-B]	NPV =[A-E]	BCR =[A/E]
Aylesbury–Milton Keynes, Oxford–Milton Keynes and Oxford – Bedford Non-electrified	1,351	718	783	281	347	1004	3.9
Aylesbury – Milton Keynes, Oxford – Milton Keynes and Oxford – Bedford Non-electrified with 60mph track speed between Bletchley and Bedford	1,088	450	527	281	359	729	3.0
Aylesbury – Milton Keynes, Oxford – Milton Keynes and Oxford – Bedford Non-electrified with high growth	1,484	778	783	281	287	1197	5.2
Aylesbury – Milton Keynes Electrified or Non-electrified	384	86	196	97	207	177	1.9
Oxford – Milton Keynes Non-electrified	551	230	331	65	167	384	3.3
Oxford – Bedford Non-electrified	747	446	542	85	181	566	4.1
Aylesbury – Milton Keynes, Oxford – Milton Keynes and Oxford – Bedford Electrified	1,399	701	957	276	532	867	2.6
Aylesbury – Milton Keynes, Oxford – Milton Keynes and Oxford – Bedford Electrified with 60mph track speed between Bletchley and Bedford	1,126	439	617	276	454	672	2.5
Aylesbury – Milton Keynes, Oxford – Milton Keynes and Oxford – Bedford Electrified with high growth	1,537	760	957	276	473	1064	3.2
Oxford – Milton Keynes Electrified	614	311	422	64	174	440	3.5
Oxford – Bedford Electrified	899	521	700	81	261	637	3.4

Once again the full Core Scheme is amongst the strongest performing options, with a high growth assumption applied to that scenario improving the BCR still further. However, the Oxford to Bedford service addition alone performs marginally better in BCR terms, due to the cost savings of not upgrading the track through Aylesbury being proportionally larger than the user benefit and revenue lost through excluding those services.

The additional costs involved in electrifying the track exceed the additional benefits generated in most cases for the Core Scenarios, with none of the electrified options being amongst the strongest performing scenarios.

The sensitivity tests of retaining the existing track between Bletchley and Bedford, which would mean restricting speeds to 60mph, show that the resulting losses in user benefits and revenues do not make the cost savings worthwhile.

6.7. Analysis of Monetised Costs and Benefits

Non-Electrified Core Scenario

Set out in Table 6-5 is a summarised VfM statement for the Core Scenario, excluding the effects of electrification. User benefits have been assessed in terms of generalised journey time, as described in section 6.3.4 and user charge benefits which result from shorter distance routes being made available. The changes in expenditure on fares result in variation to taxation revenues, while the improved service between urban areas results in agglomeration benefits and changes to imperfectly competitive markets.

Table 6-5 Core Scheme VfM: Aylesbury–Milton Keynes, Oxford–Milton Keynes and Oxford – Bedford, Non-electrified

	Business	Commute	Leisure	Total
Benefits				
Generalised Journey Time	283	192	220	694
User Charge	117	113	330	561
Indirect Tax				- 84
Marginal External Costs				181
PVB				**1,351**
Costs				
Operator Rev				718
Capital Costs				-783
Operating Costs				-281
PVC				**-347**
NPV				**1,004**
BCR				**3.89**

This table indicates that user benefits are well spread between journeys of different purposes, with leisure users gaining the greatest benefit as a result of reduced fares, which become available over trips which can now be made directly rather than travelling into and out of London. This reduction in fares has a greater influence on leisure users, as the fare forms a greater portion of the overall journey cost due to their comparatively lower value of time.

Despite the reduction in a number of fares the level of demand growth generated as a result of both fare and journey time reductions is forecast to be sufficient that revenue collected by the TOC will significantly increase compared to the Do-Minimum scenario.

This increase in revenue will be sufficient to offset almost 70% of the combined capital and operating cost increase over 60 years, generating a net gain of £1 billion and a BCR of almost 4:1.

6.7.1. Electrified Core Scenario

Table 6-6 presents an equivalent summary of performance of the electrified option for the Core Scenario.

The performance in general is very similar to that of the Non-Electrified Core, with the one key difference being the additional capital investment. The analysis shows that the electrification of the EWR-WS route for only the core EWR services has a positive business case, but that the additional investment in infrastructure is not offset by a similar increase in benefits. This means that based upon an assessment of the core EWR services only, the incremental additional cost of electrifying the route is not really justified.

However, the electrification of the EWR-WS is part of a much larger project (the ‘Electric Spine’) and should be therefore considered in those terms rather than for just the core EWR services.

Table 6-6 Core Scenario VfM Summary: Aylesbury–Milton Keynes, Oxford–Milton Keynes and Oxford – Bedford, Electrified

	Business	Commute	Leisure	Total
Benefits				
Generalised Journey Time	290	201	224	715
User Charge	121	104	359	584
Indirect Tax			-	88
Marginal External Costs				188
PVB				**1,399**
Costs				
Operator Rev				701
Capital Costs			-	1,111
Operating Costs			-	276
PVC			**-**	**686**
NPV				**712**
BCR				**2.04**

6.7.2. Cross Country Services

In addition to the Core Scenarios, a further set of incremental Cross Country Scenarios have been modelled, each based on the assumption that the Core Scenario is itself implemented. Table 6-7, Table 6-8 and Table 6-9 set out the high level performance of each of the Cross Country Scenarios under these three sets of assumptions. For further detail of option specification see Table 6-2 above.

Table 6-7 Core + XC VfM Summary: 100mph Non-Electrified (£millions)

Option	PVB	PVC	NPV	BCR
Bournemouth – Manchester	2,131	96	2,034	22.1
Bournemouth – Manchester and Reading – Nottingham	2,480	61	2,419	40.8
Bournemouth – Manchester and Bristol – Peterborough	2,488	383	2,105	6.5
Bournemouth – Manchester, Reading – Nottingham and Bristol – Peterborough	2,778	231	2,547	12.0

Table 6-8 Core + XC VfM Summary: 100mph Electrified (£millions)

Option	PVB	PVC	NPV	BCR
Bournemouth – Manchester	2,179	436	1,743	5.0
Bournemouth – Manchester and Reading – Nottingham	2,528	400	2,128	6.3
Bournemouth – Manchester and Bristol – Peterborough	2,536	722	1,813	3.5
Bournemouth – Manchester, Reading – Nottingham and Bristol – Peterborough	2,826	570	2,256	5.0

Table 6-9 Core + XC VfM Summary: 125mph Electrified (£millions)

Option	PVB	PVC	NPV	BCR
Bournemouth – Manchester	2,157	1,574	583	1.4
Bournemouth – Manchester and Reading – Nottingham	2,646	1,374	1,272	1.9
Bournemouth – Manchester and Bristol – Peterborough	2,549	1,819	730	1.4
Bournemouth – Manchester, Reading – Nottingham and Bristol – Peterborough	2,952	1,707	1,245	1.7

These results show that, while user benefits are increased both by electrification and subsequently by upgrading the infrastructure to enable 125mph speeds, the costs involved in achieving those upgrades do not indicate a strong business case for either. The results also demonstrate that the VfM of the scheme overall is significantly improved by the addition of the Cross Country service improvements. The additional revenue forecast to be generated by these services will not only cover the cost of running the services themselves, but also provide sufficient surplus revenue to cover the majority of the costs involved in the Core Scenario.

Table 6-10 sets out a breakdown of benefits and costs for the Core plus all Cross Country services scenario

Table 6-10 Core + XC VfM Comparison: Core plus Bournemouth – Manchester, Reading – Nottingham and Bristol – Peterborough XC services

	Non-Electrified 100mph	Electrified 100mph	Electrified 125mph
Benefits			
GJT	2,115	2,137	2,237
User Charge	561	584	584
Indirect Tax	-84	-88	-88
Marginal External Costs	186	193	219
PVB	**2,778**	**2,826**	**2,952**
Costs			
Operator Rev	- 2,789	-2,772	-2,731
Capital Costs	783	1,111	2,202
Operating Costs	2,236	2,231	2,237
PVC	**231**	**570**	**1,707**
NPV	**2,547**	**2,256**	**1,245**
BCR	**12.0**	**5.0**	**1.7**

This indicates that the key driver which determines the economic performance of scenario under the three tests is the difference in capital costs. While other costs and benefits vary by a few percentage points between the tests, the costs of infrastructure improvements increase by 40% for electrification and by 180% to enable 125mph running speeds.

Table 6-11 provides an equivalent breakdown for scenario including only the Bournemouth – Manchester and Reading – Nottingham services, which is the best performing of the Cross Country Scenarios in BCR terms.

Table 6-11 Core + XC VfM Comparion: Core plus Bournemouth – Manchester and Reading – Nottingham XC services

	Non-Electrified 100mph	Electrified 100mph	Electrified 125mph
Benefits			
GJT	1,858	1,879	1,968
User Charge	561	584	584
Indirect Tax	-84	-88	-88
Marginal External Costs	146	153	182
PVB	**2,480**	**2,528**	**2,646**
Costs			
Operator Rev	-2,299	-2,283	-2,405
Capital Costs	783	1,111	2,202
Operating Costs	1,577	1,572	1,577
PVC	**61**	**400**	**1,374**
NPV	**2,419**	**2,256**	**1,272**
BCR	**40.8**	**5.0**	**1.9**

Although user time savings and revenues are reduced by the omission of the Bristol to Peterborough service via EWR, the saving in operating costs reduces the overall cost to the point that, while this option still has a significant initial outlay, the revenue almost covers the total cost of the combined scheme.

6.7.3. Wider Impacts

As outlined in section 6.4, Wider Impacts were estimated for three scenarios to indicate the extent to which they could contribute to the Value for Money assessment for the scenarios modelled. Table 6-12 provides a breakdown of the estimated benefits for the selected scenarios and the extent to which they supplement conventional assessments of benefits.

Table 6-12 Conventional and Wider Economic Impacts by Package (£ million, 2010 prices and present value)

	Aylesbury to Milton Keynes only	Core Scenario Aylesbury–Milton Keynes, Oxford–Milton Keynes and Oxford – Bedford, Non-electrified	*Cross Country Electrified* Bournemouth - Manchester
Net Conventional Transport Benefits (PVB)	£384	£1,351	£2,179
Agglomeration	£34	£110	£205
Labour Market Impacts	£1	£4	£7
Output in Imperfect Competition	£10	£40	£101
Total WEI	£45	£154	£313
Net Benefits including WEIs	£429	£1,505	£2,491
WEI as % Conventional PVB	12%	11%	14%
PVC	£207	£347	£436
BCR without WI	**1.9**	**3.9**	**5.0**
BCR with WI	**2.1**	**4.3**	**5.7**

The following key points are evident from the results:

- Agglomeration impacts dominate the Wider Impacts. The benefits are focussed particularly around Milton Keynes and Buckinghamshire. This reflects the fact that the key influences on the scale of agglomeration impact are scale of change in journey costs and the characteristics of the local economy, influencing the extent to which it is responsive to agglomeration effects. These areas experience significant travel cost savings as a result of the scenarios and have above average employment in producer services which are estimated to be particularly responsive to agglomeration effects.

- Labour market impacts are limited, this is typical across Wider Impact assessments and reflects the fact that commuting costs generally equate to a small proportion of wages and therefore changes in commuting costs represent only a limited incentive to join the labour market.

- The benefit of additional output in imperfectly competitive markets is approximately a third to a half of the scale of the agglomeration benefits in each scenario, related directly to the scale of forecast business benefits in each case.

- The overall impact of Wider Impacts is to add approximately 10% to 15% to conventional benefits, increasing the BCR for each of the scenarios tested accordingly.

As described above, the Wider Impacts represent additional impacts that the scenarios tested would have on welfare and economic benefits at the national level that are not captured in the assessment of conventional user benefits described earlier in the chapter.

The scenarios are also likely to influence the local economy and GVA, for instance by changing the number and characteristics of jobs attracted to the study area. However, the impacts of the changes are likely to be limited at the national scale as they reflect a relocation of jobs from one location to another. These effects have therefore not been considered in this assessment, with the focus instead being on the net economic impact at the national level, in line with the WebTAG approach.

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7. Economic Case - Regional and Sub-Regional Economic Impact Analysis

7.1. Regional Economic Context

Introduction

This section reviews the strategic role of East West Rail in terms of its ability to contribute to the UK's growth objectives. It focuses on the importance of delivering growth within the Greater South East, as well as the role improved connectivity can play in facilitating development.

This section should be read in association with the data analysis set out in Appendix E

Importance of Greater South East to the National Economy

The Greater South East[13] is the engine of the UK's high value innovation driven economy, having developed into an internationally focussed highly inter-dependent region defined by flows of people, goods, money and ideas. The increasing agglomeration of high-wage financial, business and professional services in Greater London and neighbouring parts of the South East undoubtedly confers major benefits – both nationally and regionally – as a result of highly productive, internationally competitive and vital export earning activities.

In 2010 Centre for Cities published a report, *Private Sector Cities*, which looked at private sector jobs growth in cities between 1998 and 2008 and ranked cities as buoyant, stable or struggling based on their performance. It concluded that, while private sector jobs grew in cities across the country, the largest grouping of buoyant cities over that period, with growing economies and new private sector employment, was in the Greater South East (GSE). The Greater South East cities created approximately 338,000 private sector jobs in the 10 years prior to the recession, percent of England's total private sector jobs growth. This suggests that the future performance of GSE cities will be fundamental to the UK's future growth prospects.

As a result, the share of the Greater South East's contribution to national economic output has risen from 50.5% to 53.5% in the past 15 years. Population growth to serve the expanding economy has also been strong.

Constraints to Growth

However, despite continuing to outperform the rest of the UK, the South East economy is starting to show signs of underperformance. Our analysis shows that, despite strong growth in the period 1990-1998, growth over the last ten years has been significantly lower, with London now performing more strongly than the rest of the Greater South East.

The reasons for this relative dip in performance are complex. However, they partly relate to the fact that businesses are now increasingly looking to be located closer to other businesses, rather than being driven primarily by cost factors. The London Office Policy Review[14] sets out a number of reasons why office employment has declined in suburban office locations since the late-1980s:

- **Changes to property cost differential** A steep rental gradient from Central London in the past persuaded businesses to relocate to the Greater South East to reduce costs. This role of the GSE has been usurped by the emergence of campus-style schemes around the periphery of Central London, including Broadgate, London Bridge City, More London and Paddington: a new generation of high quality environments with better connectivity to the West End and City;
- **Changes to salary cost differential** In this too, the historic advantage of the suburbs has been upstaged. The Central London salary weighting has all but disappeared and back office functions are now more likely to be relocated to Bangalore or Glasgow than the GSE as advances in technology have eroded the need of physical proximity;

[13] Defined as the East, South East and London regions
[14] London Office Policy Review 2012: Ramidus Consulting Ltd for GLA

- **Changing work styles** Work styles have changed dramatically in response to technology and business priorities. One symptom of this is the virtual disappearance of the typing pool and large clerical, back office functions, staples of the suburban office market. Many such jobs have simply disappeared.
- **Outmoded physical environment.** The environmental quality of some locations is tired and poorly maintained, with office accommodation and other employment premises ill-suited to modern business needs, often due to being provided as lip service to planning requirements.

These structural changes can be illustrated by the fact that, whereas 20 years ago Microsoft decided to base themselves in the Thames Valley, Google have now decided to locate their UK HQ at Kings Cross. In short, connectivity is a hugely significant factor in locational decisions made by high value growth sectors (explored further below).

A further potential constraint to growth is the lack of housing supply, with a shortage of sites for new housing pushing prices up and workers out, as well as preventing workers from moving to the GSE from other parts of the country. House prices have continued to rise during the past 15 years, with levels of affordability across the South East now at record lows in some areas.

Recent research[15] has suggested that local authorities may underprovide by as many as 160,000 homes across London, East of England, the South East and South West over the next five years against calculations for housing need provided by the Town and Country Planning Association. This is expected to continue to push up prices, creating further problems for labour market mobility.

Importance of Connectivity to Growth

Transport matters for the Greater South East region. More people commute to work, and travel further to do so, than anywhere else in the UK. The region therefore has a particularly high dependence on efficient road and rail connections, and any problems with transport infrastructure often have multiplied economic costs for the UK as a whole[16].

Knowledge driven economies operate with numerous systems including those of innovation, venture capital provision and the development of highly qualified labour. Connectivity both within and between these systems is therefore critically important to system functioning. Connectivity takes many forms including physical road, rail and air connections, electronic telecommunications, and business networks. Further analysis of the academic literature on the relationship between connectivity and development is set out below.

Commercial and retail development

Public transport use tends to lead to a concentration of economic activity in core areas served by its stops or stations[17]. This concentration of economic activity has been demonstrated as a key driver of economic development and innovation in economic cluster theory. Concentrated economic activity (in its widest sense) also brings a degree of ‘buzz’ to an area, enhancing its image and leading to further investment, so starting a virtuous circle.

However, this concentration of development is not facilitated by public transport alone. Hall and Marshall[18] noted two particularly important contextual items regarding the impact of transport investment on development in general: the general economic situation and the regulatory context. It has been found that infrastructure investment has led to land use development in buoyant economic contexts, and that public transport-led development in particular had tended to flourish where planning policy favoured public transport orientated development and restricted car orientated development.

Walmsley and Perrett[19] state that public transport systems had the greatest effect on development where there was a long process of urban planning in conjunction with the rail system. There is a risk that

[15] Planning: Countdown to the Election - Savills
[16] East-West Rail: The Economic Case for Investment – Oxford Economics
[17] Siraut, J: Economic and regeneration impacts of Croydon Tramlink in Urban Transport X
[18] Hall, P & Marshall S (2000): Report on Transport and Land Use/Development for Independent Transport Commission, cited in RICS: Land Value and Public Transport: Stage 1 Report
[19] Walmsley, D & Perrett, K: The Effects of Rapid Transit on Public Transport and Urban Development, cited in RICS: Land Value and Public Transport: Stage 1 Report

developers will not make the most of the increased accessibility unless they are given a planning framework to work within and incentives to do so.

Of course, the accessibility improvements facilitated by transport investment are a critical factor in the eventual impact on development. Ryan[20] notes that it is where time savings are noted that increases in property values are likely to accrue. In other words, if the change in accessibility is sufficiently large (e.g. new metro in poor public transport area) then palpable time savings will be made (by at least some sectors of the population who would use the system). Whereas a public transport investment that hardly changed travel times to any significant degree would not expect to see so much impact.

A study into the potential property impacts of Crossrail[21] estimated that, over the next 10 years:

- Commercial office values around Crossrail stations in central London will increase due to Crossrail over the next decade, with an uplift of 10 per cent in capital value above a rising baseline projection.
- Urban realm improvements and the development of new schemes above Crossrail stations will act as a highly visible and beneficial driver for further development activity, the intensification of use and in several areas. Crossrail will have a transformative effect on the property market and development activity over time.

Residential development

Siraut[22] notes that land accumulation for private residential redevelopment is difficult and this tends to limit such development along the route of new transit systems especially where the system is a conversion of an existing heavy rail route serving well established localities, for example, Tyne & Wear Metro and the first section of the Manchester Metrolink. Where there is space available for development, for example, Don Valley in Sheffield, Beckton on the Docklands Light Railway and Salford Quays on Manchester Metrolink extensions, new residential development has been facilitated. In North America, where land tends to be more readily available there have been numerous examples of high density residential development being attracted to transit served locations.

A Study by RICS[23] notes that there are many factors that influence property prices of which transport is just one. Access to open space and the quality of local schools can impact house prices by as much as local transport accessibility.

The role of East West Rail

Drawing upon the above, we estimate that East West Rail will contribute to the following at a national level:

- **It will help to unlock higher levels of housing growth that is urgently required in the South East**. It will do this by making town centre locations (and other areas with new stations, if developed) more attractive to residential development as a result of their improved connectivity. The impact is likely to be variable at each station location depending on the change in connectivity expected;
- **It will help to alleviate labour market constraints in the South East** by expanding the size of the potential labour force within an acceptable commuting period. This may have the effect of making some locations more attractive for commercial development, bringing forward additional jobs at some locations;
- **It will help to drive agglomeration benefits at key high value clusters** by bring businesses closer to each other, thereby increasing business growth in key sectors vital for the UK
- **It will reinforce the image of the 'Golden Triangle'** as being a coherent economic entity and could attract further inward investment to key locations along the route
- **It will help to rebalance some of the growth away from the London economy**, which is subject to its own labour market and congestion constraints, towards a series of locations in the South East where there is space to grow;

[20] Ryan, S. Property Values and Transport Facilities: Finding the Transportation-Land Use Connection, cited in RICS: Land Value and Public Transport: Stage 1 Report
[21] Crossrail Property Impact Study 2012, GVA Grimley
[22] Siraut, J: Economic and regeneration impacts of Croydon Tramlink in Urban Transport
[23] RICS Policy Unit: Land value and public transport: Stage two – summary of findings

7.2. Sub-Regional Context

Introduction

This section reviews the growth aspirations along the East West Rail route and provides an assessment of how improved rail links might help to contribute to these. The analysis has been at the LEP level given their role as facilitators for inward investment and co-ordinators of sub-regional growth, with further analysis of labour market issues at the local authority level.

The LEPs and local authorities that will accommodate a station served by EWR Western Section trains are:

- Thames Valley Berkshire LEP: Reading
- Buckinghamshire and Thames Valley LEP: Aylesbury Vale
- Oxfordshire LEP: South Oxfordshire, Oxford, Cherwell
- South East Midlands LEP: Milton Keynes, Bedford, Central Bedfordshire

This section should be read in conjunction with Table 6-6 at the end of this chapter which provides key metrics to support the analysis.

Thames Valley Berkshire LEP

The Thames Valley Berkshire (TVB) LEP is home to over 870,000 people and 42,000 businesses. Together these generate economic output of around £30bn. This is equivalent to around 15% of the total for the South East region or just over 2% of the UK-wide figure. On a national stage, TVB performs strongly on most key metrics. In 2012/13, the LEP secured more inward investment projects than any other LEP area apart from London. The 2014 *UK Competitiveness Index 2013* concluded that TVB is by far the most competitive LEP area in England.

However, there are some key constraints to growth. The LEP has identified that the biggest single risk to the future economic contribution of TVB concerns the transport and communications infrastructure.

Within TVB, there are world class businesses, but many of these – particularly those in tech-based sectors – are struggling to recruit and retain the staff that they need. The LEP recognises that if its ambitions for economic growth are not to be stifled, it must grow our overall labour supply. Where particular skills are in very short supply, businesses need to be able to find solutions. East West Rail has a key role to play in increasing the size of the potential labour market to facilitate growth in the LEP.

The LEP also recognises that it is imperative that the planned housing provision is delivered. The forecasts created for the now-revoked South East Plan (which are largely reflected in the adopted Local Plans) are fast becoming out of date. Existing housing targets may have to be adjusted where there is evidence that housing affordability is significantly worse than in adjoining areas (defined in relation to Local Plans); this is a particular concern in TVB. Again, East West Rail might be able to help deliver housing and commercial floorspace within Reading town centre (as identified in Table 7-1), although its impact is likely to be relatively marginal.

Table 7-1 Development opportunities within close proximity to potential EWR Stations – Thames Valley Berkshire LEP

Station	Residential Units	Office floorspace (sq.m)	Retail floorspace (sq.m)
Reading	4,528	1,500	70,000

Source: Consultants of review of local planning strategies

Reading

- The buoyancy of the Reading Diamond in employment and labour market terms has been evident in higher economic activity and employment rates, but there are some causes for concern in the impacts of the 2008/9 recession, after which the Diamond had a higher unemployment rate than the South East. The improved connectivity realised by EWR may help to generate additional employment in the city for local residents;
- A skills gap exists in the city where employers report having employees not fully proficient for their jobs. While the data shows significant variation over time (and likely has strong cyclical tendencies) it

is notable that employers tend to identify more employees without the required skills than nationally. EWR has the potential to widen the available labour market catchment area and therefore address these issues.

Buckinghamshire & Thames Valley LEP

The Greater Thames Valley (GTV6) is the most prosperous, productive and entrepreneurial part of the UK. The economy is worth £161.7 billion per annum, with 334,915 businesses providing 3.1 million jobs. It has GVA per capita which is 13.8% above the national level as well very high educational attainment.

The LEP plans to deliver almost 11,000 homes and 31,000 jobs between 2015 and 2020 subject to securing government investment for growth.

Last year, Buckinghamshire Thames Valley LEP ranked 2nd among LEPs for housing completions. This, combined with the fact that Buckinghamshire is the 2nd most porous LEP in the country (with only 62.3% of residents working in the LEP area and 92,000 people out commuting) means congestion is becoming a significant constraint. These statistics, together with some of the empirical evidence he LEP has identified from the increasing number of businesses that are complaining about road congestion, supports the business case for the need to improve our transport infrastructure.

The LEP has commissioned a number of transport studies that have outlined that identified the following connectivity issues:

- Poor connectivity to neighbouring centres and employment areas;
- Poor north-south highway connections, in terms of journey times, speeds and reliability;
- High dependence on the private car - for many in Buckinghamshire, public transport is currently not a viable, realistic alternative, as the point to-point journey times are typically between two to two-and-a-half times longer than by car;
- The road and rail radials from London are heavily congested;
- Aylesbury has poor connectivity with neighbouring urban centres, with the fastest options involving journeys in excess of one hour;
- Poor and congested east-west connections between Bedford, Milton Keynes, Aylesbury and Oxford;

When combined with the fact that cross border growth is expected to increase travel demand, transport is likely to remain a significant constraint to growth under a business as usual scenario. East West Rail can help to help to alleviate some of these congestion issues, improving the image of the LEP for further inward investment and job creation.

Transport, particularly how it is integrated into land use planning, also has a crucial role to play in the successful delivery of town centre regeneration. Aylesbury and High Wycombe face intense competition from rival centres such as Milton Keynes, Watford, Slough, Reading, and Oxford. The regeneration of towns is required to attract private sector investment to avoid the town centres stagnating, and to support a mixed and vibrant town centre economy. Growth in and around both towns, necessitates that the town centres develop and grow to be able to support the varied needs of the population. Failure to do so will result in the towns becoming increasingly dormitory, and encourage people to travel further to more distant centres, thereby worsening congestion and carbon emission levels. The East West rail link to Aylesbury will play a key role in supporting growth at the town, with Table 7-2 illustrating that the town could deliver 885 new residential units and a considerable amount of commercial floorspace, which could be supported by the improved connectivity facilitated by the railway.

Table 7-2 Development opportunities within close proximity to potential EWR Stations – Buckinghamshire & Thames Valley LEP

Station	Residential Units	Office floorspace (sq.m)	Retail floorspace (sq.m)
Aylesbury	885	114,900	45,001

Source: Consultants of review of local planning strategies

The LEP has also identified a number of potential schemes which will help unlock a number of key local employment sites. Particular schemes of note under this priority include the Winslow Station and

Employment Site Developments (Furze Lane & Access onto A413) - This scheme will deliver a road on the edge of Winslow in order to support housing growth on the edge of the town, linked to the East West Rail developments.

Aylesbury Vale

- Aylesbury Vale is a net exporter of labour with 2001 Census data showing that 33,000 residents commute out of the District to work, with 16,000 people commuting into the District to work. Commuting self-containment appears to have fallen in recent years. This is expected to have been influenced to the construction of the Stoke Hammond bypass, which improved journey times to Milton Keynes, and the improvements to journey times on the Chiltern rail line to London Marylebone. EWR may have the effect of increasing out-commuting to larger regional centres such as Milton Keynes, although it could help to stimulate demand by improving sub-regional connectivity to the town.
- The office market in the District is relatively small and focused on local occupiers; and has grown by a very limited extent over the last decade. There is an overhang of out-dated space in Aylesbury, yet demand is currently not strong enough to support substantial speculative development. The industrial market has performed more strongly through the recession, albeit not as well developed as in surrounding centres closer to the motorway network. EWR may provide a stimulus to the redevelopment of town centres sites close to the station.

Oxfordshire LEP

Oxford is a global brand, known the world over for its academic excellence and historical significance. The area is amongst the top five Technology Innovation Ecosystems in the world, home to a significant knowledge-intensive cluster, with 1,500 high tech firms employing around 43,000 people. The close proximity of these economic assets provides major opportunities to expand university and business interaction.

Yet to date the Oxford City Region has underperformed compared with other high-tech areas. Oxfordshire's GVA per capita has followed the UK average (1980-2006), while Cambridgeshire grew at 2.5 times the national rate. Oxfordshire's hi-tech sector is similar in scale, but more broadly based, with greater spin-out activity, a 90% survival rate and in a better strategic location. But Cambridgeshire's hi-tech sector is focused in two major locations. Oxfordshire's research centres are scattered (Oxford/Culham/Harwell), and its high tech clusters widely dispersed, without the essential infrastructure and employment sites.

The LEP's diagnosis of the recent underperformance is that the LEP lacks connectivity, networks and critical mass to support growth, services and investment; without these it is much more difficult to grow and retain firms and attract Foreign Direct Investment.

The LEP's knowledge economy currently relies on fragmented and informal collaborative networks and there is limited access to resilient and fast Broadband across the county. The information and exchange networks and hubs need greater focus, connectivity, scale and reach across the region. The current road and rail connections are poor across the key areas of Bicester, Oxford and the Enterprise Zone Science Vale and this is reducing the physical connections between and across these investment locations. These connectivity issues are further constrained through capacity constraints exacerbated by high levels of in-commuting.

Improved linkages provided by East West Rail may have the effect of helping to concentrate some of these high tech activities in accessible locations, providing a critical mass for growth.

Oxfordshire's business base is static and is listed in the lowest quarter for new business formations when compared to other LEP areas. Employers report that empty job vacancies are impacting on their business due to a lack of applicants with the required skills, qualifications or experience particularly in the advanced manufacturing/motorsport industries. Lack of space is a major limitation to the Oxfordshire economy, particularly for expanding businesses and start-ups. It also restricts housing supply, particularly in Oxford, which drives up house prices and limits the attractiveness and diversity of labour supply in the county. Despite the 85,000 new homes planned in Oxfordshire over the next 15 years, local housing is at the limit of affordability for many who live and work here. East West Rail could be a key factor in increasing the size of the potential labour catchment and addressing some of these labour market issues.

Table 7-3 shows that there are development opportunities in close proximity to potential East West Rail stations, as identified in local authority planning strategies, in all three station locations considered as part of

this work, which the introduction of improved connectivity associated with East West Rail, could help to facilitate.

Table 7-3 Development opportunities within close proximity to potential EWR Stations – Oxfordshire LEP

Station	Residential Units	Office floorspace (sq.m)	Retail floorspace (sq.m)
Didcot	450	Unknown	32,000
Oxford	800	35,000	37,000
Bicester	2,300	178,200	Unknown

Source: Consultants of review of local planning strategies

Oxford

- Major threats to the growth of Oxford's economy include a limited supply of labour in some sectors. Recruitment by the city's businesses, universities, hospitals and schools is difficult, because of a lack of housing choice and affordability. This adversely affects the economy, the quality of services, and the lives of those living and working in the city. EWR can help to alleviate these issues by widening the labour market catchment of the City;
- The 'strategic' sites comprise a range of some of the most important sites that need to come forward for employment-led development to drive Oxford's economy. These sites together could provide some 268,000 sqm of floorspace, which could when completed generate an estimated 12,250 jobs (SELAA 2013). With over half the city's workforce travelling into Oxford and commuting distances increasing, the pressure on infrastructure is not sustainable, even with improvements to roads and public transport. EWR therefore has an important role to play in facilitating this growth through commuting by rail.

Cherwell

- Cherwell has very high levels of economic activity with 82% of working age population as economically active. This is a good indicator of the health of the local economy but also implies that there is little or no additional spare capacity from the existing workforce. This combined with the low projected growth in population of working age implies that labour supply could be a constraint on future growth. EWR could increase the size of the available labour force which could help address some of these issues.

South Oxfordshire

- Unemployment is expected to be higher in the future under Oxfordshire County Council forecasts. This is because it is assumed that the economically active population will grow at a faster rate than the economy and the demand for labour. The improved connectivity and profile of the area resulting from EWR mayresult in increased investment and economic activity in the District and help to create jobs at a rate in line with population growth;
- South Oxfordshire District is a significant exporter of labour, primarily to Oxford, Vale of White Horse, Reading and High Wycombe. Many South Oxfordshire residents work in both Reading and Oxford which are major employment centres on the district boundaries, these centres provide a good choice of employment and South Oxfordshire provides attractive rural housing to support these centres. The improved connectivity to these locations from EWR may provide an impetus for further housing growth in South Oxfordshire.

South East Midlands LEP

The South East Midlands is a functional economic area and a significant 'growth diamond' with the potential to be a powerhouse for the business-led recovery of the national economy. The LEP covers a population of over 1.8 million people and 75,600 businesses and accounts for 3.7% of the national economy.

The LEP notes that the area's place on the Golden Triangle formed by the university centres of Oxford, Cambridge and London is valuable. An identifiable knowledge intensive corridor, containing important educational institutions and companies, is strengthened by routes such as the A421.

This area's public transport and highway connectivity to London, the South East and to the Midlands and beyond makes it a key contributor to the labour markets of these economies. It is also a dominant business location in its own right with Milton Keynes, Aylesbury Vale and Luton all featuring in the top ten UK areas for predicted output and employment growth over 2013-17, according to a recent analysis by Experian.

The area's strategic road network and rail network were the top two aspects of what is good about the area as rated by businesses. However, the LEP notes that more investment is needed to ensure that the planned growth does not lead to congestion and reduced reliability on the road network. East West Rail therefore has a key role to play in providing links both within and outside of key settlements in the LEP.

35% of businesses reported finding it difficult to obtain key skills when recruiting new staff (skills shortages are defined as where skills are difficult to obtain from outside the organisation/from new recruits). East West Rail could be a key factor in increasing the size of the potential labour catchment and addressing some of these labour market issues.

The delivery of an adequate supply of homes to meet a range of needs is perhaps the biggest challenge in the SEMLEP area, given the historic levels of employment growth and aspirations for future expansion. Local Plans across the SEMLEP area that are either already in place or currently emerging contain ambitious levels of future residential development. Current plans generally seek to continue this trend. In the current economic climate delivery of new homes has been frustrated by issues of economic viability, the availability of mortgage finance and the need for associated infrastructure.

The challenge for the area is to accelerate the number of housing completions in order to meet existing development plan targets for the provision of 127,000 new dwellings by 2026 (with 86,700 by 2021) at a higher rate than is currently being achieved. As described under section 2.2, unlocking major transport infrastructure across key locations in South East Midlands is a required precursor to open up development opportunities to build more homes and support a growing population. Achieving higher rates of delivery will therefore require further levels of investment in enabling infrastructure. East West Rail could help to bring forward some of these new homes in key locations where a step change in connectivity is realised. Table 7-4 shows that there are development opportunities in close proximity to potential East West Rail stations, as identified in local authority planning strategies, in most station locations considered as part of this work, which the introduction of improved connectivity associated with East West Rail, could help to facilitate. There is also potential for it to help unlock a whole new residential community at Wixams, south of Bedford.

Table 7-4 Development opportunities within close proximity to potential EWR Stations – South East Midlands LEP

Station	Residential Units	Office floorspace (sq.m)	Retail floorspace (sq.m)
Milton Keynes	5,000	240,000	89,748
Bletchley	800	Unknown	Unknown
Bedford	1,205	Unknown	48,800

Source: Consultants of review of local planning strategies

SEMLEP also has an active Enterprise Zone, in the Waterside area of Northampton. This is composed of more than 20 potential brownfield investment sites along the River Nene and stretching across the town centre. The University of Northampton will build its new £330m campuses on the Enterprise Zone.

Milton Keynes

- Employment and economic activity rates in Milton Keynes are higher than in the South East as a whole. In 2007/08, the economic activity rate in Milton Keynes stood at 82.4% - slightly ahead of the South East figure of 82.0%. The employment rate in Milton Keynes is high, at 79.6% ('full' employment is often defined as an 80% employment rate). This compares to 78.5% in the South East as a whole. The unemployment rate in Milton Keynes is significantly below the regional average, at 3.4% compared to 4.2% in 2007/08. This is a good indicator of the health of the local economy but also implies that there is little or no additional spare capacity from the existing workforce. This combined with the low projected growth in population of working age implies that

labour supply could be a constraint on future growth. EWR could increase the size of the available labour force which could help address some of these issues.

- Milton Keynes has low workplace self-containment, with 37% of those working in the city commuting in from elsewhere. Connectivity to the labour market in the wider sub-region is therefore key to Milton Keynes economic performance and its continued growth. Improved connectivity to the sub-region from EWR can therefore help to secure the next stage of growth of the city.

Bedford

- The Borough's employment profile lags behind its neighbours and is linked to hotspot pockets of deprivation and inequality across the Borough In 2010, 10.6% of the working age population – which equates to 10,890 residents - were claiming key out of work benefits. In some areas, unemployment is more than 30%. EWR can help to improve access to jobs, as well as stimulate local economic growth to help address these issues.

Central Bedfordshire

- Skills shortages remain an issue for local businesses with most commonly cited being job specific, customer service and communication. Attainment at most NVQ levels has fallen over the past year and Central Bedfordshire has a higher rate people of working age with no qualifications than national and regional levels for the first time since 2006 at 9.6%. The improved connectivity facilitated by EWR can help local firms access a wider labour market, addressing these skills shortages and helping them to grow;

Table 7-5 Key Economic Metrics at LEP level

	Buckinghamshire Thames Valley	Oxfordshire	South East Midlands	Thames Valley Berkshire	England
Private and other services employment: share of total 2010	58.4%	51.8%	57.4%	64.8%	54.8%
Manufacturing employment: share of total 2010	7.6%	7.9%	9.5%	6.4%	8.9%
Share of employment in public sector 2010	15.4%	18.0%	18.2%	14.9%	20.8%
GVA per head 1998	15,300	14,700	14,000	20,500	12,700
GVA per head rank 1998	5	9	12	2	
GVA per head 2009	22,100	21,900	20,100	30,700	20,700
GVA per head rank 2009	6	8	12	2	
Ratio of unemployment claimants to jobcentre vacancies 2011	2.5	1.4	2.7	2.9	4.6
Total change in adult population 2000 - 2010	1.5%	6.1%	9.4%	8.0%	7.6%
Employment rate 2011	75.9%	76.9%	75.1%	75.8%	70.4%
Patents per 100,000 residents 2007	16.3	33.4	7.8	24.6	10.6
Share of employment in Knowledge Economy and High and Medium Tech Man. 2010	24.7%	30.3%	20.2%	29.5%	22.2%
Share of employees that are highly skilled	55.6%	57.3%	46.4%	52.3%	45.2%
No. Of enterprises per 1,000 pop 2010	52	42	37	40	34

7.3. EWR Economic Impacts

In 2011, the EWR Consortium commissioned Oxford Economics[24] to summarise the wider economic case for investment in EWR-WS. Oxford Economics used their econometric models for the UK and its regions, to assess in broad terms the level of GDP uplift likely to be associated with the implementation of EWR-WS.

These models took into account many of the factors that we have highlighted in section 7.1 and 7.2 of this chapter. The results of this analysis suggested that the annual GDP uplift to the Greater South East economy associated with the implementation of EWR-WS could be around £38.1 million per year for the previous preferred scheme. In turn, the impact on tax revenues could be around £17.4 million per year for the previous preferred scheme.

Since the publication of the Oxford Economics report there have been significant changes to the specification of EWR-WS (as described in the Strategic Case). Due to this, Arup have been commissioned by the EWR Consortium to update the econometric assessment based upon the latest scheme specification.

Arup's review concluded that whilst some of the direct project inputs have expanded, none of the factors driving the original analysis have changed. Arup's view is that the original conclusions reached in the Oxford Economics report are still valid, but that the potential impacts have increased. Based upon these findings Arup have recalculated the original estimation of the GDP impacts of the investment.

Arup used the same basis of calculation as Oxford Economics used in the original report to calculate that the potential GDP impacts of the project have increased as shown in Table 7-6.

Table 7-6 Potential GDP Impact of EWR – refresh of Oxford Economics estimates

	Core Network Rail scheme (£m)	Total investment including local Contributions (£m)
Capital cost	£352	£402
Potential GDP uplift across Greater South East (per year)	£63.7	£72.7
Potential addition to UK tax receipts (per year)	£29.1	£33.2
Indicative payback period of investment	5.5 years	5.5 years

Source: Arup analysis based on original OE methodology, July 2014

The above analysis by Arup was based upon older versions of the project costs. The latest scheme costs are likely to have an impact on the GDP impacts of the scheme. It is Atkins view that the Arup analysis should be further updated to take into account the latest scheme cost estimates, at the very least the impact will be to significantly increase the payback periods for the scheme from those shown in Table 7-6.

In addition to the above, Arup also undertook an additional analysis to estimate the national and local GVA and GDP impacts from investing in the EWR-WS. This analysis shows that the total impacts on GVA and GDP will be significant. A summary of these results are shown in Table 7-7.

Table 7-7 National and local GVA and GDP impacts from EWR investment

	National impact (£m)	Local impact (£m)
Capital cost	£352	£402
GVA impact	£1,140	£399
Direct GDP impacts	£522	£183

Arup analysis based on Centre for Economics and Business Research (Cebr) data

[24] http://www.oxfordeconomics.com/publication/open/239330

Again, these results were based upon the old scheme cost estimates for EWR-WS (and hence should be updated), however, notwithstanding that, the analysis highlights a very significant national GVA and GDP impact for the scheme.

These results, whilst not additive to the results of the Value for Money assessment, further demonstrate the compelling case for investment in the EWR-WS scheme. If updated to reflect the latest scheme cost estimates, the value of the GDP and GVA impacts are likely to increase and further highlight the value both at the local and national level, of the scheme.

7.4. Summary

This chapter has reviewed the strategic role of East West Rail in terms of its ability to contribute to the UK's growth objectives. It focuses on the importance of delivering growth within the Greater South East, as well as the role improved connectivity can play in facilitating development.

Our analysis suggests that East West Rail will contribute to the following at a national level:

- It will help to unlock higher levels of housing growth that is urgently required in the South East. It will do this by making town centre locations (and other areas with new stations, if developed) more attractive to residential development as a result of their improved connectivity. The impact is likely to be variable at each station location depending on the change in connectivity expected;

- It will help to alleviate labour market constraints in the South East by expanding the size of the potential labour force within an acceptable commuting period. This may have the effect of making some locations more attractive for commercial development, bringing forward additional jobs at some locations;

- It will help to drive agglomeration benefits at key high value clusters by bring businesses closer to each other, thereby increasing business growth in key sectors vital for the UK

- It will reinforce the image of the 'Golden Triangle' as being a coherent economic entity and could attract further inward investment to key locations along the route

- It will help to rebalance some of the growth away from the London economy, which is subject to its own labour market and congestion constraints, towards a series of locations in the South East where there is space to grow;

At the local level, we have assessed the impacts that EWR-WS could have within the LEPs which overlap the scheme.

Thames Valley Berkshire LEP

- East West Rail has a key role to play in increasing the size of the potential labour market to facilitate growth in the LEP;
- The improved connectivity realised by EWR may help to generate additional employment in the city for local residents; and
- EWR has the potential to widen the available labour market catchment area and therefore address the skills gap issue.

Buckinghamshire & Thames Valley LEP

- Transport is likely to remain a significant constraint to growth under a business as usual scenario. East West Rail can help to help to alleviate some of these congestion issues, improving the image of the LEP for further inward investment and job creation;
- The East West rail link to Aylesbury will play a key role in supporting growth at the town;
- EWR may have the effect of increasing out-commuting from Aylesbury Vale to larger regional centres such as Milton Keynes, although it could help to stimulate demand by improving sub-regional connectivity to the town; and
- EWR may provide a stimulus to the redevelopment of town centres sites close to Aylesbury station.

Oxfordshire LEP

- Improved linkages provided by East West Rail may have the effect of helping to concentrate some of these high tech activities (currently dispersed across Oxfordshire) in accessible locations, providing a critical mass for growth; and
- EWR can help to alleviate Oxford's limited labour market supply by widening the labour market catchment of the City and supporting in-commuting by rail.

South East Midlands LEP

- East West Rail has a key role to play in providing links both within and outside of key settlements in the LEP;
- East West Rail could be a key factor in increasing the size of the potential labour catchment and addressing labour market issues in the LEP;
- East West Rail could help to bring forward new homes in key locations (e.g. Milton Keynes, Bletchley and Bedford) where a step change in connectivity is realised.

Overall Economic Impacts

Analysis by Oxford Economics and Arup has identified that EWR-WS can generate significant positive GDP and GVA impacts. Nationally EWR-WS could generate over £1 billion in terms of GVA and over £500 million in direct GDP impacts.

These impacts, when considered together with the results of the conventional transport appraisal, demonstrate that there is a very strong case for implementing the EWR-WS scheme.

8. Commercial Case

8.1. Introduction

The purpose of the commercial case is to assess the commercial viability of East West Rail Western Section (EWR) project. The project is to be delivered by Network Rail. The commercial case will outline the procurement strategy and the financial implications of the proposed strategy.

EWR will be assessed using the guidance provided by the Department for Transport in the document titled "Transport Business Case". The guidance provides a checklist of items, which should be addressed, to produce a robust commercial case. Each item on the checklist will be discussed to demonstrate Network Rail's ability to deliver the project.

8.2. Output Based Specification

Due to the size and complexity of East West Rail – Western Section, an 'output based specification' is appropriate. It will enable the integrated supply chain to achieve value for money and apply innovative solutions to the project. There are two schemes, core and incremental, to consider each with their own outputs. The core scheme has the following outputs, as defined by Network Rail in their 'Output Specification'.

- East West Rail is to connect, via rail, key economic centres of activity and is to provide a strategic link between Milton Keynes and Aylesbury. In order to achieve this, a number of infrastructure improvements and additions will be required.
- The opening of East West Rail should support the ambitions of the local authorities, lying along the route. Ambitions include; economic growth based upon private job creation and housing developments.
- The scheme is to provide a connection between existing radial routes, to enable rail users to avoid interchange through London.

Further, objectives have been defined for the incremental scheme, which are as follows:

- To enhance network capacity and flexibility by creating opportunities for alternative routeing for passenger and freight services. Possible opportunities for medium and long distance services should also be exploited.
- To ensure that, if an opportunity exists, the reconstructed East West Rail route provides sufficient capacity for at least the next 20 years without the need for further enhancement.

8.3. Procurement Strategy

8.3.1. Project Alliance Agreement (PAA)

Network Rail has indicated that they intend to use a Project Alliance Agreement (PAA) to deliver the project; due to the size and complexity of the project and the risks involved with delivery. It will be similar to the PAA, currently, in place to deliver the Staffordshire Area Improvements Programme. However, the PAA will be adapted to meet the specific project needs of East West Rail – Western Section. The PAA method was first used in Western Australia for large oil & gas projects. The Staffordshire Area Improvements Programme Alliance was the first competitive tender process using the PAA method, worldwide.

This section will give a brief introduction to the proposed PAA method. Throughout, references to the 'pure' PAA method will be made as and when required as well references to the Staffordshire Area Improvements Programme alliance will also be made.

A project alliance is a form of procurement used for capital projects. This form of procurement is best suited for large complex projects which demonstrate a large degree of risks. The core objectives of a project alliance are to achieve value for money and to share the project risks. Network Rail aim to focus on the method of working and how the organisation collaborates with other business using the PAA.

A project alliance is formed between a government department or a government backed enterprise, as owners, and one or more private parties, as non-owners, to deliver a project(s). The key characteristics of a project alliance are as follows:

- There is collective sharing of all or a majority of the project risks.
- A no blame culture should be established and practiced by the different parties within the alliance.
- A project team should be selected on the basis of the best person for the role rather than any other reason.
- Decisions on important project issues should be made collectively and based upon established principles.
- The 'pure' PAA method suggests that non –owner parties should be paid using the following compensation model. Network Rail will establish an alliance model based on this structure.

  a. All project costs should be paid on 100% open book basis,
  b. Payments should be made cover to overheads and an appropriate level of profit,
  c. A pain/gain mechanism should be established to reward all members for outstanding performance and vice versa.

Network Rail has indicated that they will aim to adopt the alliancing principles in their purest form, wherever possible, as has been done for the Staffordshire Area Improvement Programme. This will mean that Network Rail has a dual role to play within the Alliance;

1. to act as the project owner and to pay the non-owners; and
2. to act as an owner participant to ensure the performance of the works.

One likely area for amendments to the alliance methodology is aligning the pure alliance method with European procurement laws, as was done for the Staffordshire Area Improvements Programme. Network Rail project delivery team have already engaged with internal contracts & procurement, legal services and external behavioural consultants to develop the alliance strategy for East West. Rail.

Network Rail has considered a number of options and has decided that the package of works can be broken down into 4 disciplines;

1. Structures, Property and Civils;
2. Permanent Way;
3. Overhead Line Equipment (OLE) and Distribution; and
4. Signalling & Telecoms.

As a result, Network Rail will tender out the packages of works separately and contractors will be able to bid for one or more of the work packages. In summary, the route to procuring the alliance is as follows:

- **Market Development**: Network Rail will undertake briefings and collaborative development training to brief the market about project scope, timescales and the contracting and procurement strategy; and
- **Link-Up selection, pre-qualification and pre-forming**: A list of 45 suppliers is on Link-Up. They will be able to submit bids for one or more of the work packages apart from OLE & Distribution, as this will be procured under their Electrification Framework. The list will then be refined to a shorter list, approximately 10. The refined list of contractors will then be asked to form pre-formed alliances as part of the tender processes.

8.3.2. Payment Mechanisms, Pricing Framework & Charging Mechanisms

Network Rail will adapt the following compensation framework as suggested for a 'pure' alliance framework and one that is used in Australia. A generic compensation model is discussed and key principles are described.

During the development stage a target cost estimate is produced and performance targets are agreed upon. This is so that each of the non-owner parties can be paid using the following '3 limb model'.

- **Limb 1**: All expenditure under the alliance including mistakes, wasted effort, and rework are paid at actual cost, subject to audit.

- **Limb 2**: A fee is paid to the non-owning parties to cover 'normal profit' and the recovery of any non project specific overheads e.g. corporate.
- **Limb 3**: A fair and pre-agreed share of the 'pain' or 'gain' is made, depending on how actual outcomes compare with pre-agreed targets (in both cost and non-cost performance areas). This is designed so that all participants can win or all can lose.

8.3.3. Design Principles for the Pain/Gain Mechanism

The alliance provides some guiding principles for jointly developing the pain/gain mechanism, as follows:

- The pain/gain mechanism should be linked to project outcomes that add or detract value to the owner.
- The end result for all members of the alliance should be a win, win or lose, lose for all the participants.
- The owning party, Network Rail, should be totally committed to the non-owning party maximising their returns through the pain/gain mechanism.
- The maximum downside risk for each of the non-owning parties should be capped to a maximum of the 'limb 2' fee. This means that each non-owning party can recover their 'limb 1' cost in the worst case scenario.
- Generally there is no cap on the upside gain potential for a non-owning party as the upside gain is inherently limited.
- The pain/gain mechanism should be clear, concise, and easy to understand and there should be complete transparency between the parties on the arrangements and payment calculations.
- All of the elements of 'limb 3' should be interlinked to ensure that there is no incentive to sacrifice performance in one area to secure reward in another area.
- Where there is more than one non-owning party within the alliance, pain/gain payments to and from non-owning parties should be in direct proportion to their 'limb 2' fees unless agreed due this mechanism not appropriately reflecting the relative contributions of each non-owning party.

8.4. Risk Allocation & Transfer

There are a number of strategies either in place or are in development to better manage risks associated with East West Rail – Western Section.

- As with a majority of large and complex infrastructure projects, most risks arise during the detailed design and delivery of the project. As mentioned earlier Network Rail is proposing for a Project Alliance Agreement for the detailed design and delivery of the project. The alliance agreement would be similar to the alliance delivering the Staffordshire Area Improvement Programme. Unlike a traditional form of contract, risks and responsibilities are shared and managed collectively, in a Project Alliance Agreement. Note that nearly all risks are collectively shared and managed. However, it might be appropriate for the owning party to sometimes retain some specific risks. Under an alliance non-owning parties should not solely own a risk. This pain/gain payment mechanism, described earlier, enables the joint sharing of risks.
- Network Rail is undertaking risk identification and management strategies as described in the Governance for Railway Infrastructure Projects (GRIP) process. This includes workshops on quantitative cost risk assessment (QCRA), quantitative schedule risk assessment (QSRA) and maintaining a live risk register. Key stakeholders are involved and the workshops are facilitated by construction risk specialists.

8.5. Human Resource Issues

As part of the project alliance agreement, suitable personnel will be transferred into the alliance from their existing organisations. Upon completion of the project, the project alliance will be disbanded and personnel will be transferred back into their original organisations. Through this whole process personal terms and conditions will remain the same.

The most appropriate staff will be selected for roles within the alliance. As part of this selection process job descriptions may need to change for personnel, however, this will not impact upon their personnel terms and conditions.

8.6. Contract Management

Network Rail has separated the contracting of the East West Rail project into two distinct phases as follows:

- GRIP 2-3 design development
- GRIP 4-8 project alliance agreement, as described earlier

The contract strategy for GRIP 2-3 design stage has been informed by 'lessons learned' from the Staffordshire Area Improvements Programme and learning from Australian contract experts and their experiences over the last 10 years. Network Rail has learned that the risk for a potential alliance contractor is reduced if land acquisition and planning requirements are better defined, beforehand, as they are large risks for a contractor to take on board. Therefore, Network Rail has decided to develop robust options at GRIP 2 and has internally labelled as GRIP 2+. As part of this process they have decided to develop the various disciplines to different levels during this stage to make more informed decisions during GRIP 4-8. Table 8-1 highlights the level of development for each discipline at GRIP 2+

Table 8-1 GRIP 2+ Development Strategy

Outline Feasibility	Design Options	Form 001
• Buckinghamshire Railway Museum • HS2 Alignment Impacts • Ashendon – Grendon • Bedford & Oxford Station Impacts	• Bletchley Viaduct • Signalling • Telecoms • E&P • Drainage • Environmental • Stations • Existing Structures • Earthworks • General Civils	• Track • Level Crossings

Network Rail has decided to produce the Form 001 for track and level crossings. The level of detail within the Form 001, will enable Network Rail to determine 'line and level' for the track and the additional stakeholder engagement required for level crossings, respectively, at an early stage. Furthermore, Network Rail aims to award the main alliance to complete GRIP 3 as it will enable the main contractor to innovate and influence the design option selection process during the PAA procurement process.

Network Rail have also deviated from their traditional scoring and assessment criteria for GRIP 2-3 design development tender and have moved towards a more collaborative approach. They have removed the criteria for programme compliance from their assessment criteria and have asked the bidders to propose suitable timescales.

8.6.1. Contract Length

The East West Rail scheme is planned to be completed in control period 5 i.e. by the end of March 2019. However, final accounts will run for longer than this.

8.7. Summary

The key commercial consideration is the procurement of the works. Network Rail has informed us that they intend to pursue a Project Alliance Agreement. It is our understanding that this agreement will be a development of the model used for the recent award of the Staffordshire Area Improvements project. The route to procuring the alliance will be as follows:

- **Market Development**: Network Rail will undertake briefings and collaborative development training to brief the market about project scope, timescales and the contracting and procurement strategy; and
- **Link-Up selection, pre-qualification and pre-forming**: A list of 45 suppliers is on Link-Up. They will be able to submit bids for one or more of the work packages apart from OLE & Distribution, as this will be

procured under their Electrification Framework. The list will then be refined to a shorter list, approximately 10. The refined list of contractors will then be asked to form pre-formed alliances as part.

Network Rail proposes to manage the project in two distinct phases:

- GRIP 2-3 design development
- GRIP 4-8 project alliance agreement, as described earlier

The contract strategy for GRIP 2-3 design stage has been informed by ‘lessons learned’ from the Staffordshire Area Improvements Programme and learning from Australian contract experts and their experiences over the last 10 years. Network Rail has learned that the risk for a potential alliance contractor is reduced if land acquisition and planning requirements are better defined, beforehand, as they are large risks for a contractor to take on board. Therefore, Network Rail has decided to develop robust options at GRIP 2 and has internally labelled as GRIP 2+. As part of this process they have decided to develop the various disciplines to different levels during this stage to make more informed decisions during GRIP 4-8.

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9. Management Case

9.1. Introduction

The purpose of the management case is to assess the deliverability of East West Rail Western Section (EWR). The project is to be delivered by Network Rail. The management case will focus on the project planning, governance structure, risk management, benefits realisation and assurance processes to provide a broad understanding of the project.

EWR will be assessed using the guidance provided by the Department for Transport in the document titled "Transport Business Case". The guidance provides a checklist of items, which should be addressed, to produce a robust management case. Each item on the checklist will be discussed to demonstrate the deliverer's ability/inability to deliver the project.

9.2. Evidence of Similar Projects

Network Rail, has a considerable amount of experience in delivering projects of similar size, complexity and nature. Some examples are as follows:

9.2.1. Northern Hub

The Northern Hub project consists of a number of upgrades and infrastructure improvements in and around the stations in the North of England. The objective is to improve capacity and connectivity. The project started in 2013 and is scheduled to finish by winter 2018, with a total estimated cost of around £560m. Some of the key infrastructure improvements are as follows:

- The Ordsall Chord will directly link Manchester Piccadilly and Manchester Victoria Stations.
- The improvement works at Manchester Victoria, the centrepiece of the Northern Hub project will enable East West rail services to call at the station.
- Two additional platforms at Manchester Piccadilly to allow more through trains to Manchester.
- New tracks on the line between Leeds and Liverpool and Sheffield and Manchester to enable faster services to overtake slower services.

9.2.2. Staffordshire Area Improvements Programme

The works are being delivered by the Staffordshire Alliance consisting of Atkins, Laing O'Rourke, Network Rail and Volker Rail. The improvement works started in February 2013 and are scheduled to finish in the summer of 2017. The objectives of the scheme are to improve capacity between London and the North West and to reduce congestion and improve reliability around the Stafford area. Some of the key infrastructure improvements are as follows:

- The signalling, telecoms and power supply equipment through in around Stafford area will be improved. This will include the installation of bi-directional signalling equipment at Stafford Station.
- An additional freight loop is being added to reduce congestion.
- Improvement works between Crewe and Norton Bridge to increase the line speed of the slow lines from 75mph to 100mph.
- The works at Norton Bridge include; the building of six miles of 100mph line, a new flyover and ten railway bridges.

9.2.3. Airdrie to Bathgate Rail Link

The rail project commenced in spring 2007 and was completed by Network Rail in winter 2010. The objective of the project was to connect a number of communities in North Lanarkshire and West Lothian by rail, which have had not a rail link for more than 50 years. The project also directly connected these communities to Edinburgh and Glasgow. Some of the key infrastructure improvements are as follows:

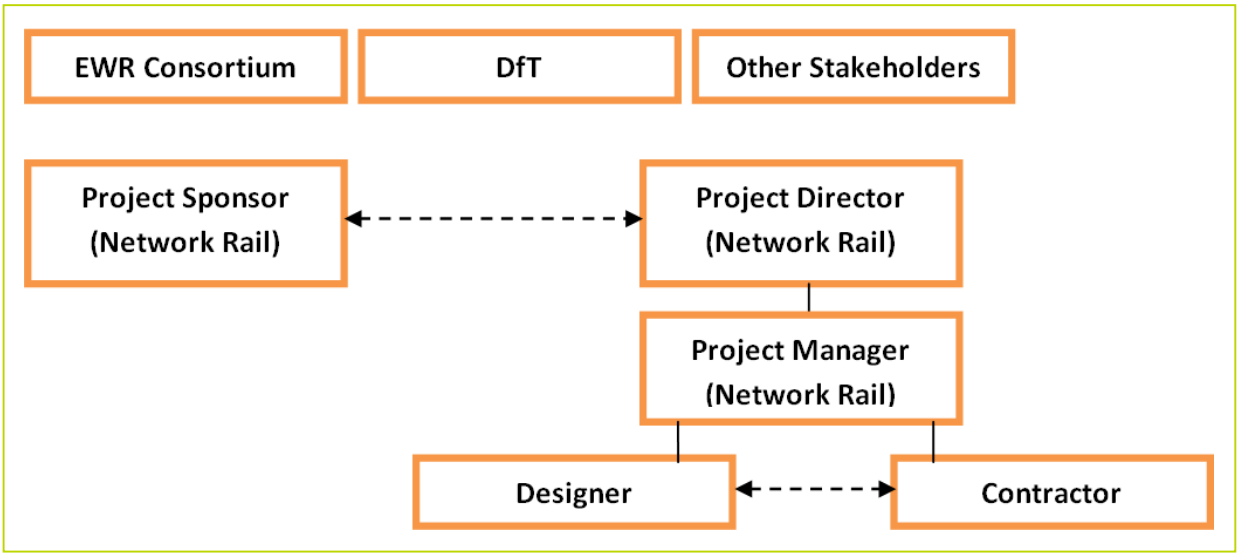
- Three new stations have been built at Armdale, Blackridge and Caldercuix, with two additional stations at Bathgate and Drumgelloch relocated. Station improvements have also been made at Airdrie, Livingston North and Uphall Station.
- The existing lines between Bathgate and Edinburgh and between Airdrie and Drumgelloch have been doubled and electrified.

The examples demonstrate Network Rail's experience and capability to deliver large scale projects with the many complexities involved.

9.3. Governance, Organisational Structure and Roles

The following proposal was made to Network Rail, with an opportunity for comments, on the organisational structure for East West Rail. Network Rail pointed out that the proposal broadly aligns with structure for GRIP 1-3 of the project.

Figure 9-1 Organisational Structure for East West Rail, during GRIP Stages 1-3



However, during GRIP stage 4-8 an alliance is most likely, as described in the 'Commercial Case'. Network Rail is in the process of deciding upon the most appropriate alliance structure and the participants within the structure. The possible candidates for sitting within the alliance are as follows:

- Network Rail
- Department for Transport
- East West Rail Consortium
- Preferred Contractors & Designers
- Local Authorities and other Interest Groups, who are impacted upon by East West Rail.
- Office of Rail Regulation

9.4. Programme / Project Plan

Network Rail Infrastructure Projects, the project delivery team, has approximately £9.5m authorised to conduct the first stage 'Output Definition' of the GRIP process. They are planning to go to internal Investment Authority Panel on the 17th July 2014 for a further £22m.

This authority is required for GRIP Stage 2+, 'Feasibility'. Network Rail has described this stage as GRIP 2+ rather than GRIP 2 as some of the surveys required to determine the feasibility of the project will need to be in more detail than is usually required by the GRIP 2 stage. In particular, the 'line and level' of the route and the interventions required for level crossings. The invitation to tender for this piece of work has now been sent out and it is likely to be awarded by the end of July 2014, once authority has been granted. Some further key dates and items are highlighted as follows:

- Network Rail estimate that the GRIP 2+ work will be completed by preferred contractor by the end of March 2015.

- They are likely to go for the investment authority in October/November 2015. Prior to this, Network Rail will decide upon the best contracting strategy. This will either be a GRIP 3 and then GRIP 4 to 8 or a GRIP 3 to 8.
- The works are to be completed by March 2019.

An additional requirement, to achieve value for money, is the Enhancement Cost Adjustment Mechanism (ECAM). This was mandated by the Office for Rail Regulation during the Control Period 5 review process. It is a process by which capital projects will be reviewed by the ORR on a progressive basis to achieve an efficient expenditure.

9.5. Assurance & Approvals Plan

Network Rail has highlighted a number of procedures, which are in place, to ensure that the project is being delivered appropriately. They are discussed as follows:

- Enhancement Cost Adjustment Mechanism (ECAM) – This has been mandated by the Office of Rail Regulation during the periodic review 2013 process. The process involves the review of capital projects on a progressive basis to ensure efficient expenditure.
- Network Rail is required to submit their business case to investment authority, internally at progressive stages of the project. A project of this nature and size is required to be submitted to large projects panel.
- Network Rail manages and controls capital projects using their Governance for Railway Investment Projects (GRIP) process. It consists of eight project stages. The process aligns with industry procedures and enables Network Rail to manage risks. Each stage is product driven rather process driven. Projects can progress along the GRIP process, upon completion of the agreed upon GRIP products at each stage.
- Network Rail has an internal Stage Gate review process. This occurs at various stages of the project lifecycle and is in place to ensure procurement is aligned to corporate and project objectives and that value for money is being achieved.

9.6. Communications & Stakeholder Management

A document titled “Western Section, East West Rail Communications and Consultation Strategy”, September 2013 was produced jointly by Network Rail and East West Rail Consortium (EWRC). The document was signed off for six months and is currently in the process of being updated. The main objective of the document is to demonstrate a joined up approach to communication and stakeholder management.

9.6.1. Communication Strategy

Due to the sheer size, complexity and the number of stakeholders involved the document highlights the need for EWRC and Network Rail to demonstrate a joined up and proactive approach to communication in order to not damage the reputation of the project. The objectives of the strategy are as follows:

- to raise awareness, communicate and engage with all stakeholders in a timely and informed manner of any activity that may affect them as the Western Section, EWR Phase (1&) 2 project progresses
- to engage relevant statutory bodies, local authorities and communities on how the Western Section of East West Rail can be delivered efficiently, amicably and sympathetically
- to draw on the knowledge and expertise of local authorities and communities ensuring they are fully engaged in the consultation process for the benefit of the project and communities, to maximise benefits and minimise any negative impact
- to identify at an early stage of development; advocates and likely challenges (and challengers) to the scheme
- to phase and/or group stakeholder communications to make efficient use of time and resource required
- to support Network Rail’s application for one or more Transport and Works Act Orders to obtain necessary powers to re-instate the line

Currently, all stakeholder communication regarding East West Rail is being monitored and logged by the communications team at Network Rail. There are four key methods for communication and the management of communication:

- **Line-side neighbours**: Line-side neighbours are currently informed of works, nearby, by contractors.

- **24 hour helpline**: Opportunity for the community to engage on arising issues.
- **Station and Community Exhibitions**: A series of East West Rail exhibitions at key railway stations (including Bedford, Milton Keynes, Bletchley, Aylesbury, and Oxford) along the route are taking place or will take place. East West Rail information panels and interactive kiosks are or will be rolled out on a progressive basis in suitable public areas within local authority premises.
- **Feedback**: All feedback is properly collated, managed and analysed to inform future decisions.

9.6.2. Consultation Strategy

The strategy identifies that Network Rail has a duty to consult stakeholders under the Transport & Works Act (TWA) legislation. The consultation will be on an iterative process. This will allow interested parties to feedback comments throughout the planning stages well ahead of the final plans being developed. In addition to other stakeholder feedback, pre-application consultation carried out in relation to this scheme will be documented and form part of our formal submission to the TWAO Unit.

Further details on the specifics of the consultation process will be made known as the project progresses and in appropriate time. Some likely areas for consultation are as follows:

Table 9-1 Possible consultation themes

Consultation Theme	Possible Options	Influencing Factors
Construction Methodologies	Access routes, hours of work, road vs. Rail	- Alliance contractor appointment
Design Options	Level crossing bridges, stations and other structures	- Alliance contractor appointment - Level crossing strategy
Environment	Mitigation solutions for noise, vibration, ecological factors	- Environmental Impact Assessment - Environmental Statement early 2015
Highways, Crossings & Rights of Way	Alternatives if level crossings closed or how to make them safe	- Level crossing strategy - Railway Crossing Task Force

9.7. Programme & Project Reporting

There are a number of reporting arrangements in place to inform and allow integration of major projects. Current programme and project reporting are as follows. Please note that the reporting arrangements will revised as the project progresses.

- A monthly update submission is made by the East West Rail team within Network Rail. This is followed by an integration meeting between the East West Rail and the Electric Spine team. Following the meeting a finalised progress report is issued.
- A monthly meeting is undertaken by the East West Rail senior leadership team.
- There is a quarterly Industry Planning Group meeting regarding East West Rail. The meeting is chaired by [text redacted under FOI section 40], Network Rail Sponsor for the project.
- There is a two weekly meeting between Network Rail and the East West Rail Consortium.
- Numerous internal meetings as and when required
- The steering leadership group meets with the local councils every quarter. Network Rail is required to provide a report ahead of this meeting.

9.8. Implementation of Work Streams

The works are divided into a number of categories with each category consisting of further details of the work streams. The categories are civil's, track, signalling, buildings, electrification and telecoms. Table 9-2 highlights the change in quantity due to change scope and differentiates between the core scheme and incremental scheme.

Table 9-2 Quantities for specified scope

Works Category	Original Scope	Revised Scope	
	Core Scheme	Core Scheme	Incremental Scheme
Track (miles)	29	53	57
Structures (no of structures, no of interventions to be confirmed)	42	472	472
Level Crossings	83	104	104
- New Footbridge	11	30	30
- New Highway Bridge	1	21	21
Signalling (miles)	29	53	57
Earthworks (no of embankments, no of interventions to be confirmed)	45	668	668
No of Train Paths Bicester - Bletchley	7	5	9
No of Train Paths Aylesbury to MK	3	4	8
No of Train Paths Bletchley to Bedford	2	2	5

9.9. Key Issues for Implementation & Project Dependencies

There are a number of issues for the EWR delivery to take account of during the development and delivery of the project. Network Rail is aware of the issues and is collaborating with the appropriate stakeholders to resolve and come to an optimal solution. These are summarised in Table 9-3:

Table 9-3 Key Issues for Implementation

Theme	Issue
Electric Spine Project	The current intention is to electrify the whole section between Oxford and Bedford via Bletchley. • The route between Oxford and Bletchley (via Denbigh Hall Junction) is to be electrified as part of the EWR project, under the remit of the Electric Spine project. • The extended route between Bletchley and Bedford is under review as the electrification of this section is likely to trigger further enhancement and the potential for this section is linked to further freight capacity and the electrification of the Midland Main Line. Therefore, this section is likely to be undertaken at a later stage, CP6. • Subject to further feasibility work, EWR have agreed to undertake W10/W12+ gauge clearance between Bletchley and Bedford to facilitate future electrification. • Power supply, traction and rolling stock maintenance strategies will be developed in accordance with wider national strategies proposed by the Electric Spine Team. East West Rail will be advised by regular communication from the Electric Spine team. • The DfT is considering an option for electrifying the Chiltern Main Line (including the section between Claydon Junction and Princes Risborough). EWR is to take account of this and should facilitate this future possibility.
East West Rail Phase 1	Phase 1 of EWR is to reconstruct the line between Oxford and Bicester. The intention is to commission between September 2015 and March 2016. The EWR – Western Section will need to account of the Phase 1 scheme and any unplanned delays and project issues.
HS2	East West Rail will intersect the proposed alignment of HS2 at Calvert, Buckinghamshire. It is a major site of construction and will become the major infrastructure maintenance depot for HS2. HS2 in their construction plan assume that rail borne traffic, during construction, will be available the EWR route.
East West Rail – Central Section	The DfT is considering a central section for East West Rail in CP6 or later. East West Rail is aware of this and will take account of any potential issues arising.

9.10. Risk Management Strategy

Network Rail has identified project risks and will implement a number of strategies to manage these risks. Please refer to the section ‘Risk Allocation & Transfer’ on the Commercial Case for full details.

9.11. Contract Management

Please refer to the sections ‘Procurement Strategy’ and ‘Contract Management’ in the Commercial Case for full details.

9.12. Benefits Realisation Plan

'Benefit realisation', within Network Rail, for infrastructure investment schemes has not been a very transparent and well structured process to date. There are no corporate tools for tracking and reporting financial, performance, safety and other qualitative claimed benefits. The East West Rail delivery team are aware of this and understand the consequences it can have on realising return on investments and ensuring value for money. However, it does not mean to say that benefits are not monitored or have not been monitored in the past, for infrastructure investment schemes. Some of the methods used are as follows:

- Previously, cash benefits have been tracked via look-back reports close out reports and pre-budget reductions.
- 'Lessons learned' are undertaken at the end of infrastructure investment projects. There are workshops to understand what was done well and what was done not so well to ensure that mistakes are not replicated in the future.

There is an increased focus on investment returns, achieving scheme objectives, maintain focus on commitments and remove duplication of claims, therefore a review of benefit realisation has taken place within Network Rail. In future, which will include East West Rail, project teams are required to report a benefit. Network Rail has outlined a four tier benefit model;

1. Quantitative – cash impact;
2. Quantitative – increase in productivity;
3. Qualitative – internal; and
4. Qualitative – external.

During CP5; Network Rail will introduce a tool to track benefits, along with guidance, roles and responsibilities.

9.13. Monitoring & Evaluation

As the project is currently in its early stages, GRIP 1, a monitoring and evaluation plan is yet to be defined. It will be completed at a later stage of project development.

9.14. Contingency Plan

As the project is currently in its early stages, GRIP 1, a full contingency plan is yet to be defined. However, a broad fallback position for the project is the scope that was defined in the High Level Output Specification (HLOS). The HLOS defined the scheme based upon the previous business case produced by the EWR consortium. This scheme is deliverable and costed, however it will deliver a significantly lower level of capability than that currently being promoted.

9.15. Summary

- Network Rail, has a considerable amount of experience in delivering projects of similar size, complexity and nature, including:
  - Northern Hub
  - Staffordshire Area Improvements Programme
  - Airdrie to Bathgate Rail Link
- Network Rail has developed a clear governance structure covering GRIP stages 1 to 3 and is currently developing the proposal for GRIP 4-8 to take into account the proposed alliance approach.
- The detailed project plan is still being developed, but is constrained to be delivered in CP5.
- There are existing Communications and Stakeholder Management strategies in place which are actively being used by Network Rail at the moment.
- Plans for monitoring and evaluation of the project are currently being developed by Network Rail. A tool to track benefits, along with guidance, roles and responsibilities will be issued during CP5.

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10. Conclusions

The update of the Business Case for EWR-WS demonstrates that there is a strong business case for the scheme.

From a strategic perspective, EWR-WS has assumed greater importance due to its ability to provide additional capacity to the network and provide new routes and services for passenger and freight services to help to support the continued growth of the wider economy.

Financially the cost estimates are higher, but more detailed than those used in the previous business case. The scope of and specification of the scheme has also increased which explains part of the cost increases, but not all. There is a significant difference between Atkins and Network Rails cost estimates and it is likely that the final cost will lie somewhere between the two.

From an economic view point the scheme represents high value for money with the ability to generate significant benefits, despite the cost estimates of the scheme being significantly higher that when assessed previously. Additionally, there have also been significant refinements to the approach to forecasting and economic appraisal adopted for this business case update that reflect the latest DfT guidance and reduce the scale and valuation of benefits when schemes are considered on a like for like basis. The impact of these changes is to reduce the BCR calculated for the equivalent Core EWR scheme from over 6:1 to just under 4:1. The Core scheme nevertheless still continues to represent high value for money.

The addition of Cross Country services and associated benefits offset the changes, even accounting for the cost of electrification at 100 mph line speed. By way of example, the electrified scheme with Core plus Cross Country services between Bournemouth – Manchester and Reading to Nottingham will generate a BCR of 6.3 (matching the BCR for the Core EWR scheme as presented in 2010).

However, the strongest economic VfM cases for the scheme are presented in the Core plus Cross Country non-electrified scenarios, reflecting the very significant value the addition of Cross Country services bring regardless of electrification. The scenario of Core plus DMU Cross Country services between Bournemouth – Manchester and Reading to Nottingham delivers a BCR in excess of 40:1, highlighting the significant capital cost saving estimated to be in excess of £200m over electrification against only a modest reduction in forecast transport user and provider economic benefits. The very substantial further cost increases associated with securing 125 mph line speed mean that these scheme scenarios fail to meet the high economic VfM threshold of a BCR of 2:1 in all instances.

Additional sensitivity testing has shown that the inclusion of rolling stock lifecycle costs, whilst having a change on the absolute appraisal values, does not change the relative performance of the options under consideration, thereby confirming the main conclusions of the analysis (See Appendix J). Furthermore, an estimate of the freight benefits of the scheme (using the MEC approach) are significant (over £800m in the central case – see Appendix K) which are currently excluded from the overall appraisal results.

When wider (WITA) impacts are included the value of benefits increases in the order of 10-15% with a consequential increase in the BCRs associated with the scheme. It should also be noted that at present no quantification of the economic benefits for freight traffic generated by EWR have been captured and these would further enhance the case.

Commercially, Network Rail has a clear strategy to procure and deliver the scheme, using a development of the alliancing model which is currently being successfully used to deliver the Staffordshire Area Improvements project. The fact that such detailed plans and preparation is in place gives confidence that the scheme will be able to move to the implementation phase for delivery within CP5.

In terms of management, Network Rail have established a clear governance structure for the current stage of the project and have set out proposals for how this will be translated into the proposed delivery alliance. Project plans and programme are currently being developed, but Network Rail is currently on track to achieve delivery within CP5. There is an active stakeholder management process in place and strong support from local and industry stakeholders for the scheme. The project interfaces with several other major rail projects including the ‘Electric Spine’ and HS2. The interfaces between these are complicated and will require active management on behalf of Network Rail, HS2 Ltd and the DfT to ensure successful delivery.

The current working relationships between these key players provide confidence that these interfaces should not provide an impediment to successful project delivery.

Overall the updated business case confirms that there is strong case for investing in the delivery of the EWR-WS scheme and that it will be able to provide significant transport and wider economic benefits at the sub-regional, regional and national level.

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Appendices

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Appendix A. ECAM

A.1. Enhancements Cost Adjustment Mechanism (ECAM)

ECAM is a new mechanism developed between Network Rail and ORR to determine the efficient level of funding available to deliver the enhancements portfolio in CP5. The mechanism will determine the level of funding for enhancements against which Network Rail will out or under perform in the control period.

As projects complete GRIP 3 they will provide evidence to ORR to demonstrate:

- The output is consistent with the HLOS, including capacity analysis where appropriate;
- Where appropriate, an update of the business case assumptions to demonstrate value for money;
- Evidence of operator buy-in to the selected option;
- A delivery plan change control submission to set out project milestones;
- Evidence to demonstrate that the estimate contains planned efficiency initiatives, wherever appropriate;
- A defined strategy on compliance to interoperability TSIs and other relevant statutory provisions; and
- Evidence that the selected option is the best whole life cost solution.

ORR will then assess the submission and determine the efficient cost of the project. The funding associated with the project will then be added to the overall funding available to deliver the enhancements programme and Network Rail will retain the flexibility to fund projects as required for delivery from this funding. A forward plan of ECAM submissions, based on completion of GRIP 3 milestones as shown in this document, will be provided to ORR on a regular basis.

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Appendix B. Depot Strategy

B.1. Introduction

An important consideration when specifying a new rail service is where the trains (assumed to be multiple units) will be stabled and serviced when not in use. There are three broad service groups of passenger services which are assumed to make use of East West Rail Western Section, these are:

- Local Services – Operating as an extension of existing Marylebone – Aylesbury Services;
- Local Services – Operating as either an extension of current diesel Reading to Oxford services or an extension to the proposed electric Paddington to Oxford services; and
- Cross Country Services – Operating by re-routing an existing service via EWR, or entirely new services making use of the new routing opportunities provided by EWR.

We will consider each of these in turn.

B.2. Marylebone to Aylesbury/Milton Keynes services

These services are currently operated by Chiltern Railways using Class165/168 DMU's. Chiltern have Depot's at Aylesbury and Wembley. It is envisaged that this would remain an appropriate strategy once the operation of services via EWR commences. It is anticipated that the modest increase in fleet size required to operate the extended services to Milton Keynes would not trigger the need for an increase in depot/stabling facilities.

B.3. Paddington/Reading to Oxford/Milton Keynes/Bedford services

These services are currently operated by First Great Western using class 165/166/180 DMU's as well as Class 43/Mk3 HST's. Services which currently terminate in Oxford make use of the carriage sidings to the north of the station for stabling. Maintenance depots are currently located at Old Oak Common (London) and Reading for the current diesel fleets.

If the EWR route opens prior to electrification then it is likely that Reading based class 165/166's would operate the services. The lack of stabling opportunities at Milton Keynes, together with the likelihood that the carriage sidings at Bedford will be intensively utilised by the new Thameslink fleet indicates that diagrams should assume that layover times should be minimised at Milton Keynes and Bedford.

There is the former maintenance depot at Bletchley which could be used for stabling and limited servicing. This is currently also used for this purpose by London Midland. The Bletchley site can be accessed from the WCML directly but is only accessible to/from EWR with reversing moves, which could act as a constraint on using this facility at busy times of the day. These constraints suggest that empty stock moves will be required at the start and end of each day to place units into the locations that they will be required for the start of services.

In a post-electrification scenario the depot's utilised will depend upon the rolling stock being used. On the Great Western class 800/801 will be based at North Pole (London) depot, the EMU replacement for the class 165/166 fleet are likely to be based at Reading. As previously highlighted, the lack of stabling at Milton Keynes and Bedford means that the nearest stabling point would be at Bletchley. This is currently used as an EMU stabling point by London Midland. The nature of the hourly service to Milton Keynes & Bedford is not likely to generate a need for extensive stabling or servicing facilities for EWR EMU's remote from their home depot. There is the potential to upgrade the facilities at Bletchley to allow for overnight servicing (cleaning/watering etc.) for units operating at the Milton Keynes Bedford at the end of the day. However the cost of this must be weighed against the cost of running the empty stock to Reading at the end of the day and back to Bedford/Milton Keynes for the start of the next. This could be a finely balanced decision and more detail on the rolling stock, timetables and unit diagrams would be required to enable this to be ascertained.

B.4. Cross Country Services

There are three potential Cross Country services being considered in terms of the use of EWR-WS, these are:

- A re-routing of the existing Bournemouth – Manchester Piccadilly service;
- A new service from Reading to Nottingham; and
- A new service from Bristol to Peterborough.

B.4.1. Bournemouth to Manchester

The current Cross Country Bournemouth to Manchester services are operated by class 220/221 DEMU's. Maintenance on the Cross Country fleet is undertaken at the Central Rivers depot near to Burton-upon-Trent. Overnight servicing for the current Bournemouth to Manchester service is also undertaken at either LNWR Eastleigh or Alstom Longsight depot's. For the re-routed Bournemouth – Manchester service it is likely that the same depot's would be used as at present.

In an electrified scenario, the depot at Longsight is already configured to maintain 25kV OLE EMU's and so could accommodate an electric Cross Country fleet. Eastleigh is not currently configured for 25kV OLE EMU's, however the Electric Spine project, will convert the lines through Eastleigh to 25kv OLE operation, meaning that it's not beyond the realms of possibility that the access to the Eastleigh works site could be electrified, thereby enabling it's continued use by South Coast to Manchester Cross Country services.

B.4.2. Reading to Nottingham

For a Reading to Nottingham service using the current class 220/221's it is likely that the depot strategy would follow the current practice where units terminating at Reading (at the end of their diagram) then run empty stock to Eastleigh for servicing. At the Nottingham end, again, as per current practice, it is likely that trains terminating at Nottingham (at the end of their diagram) would run empty stock to Central Rivers (Burton).

In an electrified scenario, the depot/stabling strategy would depend to a large extent upon the rolling stock that was utilised to operate the services. It is likely, provided that access to Eastleigh Works is electrified, that Reading terminators would continue to be serviced at Eastleigh (as Reading is unlikely to have the capacity with the Crossrail and GW EMU fleets). The Nottingham end of the journey is much more uncertain as there is very limited stabling capability at Nottingham itself. Currently, of the Cross Country services which terminate at Nottingham the class 220/221's travel empty stock to Central Rivers and the Class 170's either travel empty stock to Leicester for stabling or travel empty stock to Tyseley (Birmingham) for maintenance. It is therefore likely that, in an electrified scenario, Cross Country EMU's which terminate/start from Nottingham would have to travel empty stock to/from a remote depot at the start end of their diagram. Derby's Etches park Depot would appear to be a logical location for this once the Midland Main Line is electrified.

B.4.3. Bristol to Peterborough

A Bristol to Peterborough service would be a completely new service. If operated by class 220/221 we would envisage that the service would use LNWR's Bristol Barton Hill depot for stabling/servicing and light maintenance as this depot is currently already used by these units operating to the west of England. At the Peterborough end of the route there are carriage sidings which are currently used by First Capital Connect (FCC) (Nene Carriage Sidings) although there are no servicing facilities there at present. FCC units currently travel to Hornsey depot for servicing. It is understood that DB Schenker's Peterborough TMD has previously been used for the servicing of DMU's, however it is highly likely that investment would be required to enable the overnight servicing of class 220/221's at this location. The alternative would be running as empty coaching stock to a suitable servicing point, which could be some distance away, e.g. travelling via Melton Mowbray and Syston and onto Central Rivers via either the Castle Donnington Line or the Leicester to Burton-Upon-Trent Line.

In an electrified scenario, depot considerations become much more complicated. Apart from the new Class 800/801 depot, all of the other existing depot's in Bristol currently cater for diesel trains. Therefore, depending upon the rolling stock utilised for the electric Cross Country services the potential for providing 25kV OLE into Bristol Barton Hill or St Philips Marsh Depot's should be considered to enable other electric rolling stock to be serviced, this would enable stock to be stabled and maintained at the western end of the service. In Peterborough the Nene Carriage Sidings are currently equipped with

25kV OLE, although as mentioned previously; do not currently have the facilities to enable overnight servicing of trains. An alternative may be to investigate whether Hornsey could be used as a depot for these Cross Country units. Hornsey Depot is being expanded as part of the Thameslink project and may be able to accommodate a relatively small number of Cross Country EMU's for servicing. An intermediate stabling location, irrespective of the rolling stock could be Oxford Carriage sidings, however as noted previously, there are currently no servicing facilities at this location.

B.5. Conclusions

All of these considerations highlight the issues which will require to be resolved to enable the local and Cross Country services to operate via East West Rail. There appear to be potential options to enable DMU based services to operate over the route. However, there is some uncertainty over the rolling stock types which will be used in an electrified scenario which is highlighted in the issues raised above. There could potentially be a need for some new servicing facilities, particularly for some of the Cross Country service options being considered. Finally, the rollout of electrification across more routes and the movement of rolling stock fleets could trigger the need for new depot/stabling/servicing facilities which could be made use of by EWR Cross Country services. In particular the electrification of the Midland Main Line is going to drive the need for an electric TMD somewhere between Sheffield and Bedford. It is assumed that Derby's Etches Park Depot would be electrified to serve this requirement. This could potentially address the issue of where to provide servicing faculties at the Nottingham and Peterborough ends of the routes.

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Appendix C. Operational Analysis

C.1. Introduction.

The purpose of this analysis was to assess the performance impacts of assuming different line speeds and rolling stock on the operation of EWR-WS services. The results of this analysis will also be used to estimate Sectional Running Times (SRTs) for use in the Timetable Analysis.

C.2. Scope

The line speeds evaluated are:

- 125 mph
- 110 mph
- 100 mph

The rolling stock considered is:

- IEP EMU (5-car)
- Class 222 DEMU (5-car)
- IEP D/EMU (5 car)

The calling patterns and routes evaluated are:

- Oxford – Winslow - Bletchley
- Oxford - Oxford Parkway – Islip – Bicester – Winslow – Bletchley
- Oxford – Bicester –Milton Keynes
- Oxford – Bicester – Bletchley – Bedford

C.3. Assumptions And Limitations

The following assumptions apply to this analysis:

- Acceleration curves were obtained from RailSys (version 6.10.2) for the gross weight of the rolling stock and assuming no gradient and a performance factor of 1.0 (train uses its full acceleration and braking force).
- Braking rates for all trains were assumed to be 0.78 m/s^2
- Dwell times of 0.5 min were assumed for all stops.
- Line speeds were assumed as constant for the whole route except for the flyover at Bletchley over the West Coast Main line (WCML) and Claydon Jn, where speed restrictions of 25mph and 30mph apply respectively. The stretches at which those speed restrictions apply were simplified from those indicated in the National Electronic Sectional Appendix (NESA).

C.4. Summary Tables

Table C-1 shows the journey times achieved on each scenario and Table C-2 highlights the total distance over which each train runs at maximum line speed, for each scenario.

Table C-1 Journey Times (minutes)

		125 mph			110 mph			100 mph		
Route	Calling Pattern	IEP EMU (5-Car)	Class 222 DEMU (5-Car)	IEP D/EMU (5-Car)	IEP EMU (5-Car)	Class 222 DEMU (5-Car)	IEP D/EMU (5-Car)	IEP EMU (5-Car)	Class 222 DEMU (5-Car)	IEP D/EMU (5-Car)
Oxford-Bletchley	Oxford - Winslow - Bletchley	23.10	23.66	23.11	23.61	24.06	23.61	25.39	25.62	25.41
Oxford-Bletchley	Oxford - Oxford PKW- Islip - Bicester - Winslow - Bletchley	32.84	33.66	33.03	34.04	35.29	33.75	33.75	33.89	33.78
Oxford-MKC	Oxford - Bicester - MKC	26.76	27.49	26.77	27.44	27.82	27.45	28.86	29.24	28.85
Oxford-Bedford	Oxford - Bicester - Bletchley - Bedford	37.26	38.19	37.27	38.19	38.89	38.20	40.08	40.46	40.11

Table C-2 Total Distances Over Which Trains Run at Maximum Line Speed (miles)

		125 mph			110 mph			100 mph		
Route	Calling Pattern	IEP EMU (5-Car)	Class 222 DEMU (5-Car)	IEP D/EMU (5-Car)	IEP EMU (5-Car)	Class 222 DEMU (5-Car)	IEP D/EMU (5-Car)	IEP EMU (5-Car)	Class 222 DEMU (5-Car)	IEP D/EMU (5-Car)
Oxford-Bletchley	Oxford - Winslow - Bletchley	15.07	9.11	15.07	20.96	18.16	20.96	23.44	21.58	23.44
Oxford-Bletchley	Oxford - Oxford PKW- Islip - Bicester - Winslow - Bletchley	4.34	1.30	4.34	9.24	6.39	9.36	15.81	12.03	15.81
Oxford-MKC	Oxford - Bicester - MKC	14.32	8.37	14.32	20.15	17.35	20.15	22.82	21.02	22.88
Oxford-Bedford	Oxford - Bicester - Bletchley - Bedford	22.94	14.01	22.94	31.75	27.58	31.75	35.78	32.99	35.78

C.5. Speed Graphs

The graphs in Figures C-1 to C-12 show the speeds achieved along the route in the different scenarios.

Figure C-1 Speed graph for Semi-direct service Oxford-Bletchley – 125 mph Line Speed

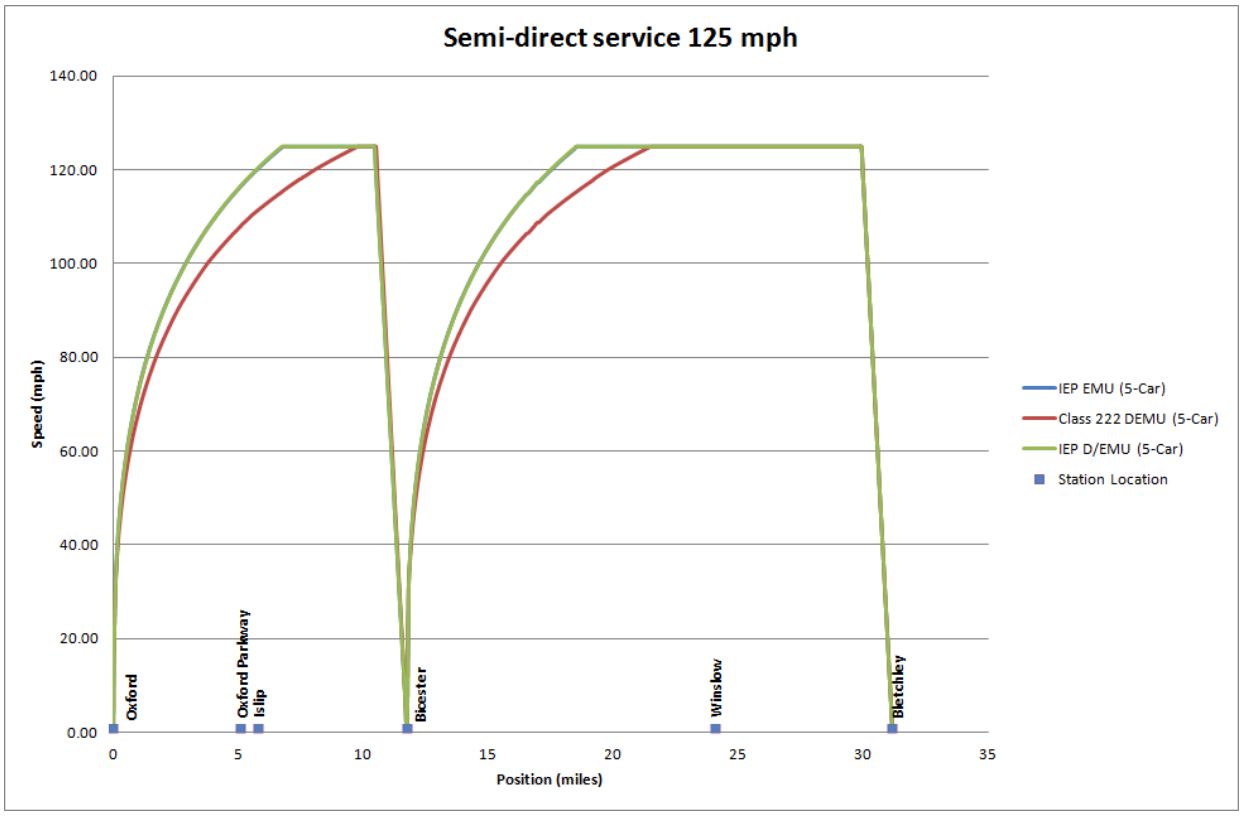

Figure C-2 Speed graph for Semi-direct service Oxford-Bletchley – 110 mph Line Speed

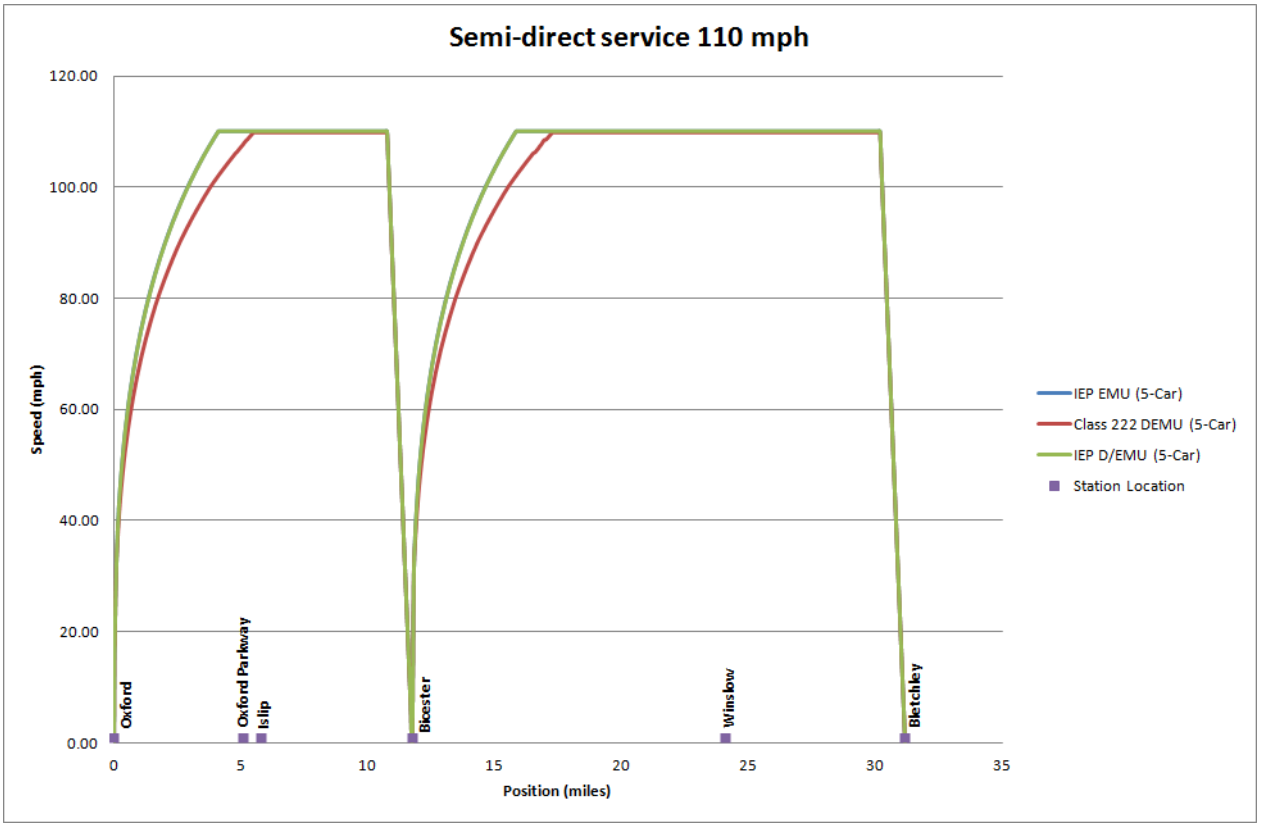

Figure C-3 Speed graph for Semi-direct service Oxford-Bletchley – 100 mph Line Speed

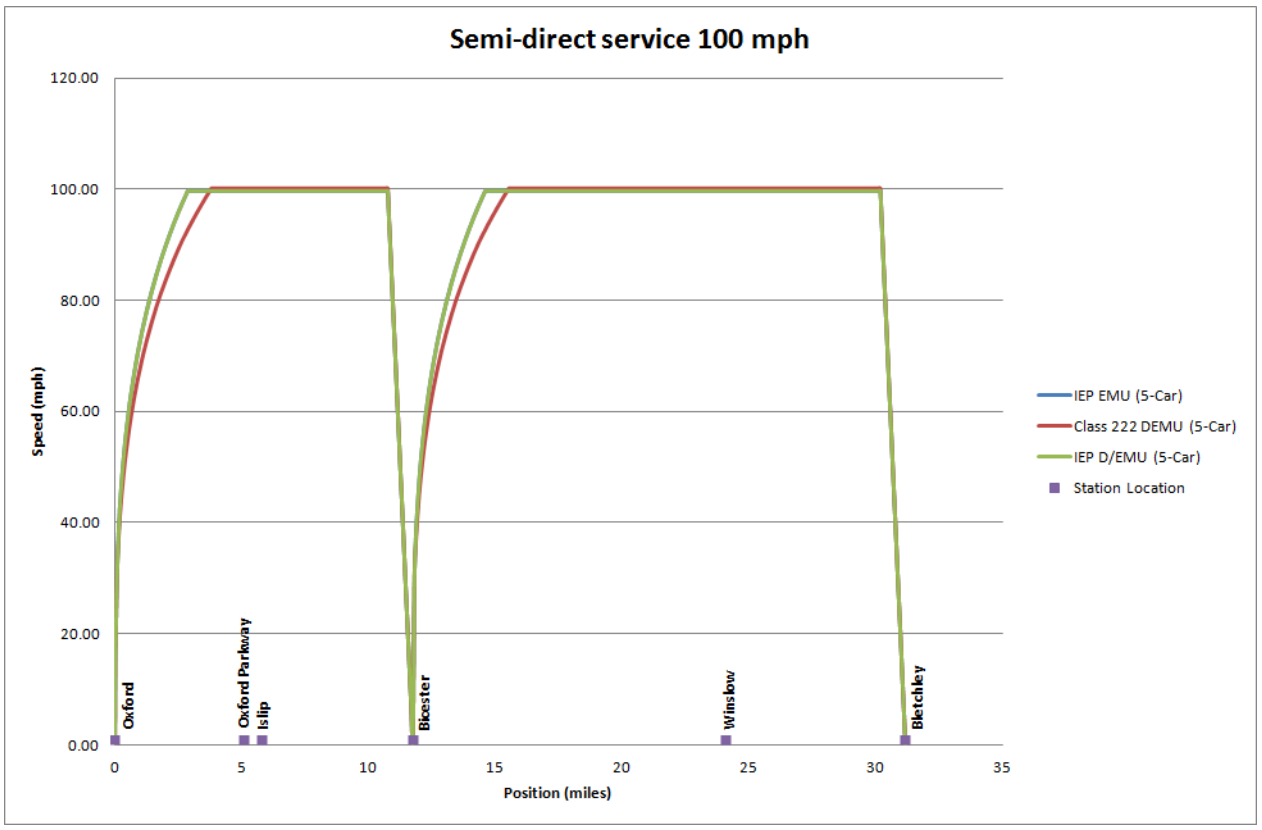

Figure C-4 Speed graph for Stopping service Oxford-Bletchley – 125 mph Line Speed

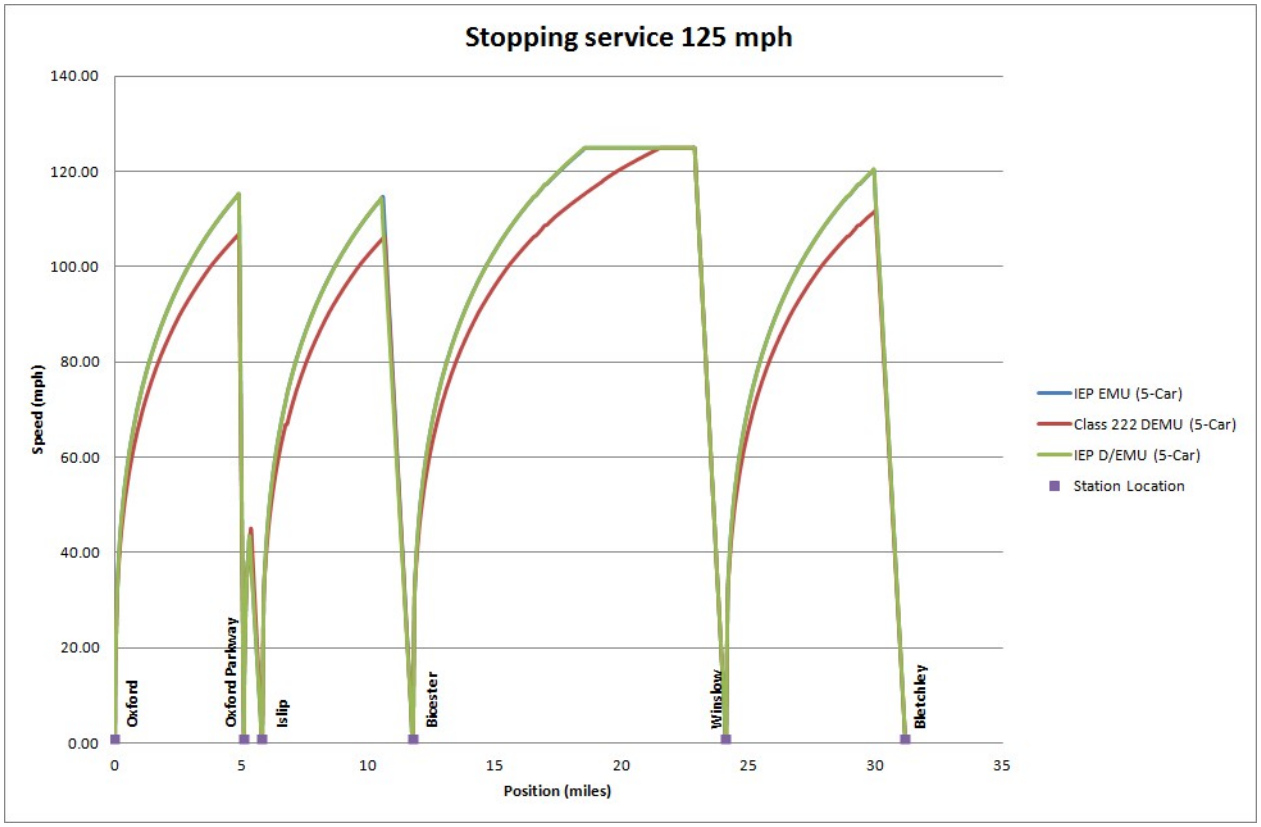

Figure C-5 Speed graph for Stopping service Oxford-Bletchley – 110 mph Line Speed

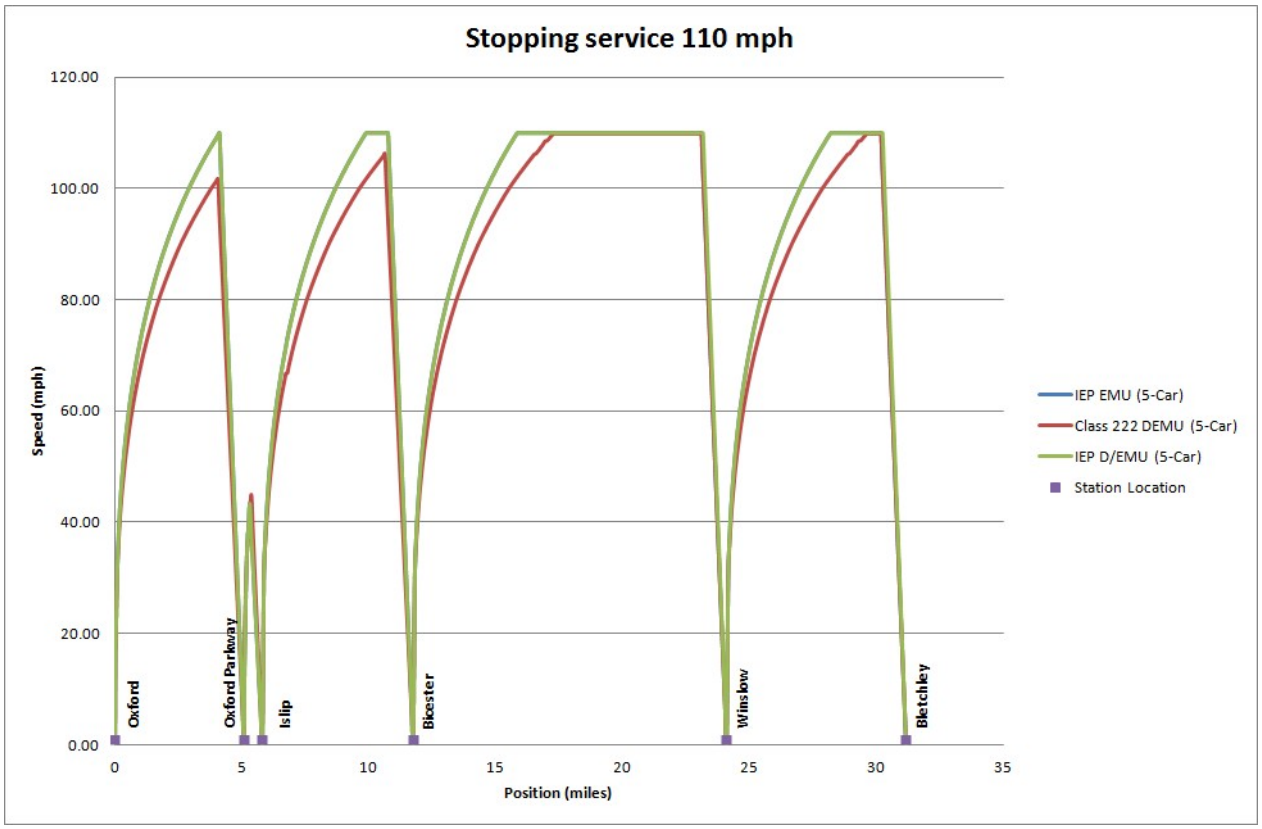

Figure C-6 Speed graph for Stopping service Oxford-Bletchley – 100 mph Line Speed

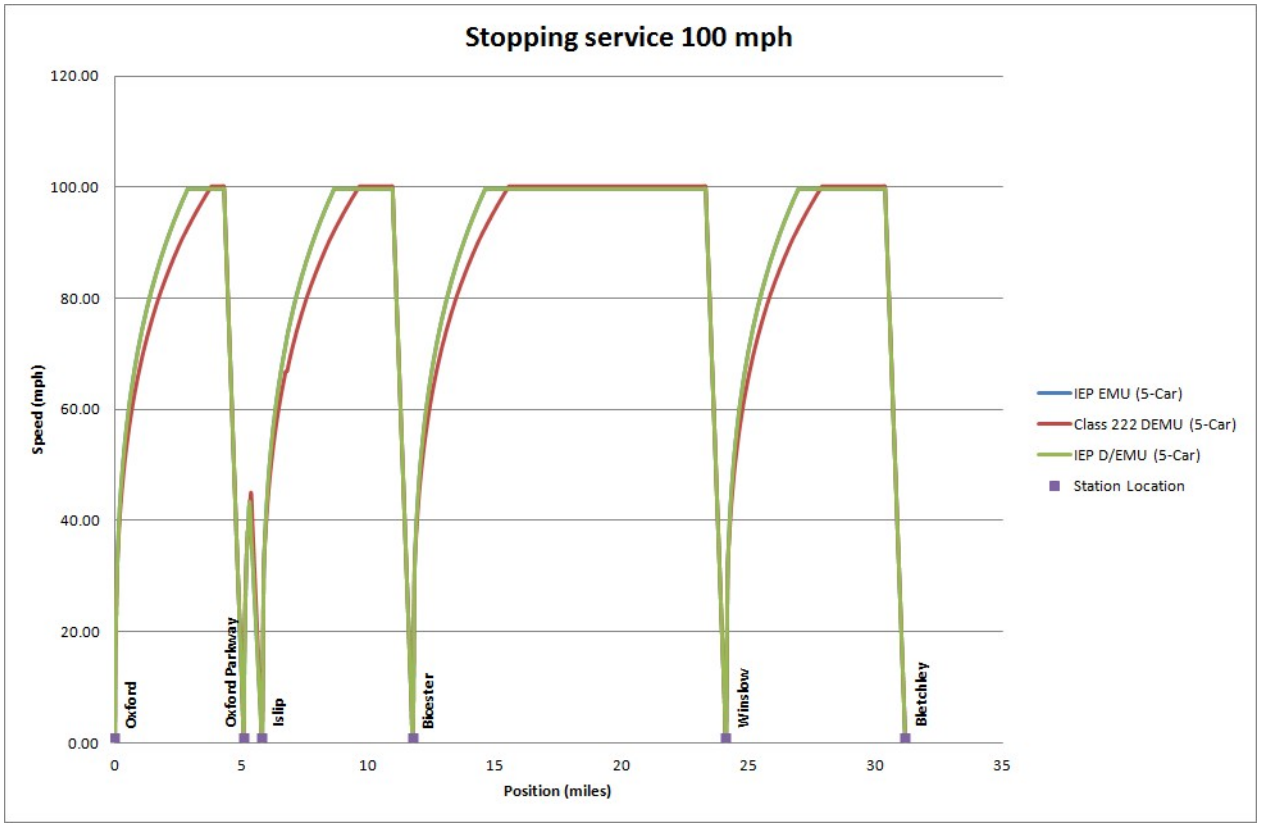

Figure C-7 Speed graph for Semi-direct service Oxford-MKC – 125 mph Line Speed

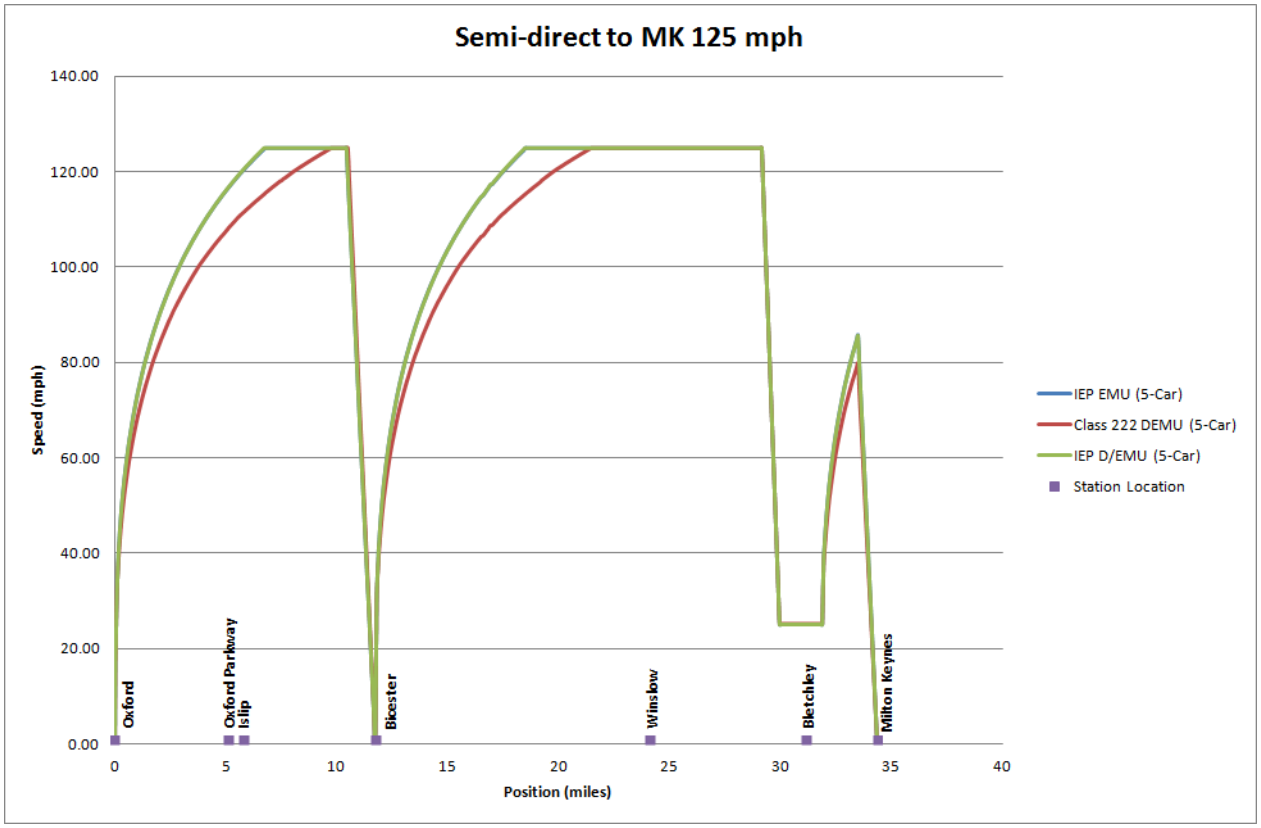

Figure C-8 Speed graph for Semi-direct service Oxford-MKC – 110 mph Line Speed

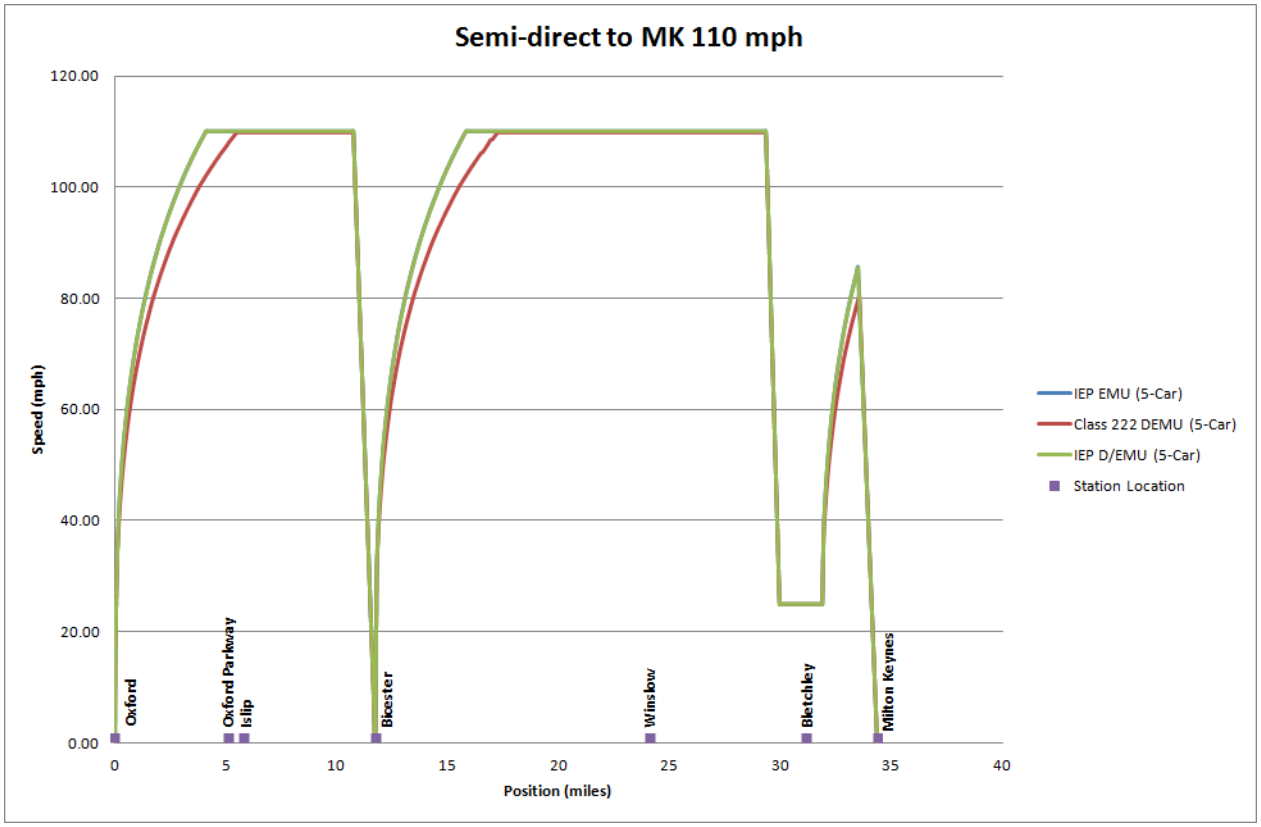

Figure C-9 Speed graph for Semi-direct service Oxford-MKC – 100 mph Line Speed

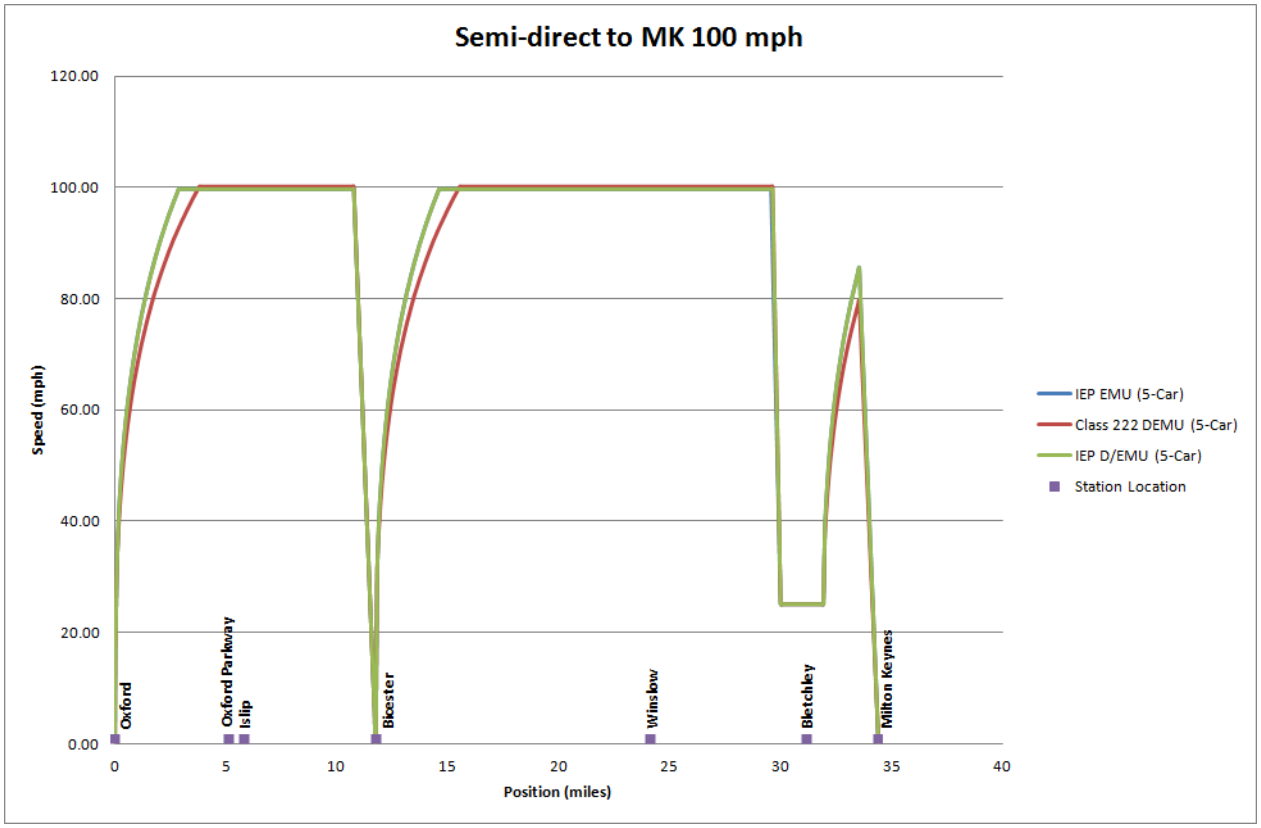

Figure C-10 Speed graph for Semi-direct service Oxford-Bedford – 125 mph Line Speed

Figure C-11 Speed graph for Semi-direct service Oxford-Bedford – 110 mph Line Speed

Figure C-12 Line Speed graph for Semi-direct service Oxford-Bedford – 100 mph Speed


Semi-direct to Bedford 100 mph
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Speed (mph)
0
10
20
30
40
50
Position (miles)
Oxford
Oxford Parkway
Islip
Bicester
Winslow
Bletchley
Bedford
IEP EMU (5-Car)
Class 222 DEMU (5-Car)
IEP D/EMU (5-Car)
Station Location

Appendix D. Timetable Analysis

D.1. Timetable Analysis

The following timetables are based upon diverting the current cross county South Coast to Manchester service via EWR-WS.

Timetable A produces an optimal timetable assuming that the current timing of the Cross Country service can be changed. Timetable B also produces an optimal timetable, but uses the current XC path on the Down service but will arrive at Oxford slightly later on the Up service (arriving XX17½ instead of XX13).

In addition, there does appear to be a path south of Oxford in these timings, then running Up Relief Didcot to Reading (100 mph).

The following assumptions are made:

- Separate Chiltern line to separate bay platforms at Oxford station from Oxford North Junction;
- Oxford North Junction to have parallel routes from GW route to/from EWR-WS;
- EWR-WS to be double track throughout from Oxford to Bedford;
- The route remains single line from Claydon LNE Junction to Aylesbury Vale Parkway;
- Bay platforms 2 and 2A used (between existing services at Milton Keynes) to terminate / start services from there.
- 3 minutes headways on East West route as per existing headways Oxford / Bicester for Evergreen.

Points from timetables:

- Draft TT gives Bedford / Oxford fast time of around 42 minutes and semi fast time with around 50 minutes. Oxford / Milton Keynes is around 30 minutes fast with semi fast being around 34 minutes.
- If only the bay at Milton Keynes (platform2A) can be used for terminating / starting services we only have 2 windows each hour off peak XX13 – XX21 and XX47 – XX01. The services from the EW route have used platforms 2 and 2A which would need to be agreed by NR in which case we can be more flexible.
- Some re-timing of existing LM services in and out of platform 2 at Milton Keynes by an odd minute or so will be necessary, i.e. the current XX47 departure to leave at XX45½.
- Table A Down has a good margin between existing Virgin West Coast (VWC) services for the XC stop at Milton Keynes on the Down Fast. Table B Down is tighter and may need the following Down VWC fast service re-timing ½ minute later from Milton Keynes. However 5 minutes running time from the new Bletchley West Junction off the EWR-WS to arriving at Milton Keynes may be generous so we could possibly call slightly earlier.
- Little overall effect on WCML capacity with 1 additional XC service being planned.
- XC path in timetable A Up has train routed Fast line Rugby to Hanslope Junction then run Up Slow to call at Milton Keynes. The path in timetable B Up is also routed this way.
- Local service Bedford / Bletchley slightly re-timed from present all day timings.
- 1 bay platform would be able to accommodate the proposed terminating / starting services at Bedford.
- Timings have been calculated from Atkins analysis (Appendix C) with bespoke estimates for specific SRTs. Have assumed 100 mph line speeds on EWR-WS. Other assumptions only improve journey times slightly but assume if it works for 100 mph we could get it to work for 110 mph and 125 mph.
- Have assumed regular Chiltern / Oxford paths. If these are fixed already and inflexible we would need to re-calculate.
- Freight paths on Up could be at Oxford N Junction between XX/17½ and XX/21 and between XX/27 and XX/41½ for timetable A and XX/21½ and XX/41½ for timetable B. in the Down direction at Oxford N Junction these could be between XX/21 and XX/25½, xx/43 and XX/55½ also XX/01½ and XX/12.

Table D-1 East West Rail – Timetable A – Up

		E	D	A	B	A	C	G	F
Bedford	D	XX15	XX18						XX50
Bedford St Johns	A								XX53
	D								XX53½
Bedford St J. Jn		XX/18	XX/21½						XX/54
Lidlington	A		XX28						XX10
	D	(1½)	XX29						XX10½
Woburn Sands	A		XX33½						XX20½
	D		XX34						XX21½
Fenny Stratford	A								XX27½
	D	XX/31½	XX/37						XX28½
Milton Keynes	A				XX56		2	2A	{2}
	D				XX57		XX15	XX18	
Denbigh Hall S Jn					XX/59½		XX/17½	XX/20 ½	
Bletchley LL									XX33
Bletchley HL	A		XX39		1½		XX19½	XX22 ½	
	D	XX/33½	XX39½		XX/03		XX020½	XX23	
Bletchley W Jn		XX/34½	XX/40½		XX/04		XX/21	XX/24	
Winslow	A		XX47				XX27½	XX30 ½	
	D		XX47½				XX28	XX31	
Claydon LNE Jn		XX/42½	XX/52		XX/12		XX/33	XX/36	
Gavray Jn		XX/47½	XX/56½	XX/59½	XX/16½	XX/29		XX/40½	
Bicester Town	A		XX57	XX/00½		XX30 ½		XX41	
	D		XX57½	XX/01		XX31		XX41½	
Islip	A			XX07		XX37			
	D			XX07½		XX37 ½			
Oxford Parkway	A			XX11½		XX41 ½			
	D			XX12		XX42			
Oxford N Jn		XX/55½	XX/06	XX/14½	XX/24	XX/44 ½		XX/50	
Oxford A		XX57½	XX08	XX/17	XX26	XX47		XX52	

A Oxford / Marylebone
B XC South Coast / Manchester via WCML
C Marylebone / Milton Keynes
D Reading / Bedford
E XC South Coast / Sheffield or Bristol Peterborough
F Existing Bletchley / Bedford all stations
G Reading / Milton Keynes

Table D-2 East West Rail – Timetable A – Down

		B	C	D	A	E	F	G	A
Oxford	D	XX13		XX16	XX26½	XX35		XX38	XX56½
Oxford N Jn		XX/15		XX/18	XX/28½	XX/37		XX/40	XX/58½
Oxford Parkway	A				XX31				XX01
	D				XX31½				XX01½
Islip	A				XX35½				XX05½
	D				XX36				XX06
Bicester Town	A			½ XX27	XX42			XX48½	XX12
	D			XX27½	XX42½	②		XX49	XX12½
Gavray Jn		XX/22½		XX/28 ½	XX/43½	XX/46½		XX/49½	XX/13½
Claydon LNE Jn		XX/27	XX/30	XX/33		XX/51		XX/54	
Winslow	A		XX/35	① XX38½				XX58½	
	D		XX35½	XX39				XX59	
Bletchley W Jn		① XX/37							
Bletchley S Jn		1½ XX/40½							
Bletchley HL	A	FL	XX43	XX46½				XX06½	
	D		XX43½	XX47		XX/00		XX07	
Bletchley LL							XX03		
Denbigh Hall S Jn			⑤ XX/50 SL					XX/10 SL	
Milton Keynes	A	XX44½	XX52½ 2					½ XX13 2A	
	D	XX45½							
Fenny Stratford	A						XX05		
	D			XX/49		XX/02	XX05½		
Woburn Sands	A			XX52			XX13½		
	D			XX52½			XX14		
Lidlington	A			XX56½			XX23½		
	D			XX57½			XX24½		
Bedford SJ Jn				XX/04		XX/14	XX/39		
Bedford St Johns	A						XX40		
	D						XX41 [2]	•	
Bedford	A			XX07		XX16½	XX47		

A Oxford / Marylebone
B XC South Coast / Manchester via WCML
C Marylebone / Milton Keynes
D Reading / Bedford
E XC South Coast / Sheffield or Bristol / Peterborough
F Existing Bletchley / Bedford all stations services
G Reading / Milton Keynes

Table D-3 East West Rail – Timetable B – Up

		E	D	A	B	A	C	G	F
Bedford	D	XX15	XX18						XX50
Bedford St Johns	A								XX53
	D								XX53½
Bedford St J. Jn		XX/18	XX/21½						XX/54
Lidlington	A		XX28						XX10
	D		XX29						XX10½
Woburn Sands	A		XX33½						XX20½
	D		XX34						XX21½
Fenny Stratford	A	(1½)							XX27½
	D	XX/31½	XX/37						XX28½
Milton Keynes	A				XX50½		2	2A	{2}
	D				XX51½		XX15	XX18	
Denbigh Hall S Jn					XX/54		XX/17½	XX/20 ½	
Bletchley LL									XX33
Bletchley HL	A		XX39				XX19½	XX22 ½	
	D	XX/33½	XX39½		XX/56		XX20	XX23	
Bletchley W Jn		XX/34½	XX/40½		XX/57		XX/21	XX/24	
Winslow	A		XX47				XX21½	XX30 ½	
	D		XX47½				XX28	XX31	
Claydon LNE Jn		XX/42½	XX/52		XX/05		XX/33	XX/36	
Gavray Jn		XX/47½	XX/56½	XX/59½	XX/09½	XX/29		XX/40½	
Bicester Town	A		XX57	XX/00½		XX30 ½		XX41	
	D		XX57½	XX/01		XX31		XX41½	
Islip	A			XX07		XX37			
	D			XX07½		XX37 ½			
Oxford Parkway	A			XX11½		XX41 ½			
	D			XX12		XX42			
Oxford N Jn		XX/55	XX/06	XX/14½	(½) XX/17½	XX/44 ½		XX/50	
Oxford A		XX57	XX08	XX/17	XX19½	XX47		XX52	

A Oxford / Marylebone
B XC South Coast / Manchester via WCML
C Marylebone / Milton Keynes
D Reading / Bedford
E XC South Coast / Sheffield or Bristol Peterborough
F Existing Bletchley / Bedford all stations
G Reading / Milton Keynes

Table D-4 East West Rail – Timetable B – Down

		E	C	D	A	B	F	G	A
Oxford	D	XX07		XX16	XX26½	XX36		XX39	XX56½

Oxford N Jn		XX/09		XX/18	XX/28½	XX/38		XX/41	XX/58½
Oxford Parkway	A				XX31				XX01
	D				XX31½				XX01½
Islip	A				XX35½				XX05½
	D				XX36				XX06
Bicester Town	A			½ XX27	XX42			XX49½	XX12
	D			XX27½	XX42½	①		XX50	XX12½
Gavray Jn		XX/16½		XX/28 ½	XX/43½	XX/46½		XX/50½	XX/13½
Claydon LNE Jn		XX/21	XX/30	XX/33		XX/51		XX/55	
Winslow	A		XX/35	① XX38½				XX59½	
	D		XX35½	XX39				XX00	
Bletchley W Jn						XX/00			
Bletchley S Jn						XX/01 FL			
Bletchley HL	A	XX/30	XX43	XX46½				XX07½	
	D		XX43½	XX47				XX08	
Bletchley LL							XX03		
Denbigh Hall S Jn			⑤ XX/50 SL					XX/11 SL	
Milton Keynes	A		XX52½ 2			XX05		XX13½ 2A	
	D					XX06			
Fenny Stratford	A						XX05		
	D	XX/32		XX/49			XX05½		
Woburn Sands	A			XX52			XX13½		
	D			XX52½			XX14		
Lidlington	A			XX56½			XX23½		
	D			XX57½			XX24½		
Bedford SJ Jn		XX/44		XX/04			XX/39		
Bedford St Johns	A						XX40		
	D	(1½) [2]					XX41 [2]	•	
Bedford	A	XX50		XX07			XX47		

A Oxford / Marylebone
B XC South Coast / Manchester via WCML
C Marylebone / Milton Keynes
D Reading / Bedford
E XC South Coast / Sheffield or Bristol / Peterborough
F Existing Bletchley / Bedford all stations services
G Reading / Milton Keynes

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Appendix E. Socio Economic Impacts

E.1. Supporting Analysis

Figure 1. Annual Population Growth 1991-2011

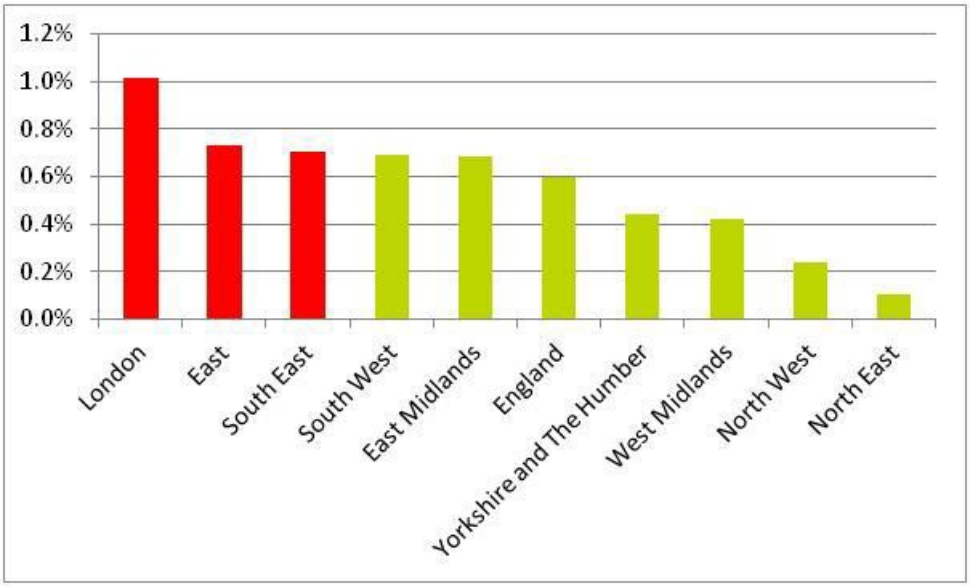


Figure 2. Total Annual Employment Growth 1991-2012

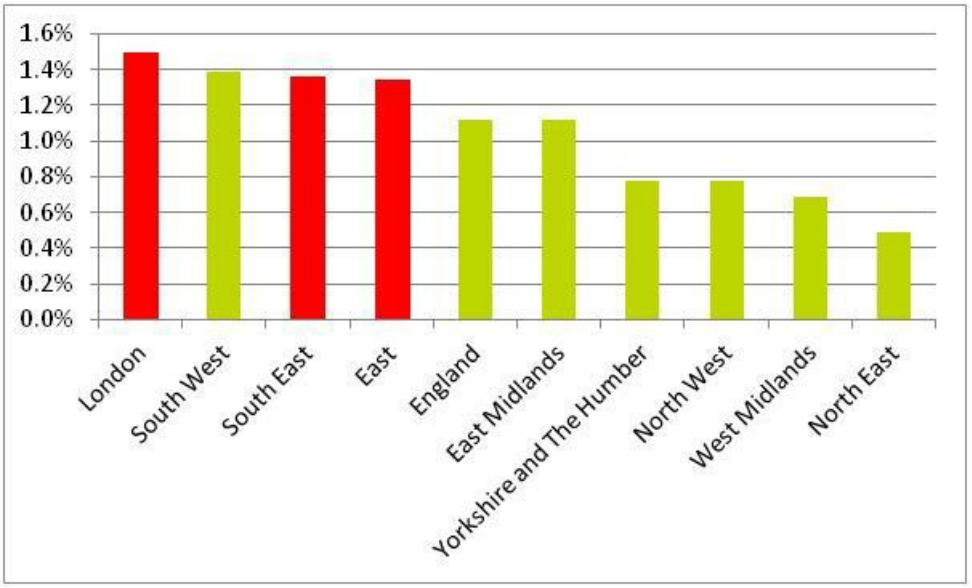


Figure 3. Employment growth by period

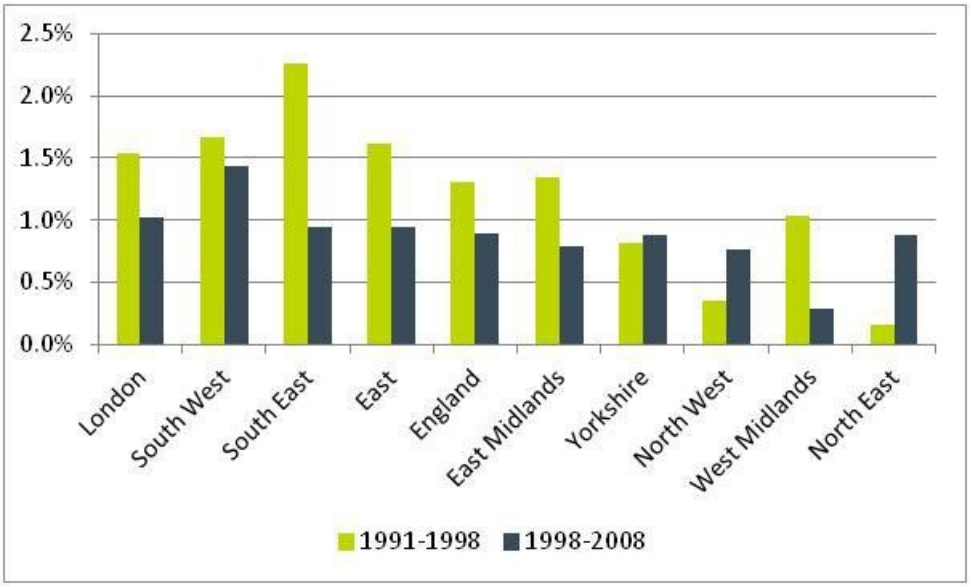


Figure 4. Workplace based GVA – Annual Growth 1997-2012

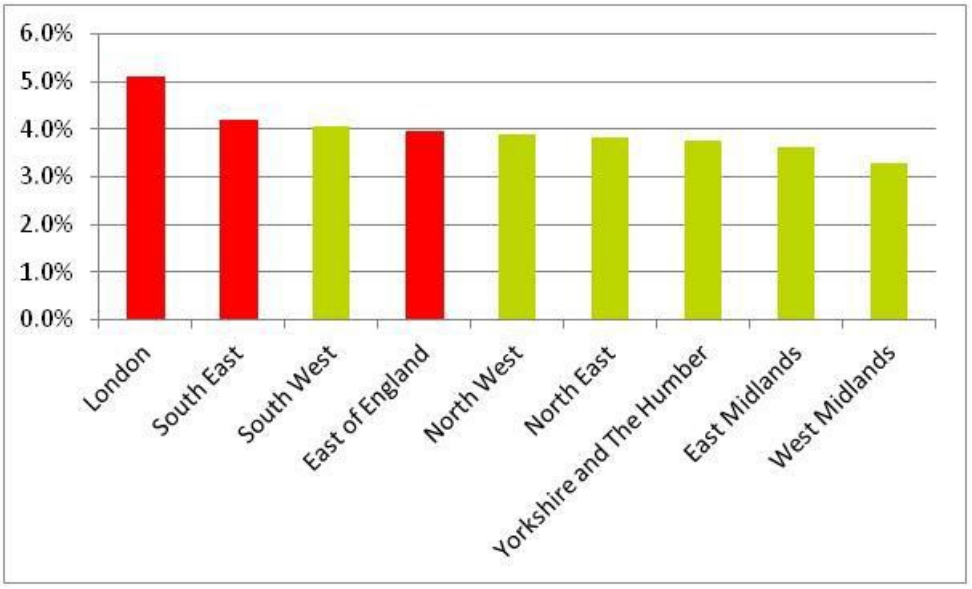


Figure 5. South East share of Total England GVA (%)

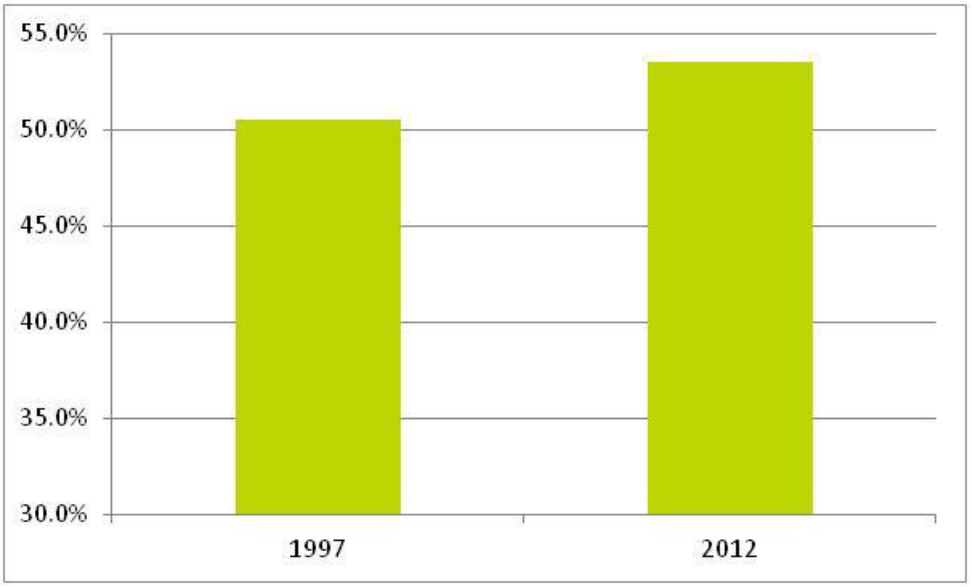


Figure 6. Annual Growth in House Prices 1998 - 2010

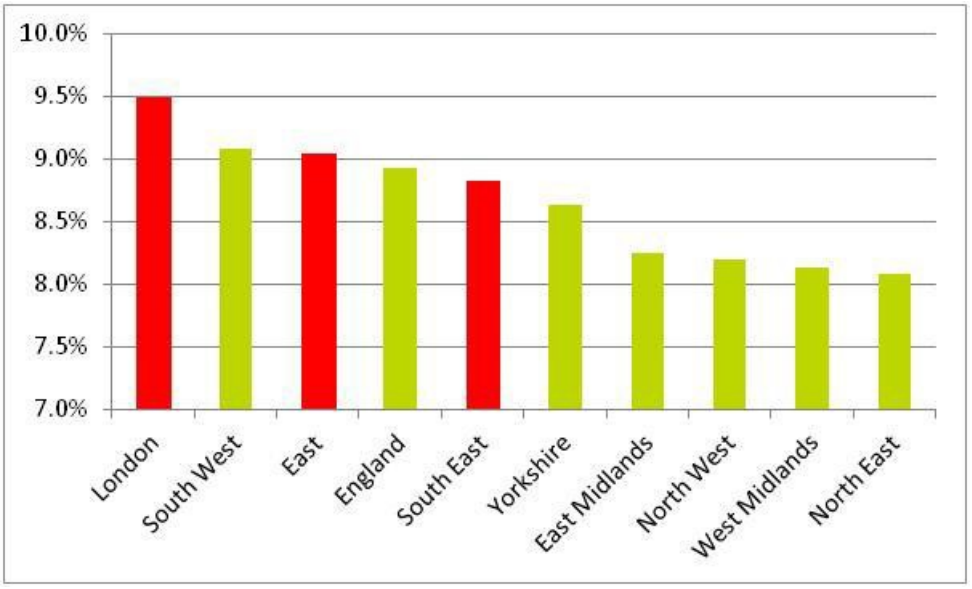


Figure 7. Median House Price to Median Income Ratio

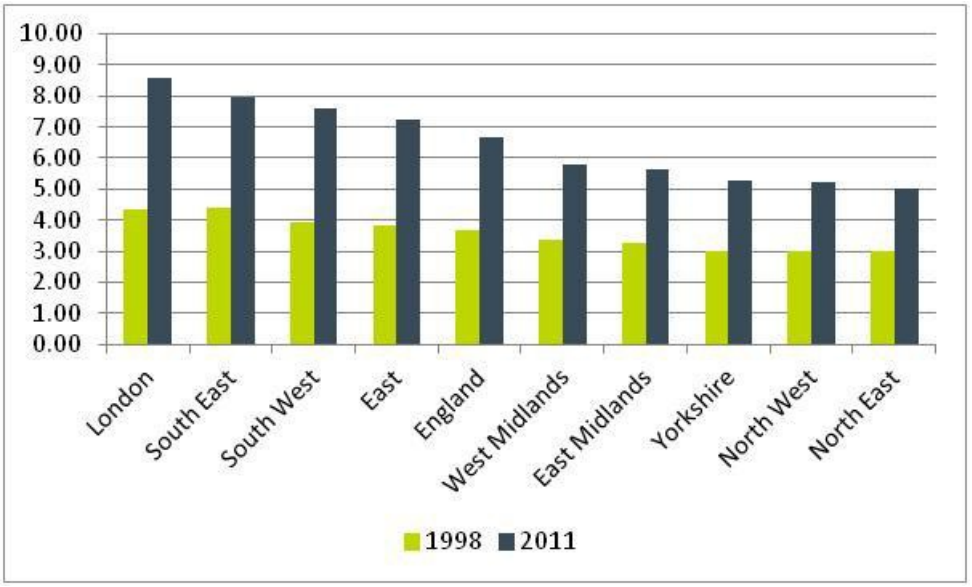


Table 1. Commuting

	Work in same LA as residence	Work in same region as residence	Relative importance of commuting (GB = 1)
South East	58.5	87.8	1.18
London	38.5	93.2	1.5
East	58.6	86.1	1.22
South West	70.4	95.8	0.74
West Midlands	63.9	95	0.9
East Midlands	58.8	90	1.13
Yorks & Humber	75.2	95.8	0.64
North West	62.7	96.8	0.89
North East	59.3	96.5	0.97

Figure 8. Proportion of journeys to work by train 2011

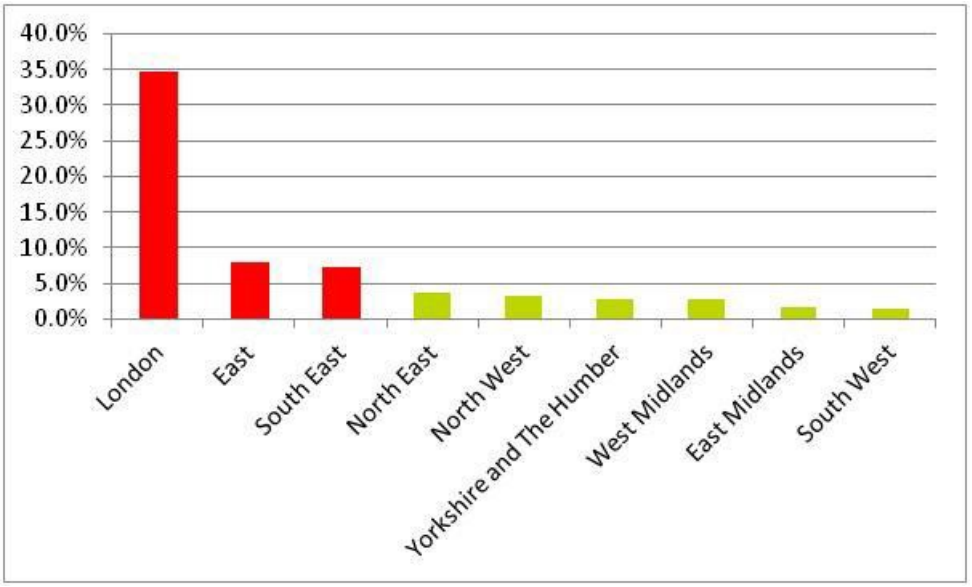
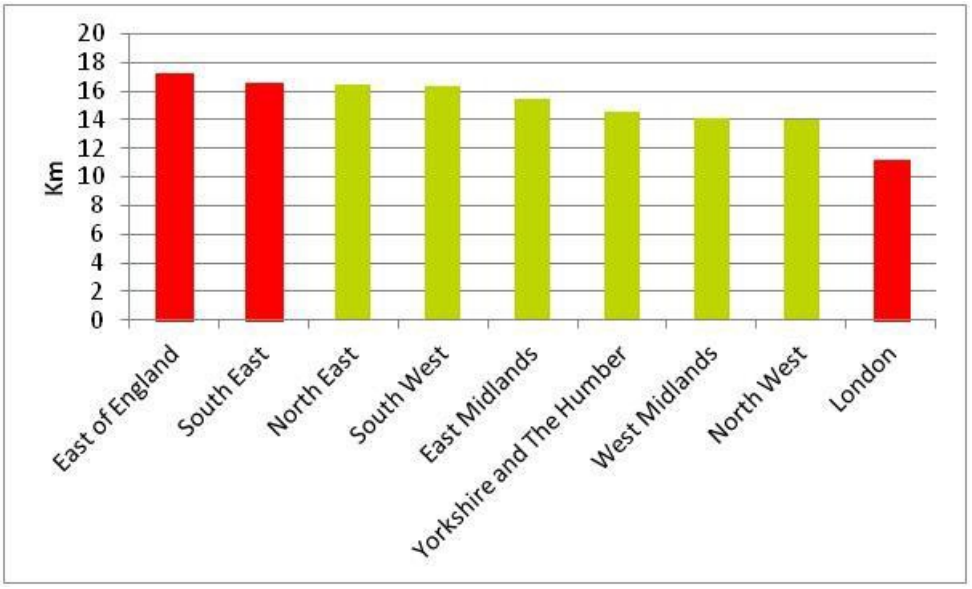


Figure 9. Average Distance Travelled to Work 2011



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Appendix F. Scheme Cost Estimates

F.1. Introduction

Atkins was asked to provide a high level indicative engineering specification and costs for the EWR Phase 2 works. This was because when commissioned it was not expected that Network Rail would have suitable costs available for use in the appraisal.

Atkins developed detailed cost estimates for the previous business case. However, the specification of the scheme has evolved significantly since then to include higher line speeds and electrification. We have therefore made use of our highly experienced rail engineering team to derive an indicative cost specification for the main phase 2 works between Bicester Town and Bletchley and from Bletchley to Bedford based upon the required linespeed and electrification requirements. This was then provided to our cost experts Faithful + Gould who have used this high level specification to develop cost estimates for the various scenarios.

For the other elements of the scheme (e.g. Claydon Jct to Aylesbury, Aylesbury to Princess Risborough and Bletchley to Milton Keynes) we have taken a simpler approach. Network Rail's current estimates for these elements of the scheme are based on applying the unit rates (cost per km) of the main works to these additional elements. The reason for this being:

- NR informed us that the Claydon to Aylesbury section is going to require a level of reconstruction similar to the core route to achieve the required linespeed. Even though this will be a predominantly single track section, the marginal difference in costs from the double track sections is expected to be small, particularly taking into account the cost of renewing/reconstructing the access to Calvert land fill site.

- Upgrading up to two miles of the Aylesbury to Princess Risborough route to double track will require extensive work as the section has only ever been single track. Taking this into account it is seen as reasonable to assume that the unit cost of this section will be similar to that on the core route.

- NR has included an allowance for the 'fifth' line between Bletchley and Milton Keynes, including a significant allowance for structures. Our timetabling analysis has not identified the need for a significant infrastructure improvement of this type. However, we recognise that some reconfiguration of the track and signalling in the area may be necessary to enable the efficient use by EWR-WS services. We have therefore made an allowance for an improvement in this area based upon the unit rate approach.

The following sections provide the cost estimates that we have produced for the core section of EWR-WS together with an overall summary of the cost that we have derived for use in the appraisal.

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F.2. Bicester Town to Bletchley – 100mph No OLE

East West Rail
Bicester Town to Bletchley- Option 2
Linespeed 100mph- No OLE

		Price base date 2Q 2014				
Item Nr	**Work Item**	**Qty**	**Unit**	**Rate**	**Total**	**Commentary/ Assumptions**
	Site Clearance					
A	Vegetation Clearance [2 sides - 1m	61,260	m2	£ 4.80	£ 294,048	Assume 1m each side of existing single track
	Earthworks					
B	Cess support [both sides]	61,260	m	£ 150.00	£ 9,189,000	Assume full length of track - Taken to both sides of track
	Drainage					
C	Filter drainage 300mm dia 2m deep drainage [both sides]	61,260	m	£ 120.00	£ 7,351,200	Assume both sides of track
D	Chamber every 50m	1,225	nr	£ 1,231.20	£ 1,508,466	
E	Cross drains /Carrier drains to outfalls 10m each every 200m	306	nr	£ 1,380.00	£ 422,694	
	Bridgeworks					
F	Not required for this option					
	Cable route and walkways					
G	Alterations to exsiting troughing route	30,630	m	£ 77.70	£ 2,379,951	Assume full length of track
	Crossings					
H	Not required for this option					
	Permanent Way					
	Removal of existing single track	30,630	m	£ 50.00	£ 1,531,500	
I	Slue single track					
J	Permanent Way track [formation works] [twin track	61,260	m	£ 650.00	£ 39,819,000	
	Signalling / Telecoms					
K	Signalling requirements [3 aspect signalling system - twin track]	30,630.0	m	£ 750.00	£ 22,972,500	
	OLE					
L	None required					
	Stations /Platforms					
M	Not required for this option					
	Externnal Works					
N	Not required for this option					
	Other					
P	Not required for this option					
	Base Construction Cost: Sub-Total A				**£ 85,468,359**	
	Prelims	**15%**			£ 12,820,254	
	OH&P	**6%**			£ 5,128,102	
	Sub-Total B				**£ 103,416,715**	
	Design Fees	**10%**			£ 10,341,671	
	Network Rail Asset Protection	**3%**			£ 3,102,501	
	Project Managment	**5%**			£ 5,170,836	
	Sub-Total C				**£ 122,032,000**	
	Risk/ Contingency	**40%**			£ 48,812,800	
	TOTAL COST				**£ 170,845,000**	

ASSUMPTIONS
Assume that the existing corridor is capable of accommodating two track railway without any land purchase. Except where sluing of the existing algnment is recommended.
Total renewal of track - new formation, geotextile membrane, ballast (300mm below sleeper), concrete sleepers, rail.
New track drainage required in cess, at grade and in cutting and at foot of embankments. Assume for total length.
Assume no work to any remaining platforms.
Assume no ground strengthening or improvement works is required.
UNDER BRIDGES
As Existing
OVER BRIDGES
As Existing
LEVEL CROSSINGS
As Existing
ALIGNMENT
There are some curves on the existing alignment but for this option assume that no re-alignment is required.

F.3. Bicester Town to Bletchley – 110mph No OLE

East West Rail
Bicester Town to Bletchley- Option 3
Linespeed 100mph- 125mph - No OLE

FAITHFUL GOULD CONSTRUCTIVE EXPERTISE

		Price base date 2Q 2014				
Item Nr	**Work Item**	**Qty**	**Unit**	**Rate**	**Total**	**Commentary/ Assumptions**
	Site Clearance					
A	Vegetation Clearance [Two sides only 1m	61,260	m2	£ 4.80	£ 294,048	Assume 1m each side of existing single track
	Earthworks					
B	Cess support [both sides]	61,260	m	£ 150.00	£ 9,189,000	Assume full length of track - Taken to both sides of track
	Drainage					
C	Filter drainage 300mm dia 2m deep drainage [both sides]	61,260	m	£ 120.00	£ 7,351,200	Assume both sides of track
D	Chamber every 50m	1,225	nr	£ 1,231.20	£ 1,508,466	
E	Cross drains /Carrier drains to outfalls 10m each every 200m	306	nr	£ 1,380.00	£ 422,694	
	Bridgeworks					
F	Not required for this option					
	Cable route and walkways					
G	Alterations to exsiting troughing route	30,630	m	£ 77.70	£ 2,379,951	Assume full length of track
	Crossings					
H	Not required for this option					
	Permanent Way					
	Removal of existing single track	30,630	m	£ 50.00	£ 1,531,500	
I	Slue single track	5,000	m	£ 100.00	£ 500,000	
J	Permanent Way track [formation works]	61,260	m	£ 650.00	£ 39,819,000	
	Signalling / Telecoms					
K	Signalling requirements [3 aspect signalling system - twin track]	30,630.0	m	£ 750.00	£ 22,972,500	
	OLE					
L	Not required for this option					
	Stations /Platforms					
M	Not required for this option					
	Externnal Works					
N	Not required for this option					
	Other					
O	Not required for this option					
	Base Construction Cost: Sub-Total A				**£ 85,968,359**	
	Prelims	**15%**			£ 12,895,254	
	OH&P	**6%**			£ 5,158,102	
	Sub-Total B				**£ 104,021,715**	
	Design Fees	**10%**			£ 10,402,171	
	Network Rail Asset Protection	**3%**			£ 3,120,651	
	Project Managment	**5%**			£ 5,201,086	
	Sub-Total C				**£ 122,746,000**	
	Risk/ Contingency	**40%**			£ 49,098,400	
	TOTAL COST				**£ 171,845,000**	

ASSUMPTIONS

1. Assume that the existing corridor is capable of accommodating two track railway without any land purchase. Except where sluing of the existing algnment is recommended.

2. Total renewal of track - new formation, geotextile membrane, ballast (300mm below sleeper), concrete sleepers, rail.

3. New track drainage required in cess, at grade and in cutting and at foot of embankments. Assume for total length.

4. Assume no work to any remaining platforms.

UNDER BRIDGES

As Existing

OVER BRIDGES

As Existing

LEVEL CROSSINGS

As Existing

ALIGNMENT

It is unlikely that a speed of 125mph will be achieved over the total length of the track. There are some curves which would require to be adjusted, however some of the route goes through a residential area, where any re-alignment could prove very expensive and not very popular. At this stage an allowance for sluing 1m over a length of 5km should be allowed for. This will entail the purchase of additional land.

F.4. Bicester Town to Bletchley – 125mph No OLE

East West Rail
Bicester Town to Bletchley- Option 4
Linespeed 125mph - No OLE

FAITHFUL GOULD CONSTRUCTIVE EXPERTISE

		Price base date 2Q 2014				
Item Nr	**Work Item**	**Qty**	**Unit**	**Rate**	**Total**	**Commentary/ Assumptions**
	Site Clearance					
A	Vegetation Clearance [both sides 1m	61,260	m2	£ 4.80	£ 294,048	Assume 1m each side of existing single track
	Earthworks					
B	Cess support [both sides]	61,260	m	£ 150.00	£ 9,189,000	Assume full length of track - Taken to both sides of track
	Drainage					
C	Filter drainage 300mm dia 2m deep drainage [both sides]	61,260	m	£ 120.00	£ 7,351,200	
D	Chamber every 50m	1,225	nr	£ 1,231.20	£ 1,508,466	
E	Cross drains /Carrier drains to outfalls 10m each every 200m	306	nr	£ 1,380.00	£ 422,694	
	Bridgeworks					
F	New footbridges to replace existing pedestrian crossings [include for ramps	12	nr	£ 350,000.00	£ 4,200,000	
G	Construction of new over bridges and associated approach road on embankments	4	nr	£1,000,000.00	£ 4,000,000	
	Cable route and walkways					
H	Alterations to exsiting troughing route	30,630	m	£ 77.70	£ 2,379,951	Assume full length of track
	Crossings					
I	Demolition/Removal of level Crossings [misc]	3	nr	£ 20,000.00	£ 60,000	
J	Demolition/Removal of existing pedestrian crossings	12	nr	£ 15,000.00	£ 180,000	
K	Demolition/Removal of existing vehicle crossing	4	nr	£ 20,000.00	£ 80,000	
	Permanent Way					
	Removal of existing single track	30,630	m	£ 50.00	£ 1,531,500	
L	Slue alignment	5,000	m	£ 100.00	£ 500,000	
M	Permanent Way track [formation works]	61,260	m	£ 650.00	£ 39,819,000	
	Signalling / Telecoms					
N	Signalling requirements [4 aspect signalling system - twin track]	30,630.0	m	£ 950.00	£ 29,098,500	
	OLE					
O	Not required for this option					
	Stations /Platforms					
P	Replacement of coping to 1nr station platform at Bicester Town	1	nr	£ 100,000.00	£ 100,000	Replacement of coping to 1nr station platform at Bicester Town
	Externnal Works					
Q	Not required for this option					
	Other					
R	Not required for this option					
	Base Construction Cost: Sub-Total A				**£ 100,714,359**	
	Prelims	**15%**			£ 15,107,154	
	OH&P	**6%**			£ 6,042,862	
	Sub-Total B				**£ 121,864,375**	
	Design Fees	**10%**			£ 12,186,437	
	Network Rail Asset Protection	**3%**			£ 3,655,931	
	Project Managment	**5%**			£ 6,093,219	
	Sub-Total C				**£ 143,800,000**	
	Risk/ Contingency	**40%**			£ 57,520,000	
	TOTAL COST				**£ 201,320,000**	

ASSUMPTIONS

1. Existing formation will require to be widened to accommodate additional formation width to provide the neccessary clearances associated with higher speed.

2. All neccessary works as stated for option 1 with the installation of a 4 aspect singalling system and associated telecoms

3. Clearances to any existing platforms will require an assessment and adjustments made. Allow for recoping and cutting back platforms where neccessary.

UNDER BRIDGES

As Existing

OVER BRIDGES

Vehicular level crossings will be replaced with overbridges and associated roads on embankments

LEVEL CROSSINGS

All level crossings will be replaced. Pedestrian level crossings will be replaced with footbridges and associated ramps.

ALIGNMENT

It is unlikely that a speed of 125mph will be achieved over the total length of the track. There are some curves which would require to be adjusted, however some of the route goes through a residential area, where any re-alignment could prove very expensive and not very popular. At this stage an allowance for sluing 1m over a length of 5km should be allowed for. This will entail the purchase of additional land.

F.5. Bicester Town to Bletchley – 100mph with OLE

East West Rail
Bicester Town to Bletchley- Option 6
Linespeed 100mph - With OLE

		Price base date 2Q 2014				
Item Nr	**Work Item**	**Qty**	**Unit**	**Rate**	**Total**	**Commentary/ Assumptions**
	Site Clearance					
A	Vegetation Clearance [both sides - 1m	61,260	m2	£ 4.80	£ 294,048	
	Earthworks					
B	Cess support [both sides]	61,260	m	£ 150.00	£ 9,189,000	
	Drainage					
C	Filter drainage 300mm dia 2m deep drainage [both sides]	61,260	m	£ 120.00	£ 7,351,200	
D	Chamber every 50m	1,225	nr	£ 1,231.20	£ 1,508,466	
E	Cross drains /Carrier drains to outfalls 10m each every 200m	306	nr	£ 1,380.00	£ 422,694	
	Bridgeworks					
F	Construction of parapets to existing overbridges to accommodate new OLE requirements	19	nr	£ 50,000.00	£ 950,000	
	Cable route and walkways					
G	Alterations to exsiting troughing route	30,630	m	£ 77.70	£ 2,379,951	
	Crossings					
H	Widening of level crossings	19	nr	£ 15,000.00	£ 285,000	
	Permanent Way					
	Removal of existing single track	30,630	m	£ 50.00	£ 1,531,500	
I	Slue single track	5,000	m	£ 100.00	£ 500,000	
J	Permanent Way track [formation works]	61,260	m	£ 650.00	£ 39,819,000	
	Signalling / Telecoms					
K	Signalling requirements [3 aspect signalling system - twin track]	30,630.0	m	£ 750.00	£ 22,972,500	
	OLE					
L	OHLE - twin track	30,630	m	£ 700.00	£ 21,441,000	
	Stations /Platforms					
M	Replacement of coping to 1nr station platform at Bicester Town	1	nr	£ 100,000.00	£ 100,000	
	Externnal Works					
N	Not required for this option					
	Other					
O	Not required for this option					
	Base Construction Cost: Sub-Total A				**£ 108,744,359**	
	Prelims	**15%**			£ 16,311,654	
	OH&P	**6%**			£ 6,524,662	
	Sub-Total B				**£ 131,580,675**	
	Design Fees	**10%**			£ 13,158,067	
	Network Rail Asset Protection	**3%**			£ 3,947,420	
	Project Managment	**5%**			£ 6,579,034	
	Sub-Total C				**£ 155,266,000**	
	Risk/ Contingency	**40%**			£ 62,106,400	
	TOTAL COST				**£ 217,373,000**	

ASSUMPTIONS
1. Existing formation will require to be widened to accommodate additional formation width to provide the neccessary clearances associated with OLE
2. All neccessary works as stated for option 1 with the installation of a 3 aspect signalling system and associated telecoms
3. Clearances to any existing platforms will require an assessment and adjustments made. Allow for recoping and cutting back platforms where neccessary.
UNDER BRIDGES
As for Option 1
OVER BRIDGES
Construction of parapets to existing over bridges
LEVEL CROSSINGS
Widening of existing level crossings
ALIGNMENT
There are some curves on the existing alignment but for this option assume that no re-alignment is required.

F.6. Bicester Town to Bletchley – 110mph with OLE

East West Rail
Bicester Town to Bletchley- Option 7
Linespeed 100mph - 125mph - With OLE

FAITHFUL GOULD CONSTRUCTIVE EXPERTISE

		Price base date 2Q 2014				
Item Nr	**Work Item**	**Qty**	**Unit**	**Rate**	**Total**	**Commentary/ Assumptions**
	Site Clearance					
A	Vegetation Clearance [both sides - 1 m	61,260	m2	£ 4.80	£ 294,048	
	Earthworks					
B	Cess support [both sides]	61,260	m	£ 150.00	£ 9,189,000	
	Drainage					
C	Filter drainage 300mm dia 2m deep drainage [both sides]	61,260	m	£ 120.00	£ 7,351,200	
D	Chamber every 50m	1,225	nr	£ 1,231.20	£ 1,508,466	
E	Cross drains /Carrier drains to outfalls 10m each every 200m	306	nr	£ 1,380.00	£ 422,694	
	Bridgeworks					
F	New footbridges to replace existing pedestrian crossings [include for ramps	12	nr	£ 350,000.00	£ 4,200,000	
G	Construction of new over bridges and associated approach road on embankments	4	nr	£ 1,000,000.00	£ 4,000,000	
	Cable route and walkways					
H	Alterations to exsiting troughing route	30,630	m	£ 77.70	£ 2,379,951	
	Crossings					
I	Demolition/Removal of level Crossings [misc]	3	nr	£ 20,000.00	£ 60,000	
J	Demolition/Removal of existing pedestrian crossings	12	nr	£ 15,000.00	£ 180,000	
K	Demolition/Removal of existing vehicle crossing	4	nr	£ 20,000.00	£ 80,000	
	Permanent Way					
	Removal of existing single track	30,630	m	£ 50.00	£ 1,531,500	
L	Slue single track	5,000	m	£ 100.00	£ 500,000	
M	Permanent Way track [formation works]	61,260	m	£ 650.00	£ 39,819,000	
	Signalling / Telecoms					
N	Signalling requirements [4 aspect signalling system - twin track]	30,630.0	m	£ 950.00	£ 29,098,500	
	OLE					
O	OHLE - twin track	30,630	m	£ 700.00	£ 21,441,000	
	Stations /Platforms					
P	Replacement of coping to 1nr station platform at Bicester Town	1	nr	£ 100,000.00	£ 100,000	
	Externnal Works					
Q	Not required for this option					
	Other					
R	Not required for this option					
	Base Construction Cost: Sub-Total A				**£ 122,155,359**	
	Prelims	**15%**			£ 18,323,304	
	OH&P	**6%**			£ 7,329,322	
	Sub-Total B				**£ 147,807,985**	
	Design Fees	**10%**			£ 14,780,798	
	Network Rail Asset Protection	**3%**			£ 4,434,240	
	Project Managment	**5%**			£ 7,390,399	
	Sub-Total C				**£ 174,414,000**	
	Risk/ Contingency	**40%**			£ 69,765,600	
	TOTAL COST				**£ 244,180,000**	

ASSUMPTIONS
1. Existing formation will require to be widened to accommodate additional formation width to provide the neccessary clearances associated with OLE
2. All neccessary works as stated for option 1 with the installation of a 3 aspect signalling system and associated telecoms
3. Clearances to any existing platforms will require an assessment and adjustments made. Allow for recoping and cutting back platforms where neccessary.
UNDER BRIDGES
As Existing
OVER BRIDGES
Vehicular level crossings will be replaced with overbridges and associated roads on embankments
LEVEL CROSSINGS
All level crossings will be replaced. Pedestrian level crossings will be replaced with footbridges and associated ramps.
ALIGNMENT
It is unlikely that a speed of 125mph will be achieved over the total length of the track. There are some curves which would require to be adjusted, however some of the route goes through a residential area, where any re-alignment could prove very expensive and not very popular. At this stage an allowance for sluing 1m over a length of 5km should be allowed for. This will entail the purchase of additional land.

F.7. Bicester Town to Bletchley – 125mph with OLE

East West Rail
Bicester Town to Bletchley- Option 8
Linespeed 125mph - With OLE

		Price base date 2Q 2014				
Item Nr	**Work Item**	**Qty**	**Unit**	**Rate**	**Total**	**Commentary/ Assumptions**
	Site Clearance					
A	Vegetation Clearance [both sides - 1m	61,260	m2	£ 4.80	£ 294,048	
	Earthworks					
B	Cess support [both sides]	61,260	m	£ 150.00	£ 9,189,000	
	Drainage					
C	Filter drainage 300mm dia 2m deep drainage [both sides]	61,260	m	£ 120.00	£ 7,351,200	
D	Chamber every 50m	1,225	nr	£ 1,231.20	£ 1,508,466	
E	Cross drains /Carrier drains to outfalls 10m each every 200m	306	nr	£ 1,380.00	£ 422,694	
	Bridgeworks					
F	New footbridges to replace existing pedestrian crossings [include for ramps	12	nr	£ 350,000.00	£ 4,200,000	
G	Construction of new over bridges and associated approach road on embankments	4	nr	£ 1,000,000.00	£ 4,000,000	
	Cable route and walkways					
H	Alterations to exsiting troughing route	30,630	m	£ 77.70	£ 2,379,951	
	Crossings					
I	Demolition/Removal of level Crossings [misc]	3	nr	£ 20,000.00	£ 60,000	
J	Demolition/Removal of existing pedestrian crossings	12	nr	£ 15,000.00	£ 180,000	
K	Demolition/Removal of existing vehicle crossing	4	nr	£ 20,000.00	£ 80,000	
	Permanent Way					
	Removal of existing single track	30,630	m	£ 50.00	£ 1,531,500	
L	Slue single track	5,000	m	£ 100.00	£ 500,000	
M	Permanent Way track [formation works]	61,260	m	£ 650.00	£ 39,819,000	
	Signalling / Telecoms					
N	Signalling requirements [4 aspect signalling system - twin track]	30,630.0	m	£ 950.00	£ 29,098,500	
	OLE					
O	OHLE - twin track	30,630	m	£ 700.00	£ 21,441,000	
	Stations /Platforms					
P	Replacement of coping to 1nr station platform at Bicester Town	1	nr	£ 100,000.00	£ 100,000	
	Externnal Works					
Q	Not required for this option					
	Other					
R	Not required for this option					
	Base Construction Cost: Sub-Total A				**£ 122,155,359**	
	Prelims	**15%**			£ 18,323,304	
	OH&P	**6%**			£ 7,329,322	
	Sub-Total B				**£ 147,807,985**	
	Design Fees	**10%**			£ 14,780,798	
	Network Rail Asset Protection	**3%**			£ 4,434,240	
	Project Managment	**5%**			£ 7,390,399	
	Sub-Total C				**£ 174,414,000**	
	Risk/ Contingency	**40%**			£ 69,765,600	
	TOTAL COST				**£ 244,180,000**	

ASSUMPTIONS
1. Existing formation will require to be widened to accommodate additional formation width to provide the neccessary clearances associated with OLE
2. All neccessary works as stated for option 1 with the installation of a 4 aspect signalling system and associated telecoms
3. Clearances to any existing platforms will require an assessment and adjustments made. Allow for recoping and cutting back platforms where neccessary.
UNDER BRIDGES
As Existing
OVER BRIDGES
Vehicular level crossings will be replaced with overbridges and associated roads on embankments
LEVEL CROSSINGS
All level crossings will be replaced. Pedestrian level crossings will be replaced with footbridges and associated ramps.
ALIGNMENT
It is unlikely that a speed of 125mph will be achieved over the total length of the track. There are some curves which would require to be adjusted, however some of the route goes through a residential area, where any re-alignment could prove very expensive and not very popular. At this stage an allowance for sluing 1m over a length of 5km should be allowed for. This will entail the purchase of additional land.

F.8. Bletchley to Bedford 100mph – No OLE

East West Rail
Bletchley to Bedford- Option 2
Linespeed 100mph - No OLE

		Price base date 2Q 2014				
Item Nr	**Work Item**	**Qty**	**Unit**	**Rate**	**Total**	**Commentary/ Assumptions**
	Site Clearance					
A	Vegetation Clearance [both sides - 1m	51,720	m2	£ 4.80	£ 248,256	
	Earthworks					
B	Cess support [both sides]	51,720	m	£ 150.00	£ 7,758,000	
	Drainage					
C	Filter drainage 300mm dia 2m deep drainage {1 sides]	51,720	m	£ 120.00	£ 6,206,400	
D	Chamber every 50m	1,034	nr	£ 1,231.20	£ 1,273,553	
E	Cross drains /Carrier drains tp puotfalls 10m each every 200m	259	nr	£ 1,380.00	£ 356,868	
	Bridgeworks					
F	Underbridges - widen span to suit double track	6	nr	£ 750,000.00	£ 4,500,000	
	Cable route and walkways					
G	Alterations to exsiting troughing route	25,860	m	£ 77.70	£ 2,009,322	
	Crossings					
H	Not required for this option					
	Permanent Way					
I	Removal of existing single track	25,860	m	£ 50.00	£ 1,293,000	
J	Slue single track					
K	Permanent Way track [formation works	51,720	m	£ 650.00	£ 33,618,000	
	Signalling / Telecoms					
L	Signalling requirements [3 aspect signalling system - twin track]	25,860.0	m	£ 750.00	£ 19,395,000	
	OLE					
M	Not required for this option					
	Stations /Platforms					
N	Not required for this option					
	Externnal Works					
O	Not required for this option					
	Other					
P	Not required for this option					
	Base Construction Cost: Sub-Total A				**£ 76,658,399**	
	Prelims	**15%**			£ 11,498,760	
	OH&P	**6%**			£ 4,599,504	
	Sub-Total B				**£ 92,756,663**	
	Design Fees	**10%**			£ 9,275,666	
	Network Rail Asset Protection	**3%**			£ 2,782,700	
	Project Managment	**5%**			£ 4,637,833	
	Sub-Total C				**£ 109,453,000**	
	Risk/ Contingency	**40%**			£ 43,781,200	
	TOTAL COST				**£ 153,235,000**	

ASSUMPTIONS
Assume that the existing corridor is capable of accommodating two track railway without any land purchase. Except where sluing of the existing algnment is recommended.
Total renewal of track - new formation, geotextile membrane, ballast (300mm below sleeper), concrete sleepers, rail.
New track drainage required in cess, at grade and in cutting and at foot of embankments. Assume for total length.
Assume no work to any remaining platforms.
New three aspect signalling system and associated telecoms
UNDER BRIDGES
The under bridges carrying the railway over the River Ouse and the A5 Trunk Road appear to be only capable of carrying a single track. Additional capacity requires to be provided. Either a separate additional span at each location OR new bridges capable of carrying double track.
OVER BRIDGES
At this stage in the process have assumed that all existing over track structures are capable of spanning a double track railway with adequate clearances.
LEVEL CROSSINGS
For this initial upgrade [track doubling], assume that apart from enabling crossings to cope with double track, no work is neccessary
ALIGNMENT
No alignment required for this option
Track slues will probably require land acquisition

F.9. Bletchley to Bedford 110mph – No OLE

East West Rail
Bletchley to Bedford- Option 3
Linespeed 100mph to 125mph - No OLE

		Price base date 2Q 2014				
Item Nr	Work Item	Qty	Unit	Rate	Total	Commentary/ Assumptions
	Site Clearance					
	Vegetation Clearance [one side only 1m	51,720	m2	£ 4.80	£ 248,256	
	Earthworks					
	Cess support [both sides]	51,720	m	£ 150.00	£ 7,758,000	
	Drainage					
	Filter drainage 300mm dia 2m deep drainage {2 sides]	51,720	m	£ 120.00	£ 6,206,400	
	Chamber every 50m	1,034	nr	£ 1,231.20	£ 1,273,553	
	Cross drains /Carrier drains tp puotfalls 10m each every 200m	259	nr	£ 1,380.00	£ 356,868	
	Bridgeworks					
	Underbridges - widen span to suit double track	6	nr	£ 750,000.00	£ 4,500,000	
***	New footbridge to replace existing pedestrian level crossir	17	nr	£ 350,000.00	£ 5,950,000	
***	New bridge to replace existing vechicle crossing	5	nr	£ 450,000.00	£ 2,250,000	
	Cable route and walkways					
	Alterations to exsiting troughing route	25,860	m	£ 77.70	£ 2,009,322	
	Crossings					
***	Demolishing/Remove Existing level crossings	22	nr	£ 7,500.00	£ 165,000	
	Permanent Way					
	Removal of existing single track	25,860	m	£ 50.00	£ 1,293,000	
	Slue single track	5,000	m	£ 100.00	£ 500,000	
	Permanent Way track [formation works	51,720	m	£ 650.00	£ 33,618,000	
	Signalling / Telecoms					
	Signalling requirements [3 aspect signalling system - twin track]	25,860.0	m	£ 750.00	19,395,000	
	OLE					
	Not required for this option					
	Stations /Platforms					
	Not required for this option					
	Externnal Works					
	Not required for this option					
	Other					
	Not required for this option					
	Base Construction Cost: Sub-Total A				**£ 85,523,399**	
	Prelims	**15%**			£ 12,828,510	
	OH&P	**6%**			£ 5,131,404	
	Sub-Total B				**£ 103,483,313**	
	Design Fees	**10%**			£ 10,348,331	
	Network Rail Asset Protection	**3%**			£ 3,104,499	
	Project Managment	**5%**			£ 5,174,166	
	Sub-Total C				**£ 122,111,000**	
	Risk/ Contingency	**40%**			£ 48,844,400	
	TOTAL COST				**£ 170,956,000**	

ASSUMPTIONS
Assume that the existing corridor is capable of accommodating two track railway without any land purchase. Except where sluing of the existing alignment is recommended.
Total renewal of track - new formation, geotextile membrane, ballast (300mm below sleeper), concrete sleepers, rail.
New track drainage required in cess, at grade and in cutting and at foot of embankments. Assume for total length.
Assume no work to any remaining platforms.
New three aspect signalling system and associated telecoms
UNDER BRIDGES
The under bridges carrying the railway over the River Ouse and the A5 Trunk Road appear to be only capable of carrying a single track. Additional capacity requires to be provided. Either a separate additional span at each location OR new bridges capable of carrying double track.
OVER BRIDGES
At this stage in the process have assumed that all existing over track structures are capable of spanning a double track railway with adequate clearances.
LEVEL CROSSINGS
For this initial upgrade [track doubling], assume that apart from enabling crossings to cope with double track, no work is neccessary
ALIGNMENT
Allow for alignment

F.10. Bletchley to Bedford 125mph – No OLE

East West Rail
Bletchley to Bedford- Option 4
Linespeed 125mph - No OLE

Item Nr	Work Item	Qty	Unit	Rate	Total	Commentary/ Assumptions
		Price base date 2Q 2014				
	Site Clearance					
	Vegetation Clearance [both side 1m	51,720	m2	£ 4.80	£ 248,256	
	Earthworks					
	Cess support [both sides	51,720	m	£ 150.00	£ 7,758,000	
	Drainage					
	Filter drainage 300mm dia 2m deep drainage [both sides]	51,720	m	£ 120.00	£ 6,206,400	
	Chamber every 50m	1,034	nr	£ 1,231.20	£ 1,273,553	
	Cross drains /Carrier drains tp puotfalls 10m each every 200m	259	nr	£ 1,380.00	£ 356,868	
	Bridgeworks					
	Underbridges - widen span to suit double track	6	nr	£ 750,000.00	£ 4,500,000	
	New footbridge to replace existing pedestrian level crossir	17	nr	£ 350,000.00	£ 5,950,000	
	New bridge to replace existing vechicle crossing	5	nr	£ 450,000.00	£ 2,250,000	
	Cable route and walkways					
	Alterations to exsiting troughing route	25,860	m	£ 77.70	£ 2,009,322	
	Crossings					
	Demolishing/Remove Existing level crossings	22	nr	£ 7,500.00	£ 165,000	
	Permanent Way					
	Removal of existing single track	25,860	m	£ 50.00	£ 1,293,000	
	Slue single track	5,000	m	£ 100.00	£ 500,000	
	Permanent Way track [formation works	51,720	m	£ 650.00	£ 33,618,000	
		-				
	Signalling / Telecoms	-				
	Signalling requirements [4 aspect signalling system - twin track]	25,860.0	m	£ 950.00	£ 24,567,000	
	OLE					
	Not required for this option					
	Stations /Platforms					
	Not required for this option					
	Externnal Works					
	Not required for this option					
	Other					
	Not required for this option					
	Base Construction Cost: Sub-Total A				**£ 90,695,399**	
	Prelims	**15%**			£ 13,604,310	
	OH&P	**6%**			£ 5,441,724	
	Sub-Total B				**£ 109,741,433**	
	Design Fees	**10%**			£ 10,974,143	
	Network Rail Asset Protection	**3%**			£ 3,292,243	
	Project Managment	**5%**			£ 5,487,072	
	Sub-Total C				**£ 129,495,000**	
	Risk/ Contingency	**40%**			£ 51,798,000	
	TOTAL COST				**£ 181,293,000**	

ASSUMPTIONS
Assume that the existing corridor is capable of accommodating two track railway without any land purchase. Except where sluing of the existing algnment is recommended.
Total renewal of track - new formation, geotextile membrane, ballast (300mm below sleeper), concrete sleepers, rail.
New track drainage required in cess, at grade and in cutting and at foot of embankments. Assume for total length.
Assume no work to any remaining platforms.
New three aspect signalling system and associated telecoms
UNDER BRIDGES
The under bridges carrying the railway over the River Ouse and the A5 Trunk Road appear to be only capable of carrying a single track. Additional capacity requires to be provided. Either a separate additional span at each location OR new bridges capable of carrying double track.
OVER BRIDGES
At this stage in the process have assumed that all existing over track structures are capable of spanning a double track railway with adequate clearances.
LEVEL CROSSINGS
Demolish existing level crossing
ALIGNMENT
Allow for alignment

F.11. Bletchley to Bedford 100mph – with OLE

East West Rail
Bletchley to Bedford- Option 6
Linespeed 100mph With OLE

		Price base date 2Q 2014				
Item Nr	**Work Item**	**Qty**	**Unit**	**Rate**	**Total**	**Commentary/ Assumptions**
	Site Clearance					
A	Vegetation Clearance [both sides - 1m	51,720	m2	£ 4.80	£ 248,256	
	Earthworks					
B	Cess support [both sides	51,720	m	£ 150.00	£ 7,758,000	
	Drainage					
C	Filter drainage 300mm dia 2m deep drainage [both sides	51,720	m	£ 120.00	£ 6,206,400	
D	Chamber every 50m	1,034	nr	£ 1,231.20	£ 1,273,553	
E	Cross drains /Carrier drains tp puotfalls 10m each every 200m	259	nr	£ 1,380.00	£ 356,868	
	Bridgeworks					
F	Underbridges - widen span to suit double track	6	nr	£ 750,000.00	£ 4,500,000	
***	Overbridges - allow for reconstruction to facilitate OLE installations	18	nr	£ 300,000.00	£ 5,400,000	
	Cable route and walkways					
J	Alterations to exsiting troughing route	25,860	m	£ 77.70	£ 2,009,322	
	Crossings					
***	Widening of level crossings	22	nr	£ 15,000.00	£ 330,000	
	Permanent Way					
	Removal of existing single track	25,860	m	£ 50.00	£ 1,293,000	
L	Slue single track	5,000	m	£ 100.00	£ 500,000	
M	Permanent Way track [formation works	51,720	m	£ 650.00	£ 33,618,000	
	Signalling / Telecoms					
N	Signalling requirements [3 aspect signalling system - twin track]	25,860	m	£ 750.00	19,395,000	
	OLE					
O	OHLE - twin track	25,860	m	£ 700.00	£ 18,102,000	
	Stations /Platforms					
P	Not required for this option					
	Externnal Works					
Q	Not required for this option					
	Other					
R	Not required for this option					
	Base Construction Cost: Sub-Total A				**£ 100,990,399**	
	Prelims	**15%**			£ 15,148,560	
	OH&P	**6%**			£ 6,059,424	
	Sub-Total B				**£ 122,198,383**	
	Design Fees	**10%**			£ 12,219,838	
	Network Rail Asset Protection	**3%**			£ 3,665,951	
	Project Managment	**5%**			£ 6,109,919	
	Sub-Total C				**£ 144,195,000**	
	Risk/ Contingency	**40%**			£ 57,678,000	
	TOTAL COST				**£ 201,873,000**	

ASSUMPTIONS
Assume that the existing corridor is capable of accommodating two track railway without any land purchase. Except where sluing of the existing algnment is recommended.
Total renewal of track - new formation, geotextile membrane, ballast (300mm below sleeper), concrete sleepers, rail.
New track drainage required in cess, at grade and in cutting and at foot of embankments. Assume for total length.
Assume no work to any remaining platforms.
New three aspect signalling system and associated telecoms
UNDER BRIDGES
The under bridges carrying the railway over the River Ouse and the A5 Trunk Road appear to be only capable of carrying a single track. Additional capacity requires to be provided. Either a separate additional span at each location OR new bridges capable of carrying double track.
OVER BRIDGES
Re-construction of existing to suit double track
LEVEL CROSSINGS
Demolish and remove existing crossings
ALIGNMENT
Allow for alignment

F.12. Bletchley to Bedford 110mph – with OLE

East West Rail
Bletchley to Bedford- Option 7
Linespeed 100mph - 125mph With OLE

FAITHFUL GOULD CONSTRUCTIVE EXPERTISE

		Price base date 2Q 2014				
Item Nr	Work Item	Qty	Unit	Rate	Total	Commentary/ Assumptions
	Site Clearance					
A	Vegetation Clearance [both sides - 1m	51,720	m2	£ 4.80	£ 248,256	
	Earthworks					
B	Cess support [both sides	51,720	m	£ 150.00	£ 7,758,000	
	Drainage					
C	Filter drainage 300mm dia 2m deep drainage {2 sides]	51,720	m	£ 120.00	£ 6,206,400	
D	Chamber every 50m	1,034	nr	£ 1,231.20	£ 1,273,553	
E	Cross drains /Carrier drains tp puotfalls 10m each every 200m	259	nr	£ 1,380.00	£ 356,868	
	Bridgeworks					
F	Underbridges - widen span to suit double track	6	nr	£ 750,000.00	£ 4,500,000	
***	Overbridges - allow for reconstruction to facilitate OLE installations	18	nr	£ 300,000.00	£ 5,400,000	
	New footbridge to replace existing pedestrian level crossir	17	nr	£ 350,000.00	£ 5,950,000	
	New bridge to replace existing vechicle crossing	5	nr	£ 450,000.00	£ 2,250,000	
	Cable route and walkways					
G	Alterations to exsiting troughing route	25,860	m	£ 77.70	£ 2,009,322	
	Crossings					
***	Demolishing/Remove Existing level crossings	22	nr	£ 7,500.00	£ 165,000	
	Permanent Way					
	Removal of existing single track	25,860	m	£ 50.00	£ 1,293,000	
I	Slue single track	5,000	m	£ 100.00	£ 500,000	
J	Permanent Way track [formation works	51,720	m	£ 650.00	£ 33,618,000	
	Signalling / Telecoms					
K	Signalling requirements [4 aspect signalling system - twin track]	25,860	m	£ 950.00	24,567,000	
	OLE					
L	OHLE - twin track	25,860	m	£ 700.00	£ 18,102,000	
	Stations /Platforms					
M	Not required for this option					
	Externnal Works					
N	Not required for this option					
	Other					
O	Not required for this option					
	Base Construction Cost: Sub-Total A				**£ 114,197,399**	
	Prelims	**15%**			£ 17,129,610	
	OH&P	**6%**			£ 6,851,844	
	Sub-Total B				**£ 138,178,853**	
	Design Fees	**10%**			£ 13,817,885	
	Network Rail Asset Protection	**3%**			£ 4,145,366	
	Project Managment	**5%**			£ 6,908,943	
	Sub-Total C				**£ 163,052,000**	
	Risk/ Contingency	**40%**			£ 65,220,800	
	TOTAL COST				**£ 228,273,000**	

ASSUMPTIONS
Assume that the existing corridor is capable of accommodating two track railway without any land purchase. Except where sluing of the existing alignment is recommended.
Total renewal of track - new formation, geotextile membrane, ballast (300mm below sleeper), concrete sleepers, rail.
New track drainage required in cess, at grade and in cutting and at foot of embankments. Assume for total length.
Assume no work to any remaining platforms.
New three aspect signalling system and associated telecoms
UNDER BRIDGES
The under bridges carrying the railway over the River Ouse and the A5 Trunk Road appear to be only capable of carrying a single track. Additional capacity requires to be provided. Either a separate additional span at each location OR new bridges capable of carrying double track.
OVER BRIDGES
At this stage in the process have assumed that all existing over track structures are capable of spanning a double track railway with adequate clearances.
LEVEL CROSSINGS
For this initial upgrade [track doubling], assume that apart from enabling crossings to cope with double track, no work is neccessary
ALIGNMENT
Allow for alignment

F.13. Bletchley to Bedford 125mph – with OLE

East West Rail
Bletchley to Bedford- Option 8
Linespeed 125mph With OLE

		Price base date 2Q 2014				
Item Nr	Work Item	Qty	Unit	Rate	Total	Commentary/ Assumptions
	Site Clearance					
	Vegetation Clearance [one side only 1m	51,720	m2	£ 4.80	£ 248,256	
	Earthworks					
	Cess support	51,720	m	£ 150.00	£ 7,758,000	
	Drainage					
	Filter drainage 300mm dia 2m deep drainage {1 sides]	51,720	m	£ 120.00	£ 6,206,400	
	Chamber every 50m	1,034	nr	£ 1,231.20	£ 1,273,553	
	Cross drains /Carrier drains tp puotfalls 10m each every 200m	259	nr	£ 1,380.00	£ 356,868	
	Bridgeworks					
	Underbridges - widen span to suit double track	6	nr	£ 750,000.00	£ 4,500,000	
	Overbridges - allow for reconstruction to facilitate OLE installations	18	nr	£ 300,000.00	£ 5,400,000	
	New footbridge to replace existing pedestrian level crossir	17	nr	£ 350,000.00	£ 5,950,000	
	New bridge to replace existing vechicle crossing	5	nr	£ 450,000.00	£ 2,250,000	
	Cable route and walkways					
	Alterations to exsiting troughing route	25,860	m	£ 77.70	£ 2,009,322	
	Crossings					
	Demolishing/Remove Existing level crossings	22	nr	£ 7,500.00	£ 165,000	
	Permanent Way					
	Removal of existing single track	25,860	m	£ 50.00	£ 1,293,000	
	Slue single track	5,000	m	£ 100.00	£ 500,000	
	Permanent Way track [formation works	51,720	m	£ 650.00	£ 33,618,000	
	Signalling / Telecoms					
	Signalling requirements [4 aspect signalling system - twin track]	25,860	m	£ 950.00	24,567,000	
	OLE					
	OHLE - twin track	25,860	m	£ 700.00	£ 18,102,000	
	Stations /Platforms					
	Not required for this option					
	Externnal Works					
	Not required for this option					
	Other					
	Not required for this option					
	Base Construction Cost: Sub-Total A				**£ 114,197,399**	
	Prelims	**15%**			£ 17,129,610	
	OH&P	**6%**			£ 6,851,844	
	Sub-Total B				**£ 138,178,853**	
	Design Fees	**10%**			£ 13,817,885	
	Network Rail Asset Protection	**3%**			£ 4,145,366	
	Project Managment	**5%**			£ 6,908,943	
	Sub-Total C				**£ 163,052,000**	
	Risk/ Contingency	**40%**			£ 65,220,800	
	TOTAL COST				**£ 228,273,000**	

ASSUMPTIONS
Assume that the existing corridor is capable of accommodating two track railway without any land purchase. Except where sluing of the existing alignment is recommended.
Total renewal of track - new formation, geotextile membrane, ballast (300mm below sleeper), concrete sleepers, rail.
New track drainage required in cess, at grade and in cutting and at foot of embankments. Assume for total length.
Assume no work to any remaining platforms.
New three aspect signalling system and associated telecoms
Assume no ground strengthening or improvement works is required
UNDER BRIDGES
The under bridges carrying the railway over the River Ouse and the A5 Trunk Road appear to be only capable of carrying a single track. Additional capacity requires to be provided. Either a separate additional span at each location OR new bridges capable of carrying double track.
OVER BRIDGES
Re-construction of existing to suit double track
LEVEL CROSSINGS
Demolish and remove existing crossings
ALIGNMENT
Allow for alignment

F.14. Overall Scenario Costs

Table F-1 shows the overall cost estimates for each of the scenarios which were costed by Atkins. The cost estimates take into account the costs for each scenario on the core sections (with and without electrification) as produced by F+G, as well as using this information as the basis for estimating the costs of additional sections (e.g. Claydon Jct to Aylesbury, Aylesbury to Princess Risborough and Bletchley to Milton Keynes).

Table F-1 Summary of Atkins Cost Estimates for EWR-WS

Section	Bicester to Bletchley		Bletchley to Bedford		Claydon to Aylesbury		Aylesbury to Princess Risborough		Denbigh Hall - Milton Keynes		TOTAL COST (2014 prices)
100mph (No OLE)	£170,845,000		£153,235,000		£99,024,444		£18,004,444		£27,006,667		£468,115,556
110mph (No OLE)	£171,845,000		£170,956,000		£104,744,750		£19,044,500		£28,566,750		£495,157,000
125mph (No OLE)	£201,320,000		£181,293,000		£116,909,528		£21,256,278		£31,884,417		£552,663,222
100mph (With OLE)	£217,373,000		£201,873,000		£99,024,444		£18,004,444		£34,937,167		£571,212,056
110mph (With OLE)	£244,180,000		£228,273,000		£104,744,750		£19,044,500		£39,371,083		£635,613,333
125mph (With OLE)	£244,180,000		£228,273,000		£116,909,528		£21,256,278		£39,371,083		£649,989,889

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Appendix G. Franchise Considerations

G.1. East West Rail – Franchise Considerations

We consider that there are two aspects to determining which franchise a particular service would best fit within, these are:

- • Operational; and
- • Financial.

The operational perspective will take into account the issues such as diagramming, timetabling, rolling stock and depot's which will have an impact on which franchise a service will best fit, whereas the financial perspective will take into account the value of an individual service in terms of revenue and financial viability.

In terms of existing operators there are currently:

- • Four Trains per hour between Bletchley and Milton Keynes (3 x London Midland & 1 x Southern); and
- • One Train per hour between Bletchley and Bedford (operated by London Midland).

EWR-WS core services will increase the number of trains per hour between Bletchley and Milton Keynes by two, making six trains per hour and also double the frequency between Bletchley and Bedford to two trains per hour. Potential new Cross Country routes via EWR-WS will provide additional services on top of this.

The EWR-WS services will generate new rail demand; however, where the services overlap with existing franchises there is the potential for a dilution of revenues and the potential for some abstraction of customers particularly in the early years of operation when demand is ramping up. We have analysed MOIRA (version OR34) to ascertain the scale of these impacts and provide a summary of these in the next section.

G.2. MOIRA Analysis

Core EWR-WS Services

- • Aylesbury – Milton Keynes
- • Oxford – Milton Keynes
- • Oxford – Bedford

Analysis of the impact of these new services in MOIRA highlight the impact that these new rail services will have on the existing operators, particularly in terms of enabling shorter journeys which do not require an interchange in London. In terms of current franchised operators the following will see a small reduction in revenue related to a reduction in journeys to London:

- • South West Trains (-0.05% of revenue);
- • First Great Western (-0.2% of revenue);
- • London Midland (-0.3% of revenue); and
- • East Midlands Trains (-0.07% of revenue).

Analysis of the MOIRA results indicates that journeys which were being made via London are made via EWR-WS services. The changes in revenue are not considered to be significant and are likely to be neutral in real terms as the use of EWR-WS frees up some capacity for passengers on the above London focussed services which is likely to generate new trips to make up for the shortfall.

The impact on the Cross Country franchise (-0.5% of revenue) is similarly not significant overall. However, in the absence of new or re-routed Cross Country services there is a significant reduction in revenue on the existing Oxford to Manchester services (-22% of revenue) which is due to passengers travelling from Oxford to Milton Keynes via EWR-WS to catch the fast Virgin service to Manchester. This indicates that the proposal to re-route the Bournemouth to Manchester service via EWR-WS could be a pragmatic solution to retaining the value within the Cross Country franchise. This will be explored further in the following sections.

G.3. Aylesbury to Milton Keynes

This service is proposed to be formed as an extension of an existing London Marylebone to Aylesbury (via High Wycombe) service currently operated by Chiltern Railways. The service is currently operated by DMU's and is likely to do so in the future as there are currently no firm plans to electrify the Chiltern lines.

From an operational perspective, the service would require an additional 2 DMU's to operate. DMU's similar to the type currently used by Chiltern Trains may become available for transfer following the electrification of the GWML. The service is a modest extension to an existing service, the bulk of the revenue being generated on the remainder of the route between Aylesbury and London Marylebone (as at present). The service would need to fit into Chilterns timetables and diagrams. It would be simpler, operationally, to operate this as an extension to the existing service.

Financially the service appears to be revenue positive and would add value to the Chiltern franchise if the service remained within it. The service could potentially provide some competition to the existing London Midland, Virgin and Southern services in terms of providing an alternative service to London from Milton Keynes, however analysis of MOIRA suggests that this effect is negligible. The service has a negligible impact on other franchised services. On this basis we consider it logical for this service to become part of the Chiltern Railways franchise as from an operational and financial perspective this is where it best fits.

G.4. Services to Milton Keynes & Bedford

There are several options for the operation of the operation of services between Oxford and Milton Keynes / Bedford. In advance of the electrification of EWR-WS it would be possible to operate stand alone Oxford to/from Milton Keynes and Oxford to/from Bedford services. The electrification of the Great Western Main Line should release a number of DMU's which could be used to operate this service. Atkins have assessed that 4 DMU's should be able to cover both the Milton Keynes and Oxford services.

Our analysis of MOIRA has shown that it is likely that EWR-WS services will abstract a some passengers and revenue from the existing Bletchley – Milton Keynes and Bletchley – Bedford services.

Services between Bletchley and Milton Keynes are currently operated by London Midland (3tph) and Southern (1tph). Our analysis of MOIRA suggests that there will be a minimal impact on this section of route, reducing London Midland revenues on this station to station journey by 8% and a negligible change on Southern revenue.

The Bletchley to Bedford (all station stopping) services are currently operated by London Midland as an irregular hourly DMU service. EWR-WS will provide a regular hourly limited stop service (calling only at Woburn Sands and Lidlington). MOIRA analysis suggests that the EWR-WS service will attract a significant proportion of the revenue between Bletchely, Woburn Sands, Lidlington and Bedford, but have a much smaller impact on revenue from the other stations along the line.

There are four options for franchises for these services, these are:

- Operate the services as a stand-alone mini-franchise;
- Incorporate the services into the Chiltern Franchise;
- Incorporate the services into the Great Western Franchise; or
- Incorporate the services into the London Midland Franchise.

Each of these options will be discussed in turn.

G.4.1. Mini-Franchise

There could be some merit to running the interim diesel services as a mini franchise. The reasons being:

- It would be a short term / interim solution until the EWR-WS is electrified; and
- It could be implemented without having to renegotiate an existing franchise.

The limited scale of these services could have significant revenue risk, particularly in the opening years whilst patronage is built up, meaning that the DfT may have to take this risk on, either by letting the services as a concession / management contract, or operating the services directly via Directly Operated Railways

(DOR) as a short term / interim measure. Operating these as an interim service in advance of electrification will allow passenger flows to develop and provide more certainty to a future operator of the likely revenues which could be earned.

G.4.2. Chiltern Railways

Chiltern Railways currently operate the Oxford to Bicester shuttle service (currently suspended due to EG3 construction works) and will also operate the Oxford to Marylebone services following the completion of EG3 so will continue to have a presence at the Oxford end of the route for some time. Chiltern currently operate DMUs on their routes so have the facilities and experience necessary to maintain this type of rolling stock for use on the EWR services. The existing Oxford to Bicester shuttle is planned to be subsumed into the EWR-WS services once they are operating.

However, once the route is electrified Chiltern will not be best placed operationally to provide these services as all of their current facilities are based around maintaining and operating diesel rolling stock. This would suggest that once the route is electrified that the operation of these services should be undertaken by an operator with the facilities to operate and maintain electric rolling stock.

From a financial perspective would be no abstractive impacts between Oxford and Bicester if Chiltern are operating all of the services between these two locations. As discussed previously, there is expected to be a negligible level of abstraction of revenue between Bletchley and Milton Keynes, however the level of abstraction between Bletchley and Bedford is likely to be significant which could impact on the operation of the existing all stops service.

On this basis, whilst we consider the Chiltern franchise to be the logical place to operate the Aylesbury to Milton Keynes services, it would only be logical for Chiltern to operate the diesel services between Oxford and Milton Keynes/Bedford. Once the route is electrified it would be more logical for the services to be operated by a franchise with an existing or planned capability to operate electric rolling stock.

G.4.3. Great Western Franchise

Great Western currently operates the majority of the services which serve Oxford. The majority of the services originate at London Paddington and terminate at Oxford, with a limited number carrying on to destinations such as Banbury, Worcester and Hereford. The ongoing electrification of the Great Western Route means that it is expected that most services will move to electric traction from 2017 onwards. Operationally the DMUs or EMU’s which operate the services are likely to be operated from the new Reading Depot.

In either the diesel or electrified scenario, it could prove operationally beneficial for the EWR-WS services to Milton Keynes and Bedford being formed from extensions of existing Great Western services. This scenario is likely to be the most beneficial to the Great Western Franchise as it will allow an efficient use of rolling stock (diesel or electric) and hence minimise operating costs, with the benefit to passengers of providing through connections to London.

It is our understanding that the class 2 (or stopping train) services which would be extended from Oxford to Milton Keynes and Bedford. Therefore these services would provide the essential and efficient local connectivity which is required between Milton Keynes, Bedford and Oxford, but a slow direct service to London. Analysis of MOIRA highlights that it would be journeys from intermediate stations such as Reading and Didcot to Milton Keynes which would benefit from extending the existing Great Western services to Milton Keynes and Bedford.

As identified previously, there is likely to be a negligible level of abstraction of revenue between Bletchley and Milton Keynes, but a significant level between Bletchley and Bedford significant which could impact on the operation of the existing all stops service.

Extending Great Western services to serve Milton Keynes and Bedford form Oxford will provide significant connectivity gains which aligns with the results of our analysis from our other models which highlight the benefits of improving links between Milton Keynes/Bedford and Reading. The operational fit of this (in both the DMU and EMU scenarios) means that this could provide the best overall solution in terms of the services between Oxford and Milton Keynes/Bedford.

G.4.4. London Midland Franchise

London Midland currently operates services on the WCML between Bletchley and Milton Keynes and between Bletchley and Bedford. The services between Bletchley and Milton Keynes are operated by EMU's and those between Bletchley and Bedford are currently operated by DMU's.

Prior to the electrification of EWR-WS the services would have to be operated with DMU's. LM's current DMU fleet is currently maintained at Tyseley (Birmingham) with stabling facilities at the former Bletchley depot. If (as per the other scenarios) it is assumed that DMUs will become available following the electrification of the GWML these units could be utilised to provide the required services.

Following electrification the service could be operated by EMU's. London Midlands EMU depot is at Kings Heath, Northampton, which would be a convenient base for units operating the EWR-WS services. It is assumed (as in all other scenarios) that suitable rolling stock will be available to operate the services.

If the services were operated by London Midland it is assumed that they would run as Milton Keynes to Oxford and Bedford to Oxford services, with no onward extensions. In this scenario the question of abstraction is largely resolved as London Midland will be operating the majority of the overlapping services. There is however a potential dilution of franchise value in the early years of operation where the full operating costs of the services are incurred against an build up in usage of the new services and hence revenue.

Whilst this option works best in terms of maintaining the value (in revenue terms) of the London Midland franchise, it would not be as good in terms of connectivity as the option of including the services in the Great Western Franchise. However, this option would provide a solution for both the DMU and EMU scenarios, and in that respect would be a superior option to operating the services via the Chiltern franchise.

G.5. Cross Country Services

Analysis of MOIRA has revealed that the Bournemouth to Manchester service would lose a significant amount of revenue on the Oxford to Manchester proportion of the journey. MOIRA suggests that the introduction of EWR makes the trip from Oxford to Milton Keynes (via the EWR-WS service) and from there changing to a fast Virgin service to Manchester becomes a viable and attractive journey option.

It is against this background that a number of options have been devised and tested to exploit the new journey and routing opportunities presented by the completion of EWR-WS. For the purposes of the updated business case three Cross Country service options have been identified, these are:

- • Re-routing the existing Bournemouth to Manchester Cross Country service so that it runs via EWR-WS and the WCML to Manchester avoiding Birmingham, (Route: Bournemouth, Oxford, Milton Keynes, Crewe, Wilmslow, Stockport and Manchester) and hence providing significantly improved end to end journey times.

- • Creating a new service from Reading to Nottingham (Route: Reading, Oxford, Bletchley, Bedford, Kettering, Leicester, East Midlands Parkway and Nottingham).

- • Creating a new service from Bristol to Peterborough (Route: Bristol, Bath, Swindon, Oxford, Bicester Town, Bletchley, Bedford, Kettering, Corby and Peterborough).

It is important to note that these services will not necessarily form part of the Cross Country franchise, we have used the term to describe the nature of the services which are inter regional in nature and not London focussed. The following sections consider the franchise options for each of these services.

G.5.1. Bournemouth to Manchester

As a diversion of an existing Cross Country franchised service it would appear logical that this service would remain within the current Cross Country franchise. The service would provide a fast link between Oxford and Milton Keynes which would complement the proposed core EWR services which will stop at intermediate stations. Operationally, this could be operated with the existing rolling stock (class 221 DEMU's – with tilt enabled for use on the WCML) and changed to EMU type vehicles following electrification of the electric spine. However, it is important to note that unless the replacement EMU's are tilt capable they will only be

able to run at a maximum speed of 110mph on the WCML. Atkins have assessed that this service can be run with the existing number of rolling stock.

A side effect of re-routing the existing service via EWR-WS that there is a reduction in the level of service between Oxford and Birmingham and between Birmingham and Manchester. As there is an existing and strong demand for travel between these locations it will be necessary to re-provide these linkages through the provision of additional services, this could be achieved by:

- • Providing a new Manchester – Birmingham – Oxford service;
- • Providing two new services, Manchester – Birmingham and Birmingham – Oxford;
- • Strengthening existing Manchester – Birmingham and Birmingham – Oxford services, e.g. run them in 2xunit formation (e.g. 2x Class 220) or replace an existing service with a longer train (e.g. replacing a 4 car Class 220, with an 8 car HST);
- • Or provide a new service Manchester – Birmingham and extend an existing service which currently terminates at Oxford on to Birmingham.

All of these options will lead to a net increase in costs as additional rolling stock will be required (over and above the existing) to provide the additional services to backfill the diverted service. Atkins have assessed that 4 additional units will be required to provide the Oxford to Birmingham service and a further 4 additional units will be required to operate the Birmingham to Manchester services (assuming 3 car DMU Oxford to Birmingham and 4 car EMU Birmingham to Manchester), making a total of 8 additional units.

Operationally it would be preferable to operate a through service from Oxford to Manchester; the reason for this is that it would avoid having to terminate trains in Birmingham New Street Station and occupying platforms for extended periods whilst they are prepared for their return journey. However, in franchise terms it may be preferable to have two operators to enable the efficient use of rolling stock to match demand on the back fill service.

Analysis in MOIRA shows that this change will provide a significant increase in revenue to the Cross Country franchise, some of this (approx 20%) would be abstracted form the Virgin West Coast Franchise and the First Great Western Franchise (approximately 70%) which is mainly due to passengers at locations south of Oxford making a direct trip via the new Cross Country service rather than travelling via London on Virgin and First Great Western services.

Based on these considerations we consider it logical that the re-routed Cross Country service should remain within the Cross Country Franchise.

Currently all of the direct services between Birmingham and Manchester Piccadilly and Oxford and Birmingham are operated by the Cross Country franchise. The backfill Oxford to Manchester service could be operated by the Cross Country franchise making use of Class 220's which may be available once services on the 'Electric Spine' route (including EWR-WS) convert to electric traction.

Alternatively splitting the service into two (OXF – BHM and BHM – MAN) could enable some of the 'fast' Great Western services which terminate at Oxford to be extended to terminate in Birmingham which could provide additional connectivity between locations on the Great Western Route and the West Midlands. This would also enable the backfill Birmingham to Manchester service to operate using electric traction (as this route is already electrified).

Without further detailed investigations we do not have sufficient information to make a firm judgement on these services. However based upon all of the above our current view is the following:

- • The re-routed Bournemouth to Manchester service should remain in the Cross Country franchise;
- • The back fill service should be split into two separate services;
- • The Oxford to Birmingham service should be operated form the Great Western Franchise by extending one of the 'fast' London Paddington to Oxford services onto Birmingham; and

- • The Manchester to Birmingham service should be operated by the Cross Country franchise.

All of the above will require additional rolling stock to enable them to be operated. We have assumed that suitable rolling stock will become available (either via new build or cascade of existing) to enable these services to operate.

G.5.2. Reading to Nottingham

It is proposed that this will be a completely new service which makes use of the new connectivity and routing options provided by EWR-WS, providing direct journey opportunities which can only currently be made by interchanging in either London or Birmingham.

Analysis in MOIRA confirms that there would be value generated by the Cross Country service, however, some of this would be abstracted from existing Great Western, East Midlands and South West services due to passengers travelling directly rather than via London.

Operationally, this could be operated with DMU rolling stock from the opening of the EWR-WS, however, the Midland Main Line (MML) Capacity Upgrade, programmed for completion in CP5 is likely to be a pre-requisite for this service. This is also linked to the electrification of the MML, which means that operations may not be able to start until this scheme is completed in early CP6, if this is the case it would be pragmatic to consider operating this service with electric rolling stock from the outset. Atkins have assessed that an additional 5 units (assumed to be 5 car Cross Country configured DEMU (e.g. class 220/221/222) or EMUs.

Currently there is one direct Nottingham to Bournemouth service a day operated by Cross Country, together with an hourly Nottingham to Cardiff service and hourly Nottingham to Birmingham service. As there is an established presence at Nottingham Station, of the Cross Country franchise, it would not be unreasonable to consider including this service within the Cross Country franchise. However, East Midlands Trains also operate Cross Country services, such as Liverpool to Norwich. This together with the need to enable efficient operation of services on the MML between Nottingham and Bedford suggests that the inclusion of the Nottingham to Reading service within the East Midlands franchise is another viable option.

Without further detailed investigations we do not have sufficient information to make a firm judgement on this new service. However based upon the above our current view is that the service should form part of the East Midlands franchise. The reason for this is that it would enable the Nottingham to Bedford section to be fully integrated into the East Midlands operations and timetables for efficient operation along the MML section of the route. This is likely to be critical as capacity on the MML will be limited.

G.5.3. Bristol to Peterborough

It is proposed that this will be a completely new service which makes use of the new connectivity and routing options provided by EWR-WS, providing direct journey opportunities which can only currently be made by interchanging in London.

Analysis in MOIRA confirms that there would be value generated by the Cross Country service, however, some of this would be abstracted from existing Great Western, East Midlands and Cross Country services due to passengers travelling directly rather than via London.

Operationally, the service is reliant upon the installation of a chord at Manton to enable the service to operate between Kettering and Peterborough, although this is outside the scope of the business case for the EWR-WS project and does not form part of the current scheme. Additionally, it needs to be confirmed that there is sufficient capacity on the single line Kettering to Corby section to operate this new service as well as the current passenger and freight services. Atkins have assessed that an additional 6 units (assumed to be 5 car Cross Country configured DEMU (e.g. class 220/221/222) or EMUs

In terms of franchises, the service could complement the existing Birmingham to Stansted service operated by the current Cross Country franchise. It would also fit in with the current East Midlands franchise, which currently operates services from Corby to Kettering and on to London St Pancras.

Without further detailed investigations we do not have sufficient financial information to make a firm judgement on this new service. There is a strong case to be made for including the new service in either the Cross Country of East Midlands franchise. Without further detailed analysis (which is not possible with the

models developed for this study) we cannot provide a firm steer as to which franchise it should be included within.

From an operational viewpoint Cross Country currently use depot facilities at Bristol Barton Hill which could be used as a base for DMU operations. East Midlands Trains have depots at Derby, Nottingham and Cricklewood (London). All are remote from Peterborough which would imply extended empty stock moves to get units serviced. Therefore, from this perspective, it could make more sense for this service to be included within the Cross Country franchise.

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Appendix H. Depot Considerations

H.1. East West Rail – Western Section – Depot Strategy

An important consideration when specifying a new rail service is where the trains (assumed to be multiple units) will be stabled and serviced when not in use. There are three broad service groups of passenger services which are assumed to make use of East West Rail Western Section, these are:

- • Local Services – Operating as an extension of existing Marylebone – Aylesbury Services;
- • Local Services – Operating as either an extension of current diesel Reading to Oxford services or an extension to the proposed electric Paddington to Oxford services; and
- • Cross Country Services – Operating by re-routing an existing service via EWR, or entirely new services making use of the new routing opportunities provided by EWR.

We will consider each of these in turn.

H.2. Marylebone to Aylesbury/Milton Keynes services

These services are currently operated by Chiltern Railways using Class165/168 DMU's. Chiltern have Depot's at Aylesbury and Wembley. It is envisaged that this would remain an appropriate strategy once the operation of services via EWR commences. It is anticipated that the modest increase in fleet size required to operate the extended services to Milton Keynes would not trigger the need for an increase in depot/stabling facilities.

H.3. Paddington/Reading to Oxford/Milton Keynes/Bedford services

These services are currently operated by First Great Western using class 165/166/180 DMU's as well as Class 43/Mk3 HST's. Services which currently terminate in Oxford make use of the carriage sidings to the north of the station for stabling. Maintenance depots are currently located at Old Oak Common (London) and Reading for the current diesel fleets.

If the EWR route opens prior to electrification then it is likely that Reading based class 165/166's would operate the services. The lack of stabling opportunities at Milton Keynes, together with the likelihood that the carriage sidings at Bedford will be intensively utilised by the new Thameslink fleet indicates that diagrams should assume that layover times should be minimised at Milton Keynes and Bedford.

There is the former maintenance depot at Bletchley which could be used for stabling and limited servicing. This is currently also used for this purpose by London Midland. The Bletchley site can be accessed from the WCML directly but is only accessible to/from EWR with reversing moves, which could act as a constraint on using this facility at busy times of the day. These constraints suggest that empty stock moves will be required at the start and end of each day to place units into the locations that they will be required for the start of services.

In a post-electrification scenario the depot's utilised will depend upon the rolling stock being used. On the Great Western class 800/801 will be based at North Pole (London) depot, the EMU replacement for the class 165/166 fleet are likely to be based at Reading. As previously highlighted, the lack of stabling at Milton Keynes and Bedford means that the nearest stabling point would be at Bletchley. This is currently used as an EMU stabling point by London Midland. The nature of the hourly service to Milton Keynes & Bedford is not likely to generate a need for extensive stabling or servicing facilities for EWR EMU's remote from their home depot. There is the potential to upgrade the facilities at Bletchley to allow for overnight servicing (cleaning/watering etc.) for units operating at the Milton Keynes Bedford at the end of the day. However the cost of this must be weighed against the cost of running the empty stock to Reading at the end of the day and back to Bedford/Milton Keynes for the start of the next. This could be a finely balanced decision and more detail on the rolling stock, timetables and unit diagrams would be required to enable this to be ascertained.

H.4. Cross Country Services

There are three potential Cross Country services being considered in terms of the use of EWR-WS, these are:

- • A re-routing of the existing Bournemouth – Manchester Piccadilly service;
- • A new service from Reading to Nottingham; and
- • A new service from Bristol to Peterborough.

H.4.1. Bournemouth to Manchester

The current Cross Country Bournemouth to Manchester services are operated by class 220/221 DEMU's. Maintenance on the Cross Country fleet is undertaken at the Central Rivers depot near to Burton-upon-Trent. Overnight servicing for the current Bournemouth to Manchester service is also undertaken at either LNWR Eastleigh or Alstom Longsight depot's. For the re-routed Bournemouth – Manchester service it is likely that the same depot's would be used as at present.

In an electrified scenario, the depot at Longsight is already configured to maintain 25kV OLE EMU's and so could accommodate an electric Cross Country fleet. Eastleigh is not currently configured for 25kV OLE EMU's, however the Electric Spine project, will convert the lines through Eastleigh to 25kv OLE operation, meaning that it's not beyond the realms of possibility that the access to the Eastleigh works site could be electrified, thereby enabling it's continued use by South Coast to Manchester Cross Country services.

H.4.2. Reading to Nottingham

For a Reading to Nottingham service using the current class 220/221's it is likely that the depot strategy would follow the current practice where units terminating at Reading (at the end of their diagram) then run empty stock to Eastleigh for servicing. At the Nottingham end, again, as per current practice, it is likely that trains terminating at Nottingham (at the end of their diagram) would run empty stock to Central Rivers (Burton).

In an electrified scenario, the depot/stabling strategy would depend to a large extent upon the rolling stock that was utilised to operate the services. It is likely, provided that access to Eastleigh Works is electrified, that Reading terminators would continue to be serviced at Eastleigh (as Reading is unlikely to have the capacity with the Crossrail and GW EMU fleets). The Nottingham end of the journey is much more uncertain as there is very limited stabling capability at Nottingham itself. Currently, of the Cross Country services which terminate at Nottingham the class 220/221's travel empty stock to Central Rivers and the Class 170's either travel empty stock to Leicester for stabling or travel empty stock to Tyseley (Birmingham) for maintenance. It is therefore likely that, in an electrified scenario, Cross Country EMU's which terminate/start from Nottingham would have to travel empty stock to/from a remote depot at the start end of their diagram. Derby's Etches Park Depot would appear to be a logical location for this once the Midland Main Line is electrified.

H.4.3. Bristol to Peterborough

A Bristol to Peterborough service would be a completely new service. If operated by class 220/221 we would envisage that the service would use LNWR's Bristol Barton Hill depot for stabling/servicing and light maintenance as this depot is currently already used by these units operating to the west of England. At the Peterborough end of the route there are carriage sidings which are currently used by First Capital Connect (FCC) (Nene Carriage Sidings) although there are no servicing facilities there at present. FCC units currently travel to Hornsey depot for servicing. It is understood that DB Schenker's Peterborough TMD has previously been used for the servicing of DMU's, however it is highly likely that investment would be required to enable the overnight servicing of class 220/221's at this location. The alternative would be running as empty coaching stock to a suitable servicing point, which could be some distance away, e.g. travelling via Melton Mowbray and Syston and onto Central Rivers via either the Castle Donnington Line or the Leicester to Burton-Upon-Trent Line.

In an electrified scenario, depot considerations become much more complicated. Apart from the new Class 800/801 depot, all of the other existing depot's in Bristol currently cater for diesel trains. Therefore, depending upon the rolling stock utilised for the electric Cross Country services the potential for providing

25kV OLE into Bristol Barton Hill or St Philips Marsh Depot's should be considered to enable other electric rolling stock to be serviced, this would enable stock to be stabled and maintained at the western end of the service. In Peterborough the Nene Carriage Sidings are currently equipped with 25kV OLE, although as mentioned previously; do not currently have the facilities to enable overnight servicing of trains. An alternative may be to investigate whether Hornsey could be used as a depot for these Cross Country units. Hornsey Depot is being expanded as part of the Thameslink project and may be able to accommodate a relatively small number of Cross Country EMU's for servicing. An intermediate stabling location, irrespective of the rolling stock could be Oxford Carriage sidings, however as noted previously, there are currently no servicing facilities at this location.

All of these considerations highlight the issues which will require to be resolved to enable the local and Cross Country services to operate via East West Rail. There appear to be potential options to enable DMU based services to operate over the route. However, there is some uncertainty over the rolling stock types which will be used in an electrified scenario which is highlighted in the issues raised above. There could potentially be a need for some new servicing facilities, particularly for some of the Cross Country service options being considered. Finally, the rollout of electrification across more routes and the movement of rolling stock fleets could trigger the need for new depot/stabling/servicing facilities which could be made use of by EWR Cross Country services. In particular the electrification of the Midland Main Line is going to drive the need for an electric TMD somewhere between Sheffield and Bedford. It is assumed that Derby's Etches Park Depot would be electrified to serve this requirement. This could potentially address the issue of where to provide servicing faculties at the Nottingham and Peterborough ends of the routes.

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Appendix I. EWR Funding Contributions

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EastWestRail

Stephen Hammond MP
Under Secretary of State for Transport
Department for Transport
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Reply to:
Cllr Janet Blake
Chair East West Rail Joint Delivery Board
Buckinghamshire County Council
County Hall
Walton Road
Aylesbury
HP20 1UY

www.eastwestrail.org.uk
Date 11 November 2013

Dear Minister,

EAST WEST RAIL: COMMITMENT TO OUR LOCAL CONTRIBUTION

In April 2012 we wrote to the Department expressing our commitment in principle to use our best efforts to contribute £30 million and reasonable efforts to contribute a further £20 million toward the capital cost of the western section of East West Rail. Provided this condition was met, it was agreed that Network Rail would work in conjunction with the East West Rail Consortium, to deliver the scheme as set out by the Consortium in its November 2011 prospectus.

In July last year, as a result of this commitment, the Secretary of State was able to announce the funding of East West Rail in the Department's spending programme for Control Period 5 (2014 -19). This included an unexpected commitment to electrify Oxford – Bedford and the route's incorporation in the new strategic rail corridor between Southampton, the East Midlands and South Yorkshire.

Since then my colleagues in the Consortium have been working hard to translate our in-principle commitment to make a local contribution into a legally binding commitment. I am delighted to be able to tell you that the local authorities that comprise the membership of the Joint Delivery Board, established to provide the governance and oversight of our joint local contributions, have now fully signed up to the funding of their respective individual contributions. Specifically the fully committed contributions to date total £45.38 million made up as follows:

Local Authority	£ million
Aylesbury Vale District Council	5.36
Buckinghamshire County Council	10.16
Milton Keynes Council	7.65
Bedford Borough Council	2.6
Central Bedfordshire Council	4.2
Cherwell District Council	4.35
Oxfordshire County Council	11.06

This letter serves to notify you, in advance of the signing of the formal agreement between the Department and Buckinghamshire County Council as the lead local authority, that all the authorities above have either obtained full council approval or are in the process of doing so, to allocate funds to East West Rail and to pay the Department in accordance with agreed payment schedules that will form part of the formal agreement between us.

We believe that this is a matter to be celebrated, as significant funding of this nature by local government toward the cost of a rail infrastructure project is almost unprecedented. It is all the more unique inasmuch as all local authorities are, as I am sure you are aware, working with substantially reduced budgets. In agreeing to make this large contribution to East West Rail, we provide evidence of the importance we all attach to the benefits to the economy and the growth in new housing and jobs which we believe will be delivered following the implementation of this fantastic new infrastructure project; a project incidentally, which we have been promoting since 1995. Thus today's celebration represents for us an extraordinary milestone achievement following the many years of hard work we have invested in this project.

Our approach to funding will help deliver a more cost efficient railway carefully integrated with local needs, for we will be undertaking works both for the railway and around the railway as part of our contribution. This pioneering approach has all local authorities working with Network Rail to collectively deliver the project and the local authorities providing resources to help manage project requirements such as local rights of way and environmental issues. Where the local authority is better placed than Network Rail to undertake specific works such as highway changes, we will agree with Network Rail to undertake these from our own resources. The value of all these works will be part of our funding contribution.

In conclusion we very much look forward to the opening of East West Rail train services by December 2017. In parallel with the delivery programme for the western section of East West Rail, the broader East West Rail Consortium continue to devote resources to establish new railway links east of Bedford in our bid to re-open the final phase of the old varsity line to Cambridge.

Yours sincerely

Janet Blake

Cllr Janet Blake
Cabinet Member for Transport and Planning
Buckinghamshire County Council
and
Chair of the East West Rail Joint Delivery Board

Appendix J. OPEX Update

J.1. Introduction

This note has been prepared as an addendum to the EWR-WS Business Case Update. Following the presentation of results in that document it was agreed that the approach used in forecasting the operating costs of the main options under consideration may have been too simplistic for the purposes of this business case and that a greater degree of sophistication in this aspect of the appraisal would provide improved certainty over the business case findings.

In addition, an error was identified in the calculation of benefits generated by one of the options tested. This error has already been disclosed and the impact on results presented, but the alteration is summarised here to provide a permanent record of the change from the original business case document.

J.2. Correction of Benefits

Subsequently to the submission of the business case document, an error was identified in the gravity modelling element of the non-electrified scenario. At the time of commissioning the enhancement to the modelling of operating costs, this error was highlighted and corrected results presented. As this error affected the Core DMU scenario, the same difference fed through to the results of the Cross Country DMU scenario, for which the calculation of benefits was incremental to the Core. None of the electrified options were affected.

The tables below outline the key economic indicators of these scenarios, both as originally reported and with the revision in place.

Table J-1 Amendment to Economic Indicators for DMU Scenario

	Draft Business Case (Aug' 14)				Revised Benefits and Revenues		
	PVB £millions	PVC £millions	BCR		PVB £millions	PVC £millions	BCR
EWR 1.0.DMU	1,351	347	3.89		1,182	468	2.53
EWR 1.0 DMU High Growth	1,484	287	5.17		1,298	417	3.11
Core DMU +XC Scenarios 100mph	2,778	231	12.03		2,609	351	7.42

As correcting the error resulted in reductions to both user benefits and operator revenues, the amendment results in revisions to the PVC as well as the PVB.

J.3. Enhanced Operating Costs

In order to accurately reflect the differences in operating cost which would arise under the circumstances of retaining diesel powered rolling stock or replacing these with electrified vehicles, additional detail in the operating cost model has been considered necessary. A revised assessment has been carried out in which operating costs have been updated, but there has been no revision to any of:

- User benefits (generalised journey time, crowding and user charges);
- Operator revenues;
- Non-user benefits (marginal external costs, indirect taxes and carbon emissions); or
- Capital investment.

The enhancement to forecasts of operating costs include the following changes:

1. A full rolling stock lifecycle has been developed to identify replacement dates of rolling stock, which varies by scenario according to whether diesel or electric units are used on each service. Changes in annual costs of leasing these units over time has been assessed, rather than assuming an annual cost which remains constant in real terms.

2. Industry forecasts of rates of change for each element of operating cost have been applied, rather than assuming annual costs which remains constant in real terms for all cost types.
3. Rolling stock profiles have been updated, retaining the same train frequencies as used in the earlier assessment, but in some cases lengthening those trains at specified points in the appraisal period.
4. Minor alterations to rolling stock types used by service.

In addition to the above changes to assumptions, a more detailed review of which sections of track are subject to capacity charges has been carried out. This included use of a finer disaggregation of track sections, in order to calculate differences in capacity charges between options more accurately.

J.4. Impact of Enhanced Costs

In order to illustrate the change to performance in economic terms of the primary options assessed in this business case, the tables below set out economic indicators as presented previously and the same indicators under the revised cost assessment.

J.4.1. Core Scenarios

Table J-2 Economic Indicators in Original Business Case - Core Scenarios

	Revised Draft Business Case (from Table J-1)				Enhanced Operating Costs		
	PVB £millions	PVC £millions	BCR		PVB £millions	PVC £millions	BCR
EWR 1.0.DMU	1,182	468	2.53		1,182	572	2.06
EWR 1.0 DMU High Growth	1,298	417	3.11		1,298	522	2.49
EWR 1.0 EMU	1,399	686	2.04		1,399	839	1.67
EWR 1.0 EMU High Growth	1,537	628	2.45		1,537	780	1.97

As stated above, no change to the calculation of user or non-user benefits has been made, so the PVB remains constant in all cases, while the PVC includes capital costs and operating costs, offset by increases in revenue. Of these values only the operating costs have been adjusted.

The results presented in **Table J-2** indicate that the original assessment of operating costs represented quite a conservative forecast. The primary reasons for the difference between costs are:

- The application of rolling stock lifecycle profiling results in a cost reduction for the EMU scenarios and a cost increase for the DMU scenarios;
- The assumption that trains will be lengthened in 2036/37, in some cases doubling the number of cars;
- Growth rates applied to costs, of which the increase in electricity unit prices are most significant.

Although operating costs have increased and BCRs fallen as a result of these revisions, the cost changes are largely consistent across the tested options, with operating costs increasing by around 40-50% in each case. As a result the relative performance of options in economic terms remains unchanged. The core scenario performs most strongly when operated using DMU rolling stock and high growth sensitivity tests generate additional user benefits and revenue, resulting in a larger return on investment.

J.4.2. Cross Country Scenarios

As for the core scenarios, revisions to operating costs have been made for DMU and EMU cross country scenarios. In these cases the increase in operating cost is proportionally smaller at only 20-30% of the original forecast, but due to the longer distances covered these operating cost increases represent larger absolute values.

Table J-3 Economic Indicators in Original Business Case - Cross Country Scenarios

	Original Business Case				Revised Operating Costs		
	PVB £millions	PVC £millions	BCR		PVB £millions	PVC £millions	BCR
Core EMU +XC Scenarios 100mph	2,826	570	4.96		2,826	1,302	2.17
High Growth Core EMU+XC Scenarios 100mph	2,964	512	5.79		2,964	1,243	2.38
Core DMU +XC Scenarios 100mph	2,609	351	7.42		2,609	787	3.32

The most influential factors generating the cost increases set out in **Table J-3** are:

- Rates of change in capacity charges between CP4 and CP5. The capacity charge, especially on the WCML represents a large portion of the additional cost of some cross country services.
- The application of rolling stock lifecycle profiling results in a cost reduction for the EMU scenarios and a cost increase for the DMU scenario;
- Growth rates applied to fuel costs, of which the increase in electricity unit prices are most significant.
- In the case of EMU XC, costs are increased due to lengthening of trains on the Bournemouth to Manchester service from 2026/27 onward. However, a cost saving has been achieved in this scenario through introduction of more efficient rolling stock at the same date.

A notable change which is apparent in both core and cross country scenarios, is that recent changes to the DECC forecast of growth in diesel prices over the next 15-20 years suggest that while electric units may be more economical to run now, in the longer term diesel units will become increasingly competitive. However, this does not take into account any future government policy decisions on fuel duties or carbon pricing, which could significantly change the impact of this revised trend in diesel and electricity prices.

Once again, as the changes to costs resulting from this revision are a fairly consistent proportion of the original cost forecasts, the order of preference in economic terms for the test cross country options does not change.

The value for money in each case is significantly reduced, as the operating costs for cross country scenarios form a large proportion of the overall PVC.

The DMU option demonstrates a higher performance than the EMU options, despite no longer appearing as a financially positive investment and cross country options continue to perform more strongly than the respective options for service improvements only within the core.

A major factor in the performance of all options is the capital costs of the scheme. The electrification of EWR is part of the larger ‘Electric Spine’ project. At present the whole cost of electrifying the EWR route is included within this business case. It needs to be considered if this is a reasonable apportionment of costs for the purpose of this appraisal considering the strategic nature of the Electric Spine project which is about providing strategic connectivity from the south coast to the midlands and north. Any reduction in the apportionment of the electrification costs against the EWR-WS project would lead to a direct improvement in the business case of the electrified options. This is something which the department may wish to consider when taking forward the EWR-WS scheme.

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Appendix K. Freight Benefits

K.1. Introduction

The East West Rail Western Section, together with the associated enhancement plans, provides the opportunity to run additional freight trains from Southampton and other ports to the Midlands, North West and South Yorkshire, providing benefits by removing HGV traffic from roads along the corridor.

A high level approach has been developed (based upon that undertaken for the Midland Main Line Business Case) to allow an assessment of the potential order of magnitude of freight benefits along the route. The appraisal is based on the provision of additional rail freight paths between the Port of Southampton and Manchester Trafford Park Freight Terminal.

K.1.1. Methodology

The appraisal model applies a Marginal External Cost (MEC) approach to estimating the potential benefits of the additional rail freight paths. External costs are those imposed on others, and not paid for directly by the person/company imposing that cost. In the case of this appraisal, the External Costs considered include:

- Congestion – Impact an extra HGV on the road has on the journey time of other road users as a result of increases in congestion[25];
- Infrastructure – Cost of damage to the road infrastructure as a result of an additional vehicle using the road;
- (Road) Accidents – Additional traffic will increase the risk of accidents and so an increase in the cost of accidents for all road users;
- Local Air Quality – Additional emissions from road or rail users will have an impact on levels of NOx and PM10, which imposes costs on everyone in that locality;
- Noise – Increases in road and rail vehicle movements will also increase noise levels in that area, impacting on everyone in that locality;
- Greenhouse Gas (GHG) emissions - Increased road and rail movements results in increased GHG emissions, with associated costs and risks of climate change;
- Indirect Tax – Reflecting the fact that increases in road traffic will increase fuel consumption and the associated tax revenues.

The approach used ignores changes in private costs, including (for rail) infrastructure costs, which are assumed to be fully internalised through Track Access Charges. This implies some (restrictive) assumptions on the nature of competition in the sector – which effectively implies that changes in private costs (e.g. the cost of running additional freight trains) can be ignored. As such the appraisal model only provides an order of magnitude estimate of the potential benefits of additional freight paths provided by East West Rail Western Section.

It should also be noted that this approach also ignores any potential benefits of reduced operating costs for rail freight (e.g. through a shift from diesel to electric traction, or by using shorter routes between rail freight terminals).

K.1.2. Calculating the Benefits of Freight Mode Shift

The benefits of achieving freight modal shift from road to rail is based on data provided by DfT on the MEC of HGV traffic. This provides an estimate of the external cost of each of the above categories for a range of road types.

Data was provided in 5 year intervals from 2010 to 2035. For the purpose of the appraisal the data was converted to annual data (using interpolation) and extended to 2076 by assuming:

- Congestion costs increase in line with the value of time;
- Accident, local air quality and noise increase in line with GDP per capita;
- GHG costs change in line with the central cost of carbon; and

[25] Note that the cost of congestion experienced by the HGV (driver) is a private cost. External costs only cover the fact that an extra vehicle will result in slower traffic – thereby increasing journey times for other road users.

- Infrastructure and indirect tax effects are assumed to be constant in real terms.

Scheme specific average values were calculated based on the most appropriate mix of road types – reflecting the likely route of HGVs on an equivalent route to the rail freight route. In this case an example route was considered between the Port of Southampton and the Manchester Trafford Park Freight Terminal.

The Google Journey Planner was used to consider the likely route and road types that might apply. The tool provides the following mix of roads:

Table K-1 Mix of Road Types reported by Google Journey Planner for a trip between the Port of Southampton and Manchester Trafford Park Freight Terminal

Road Type	Distance (km)
'High' Motorway	0
Standard Motorway	250.7
Standard A road	110.7
Standard Other Road	3.1
Total	364.7

These categories do not match the categories provided by DfT in the MEC data, so some interpretation was required.

- 'High' Motorway reflected roads – mainly the M25 – which have higher external costs associated with them. To reflect this higher cost, the category of 'Inner/Outer Conurbation Motorway' was applied to this section of the route;
- Standard Motorway – Assumed MECs associated with the 'Rural Motorway' category;
- Standard A and Other Roads – Most of these roads were on the outskirts of Southampton; and Manchester. Therefore the 'Other Urban A Roads' and 'Other Urban Other Roads' categories were applied.

K.1.3. Scale of Mode Shift to Rail

An estimate of the number of total number of HGV movements is required to calculate the total benefits of the additional freight paths.

There is limited evidence on the potential scale of mode shift. Desk based research suggests that a 400m freight train is likely to consist of 20 x 60ft wagons. Each wagon can accommodate 3 x 20ft containers or 1 x 40ft and 1 x 20ft containers. For simplicity, we have assumed that each typical wagon will carry 3 x 20ft containers.

Therefore, a total of 60 x 20ft containers can be carried by a 400m train. A typical articulated HGV can carry up to 2 x 20ft containers. Therefore, a 400m freight train could remove 30 lorry movements from the road. It is not clear whether 400m trains will be in service on the proposed route, what mix of containers is likely, or what the average utilisation of these trains might be. However, it is considered that these are reasonable starting assumptions for use in this 'order of magnitude' estimate of the potential benefits.

Data provided by Network Rail suggests that the average train carrying 'consumer and other goods' removes around 43 HGVs from the road[26]. This assumption is critical in the derivation of total benefits. Given the sensitivity of the results and the uncertainty around the scale of potential mode shift, a range of assumptions have been applied:

- As an upper bound, the Network Rail value of 43 HGVs per train has been applied;
- A central case assumption of 30 HGVs per train (based on 20ft containers on a 400m train) has been used; and

[26] Value and Importance of Rail Freight, Network Rail, 2010

- As a lower bound, it was assumed that utilisation rates were only 50% of the central case (i.e. 15 HGVs removed per train).

In Network Rail's 'Output Specification' for the western section of East West Rail, the following freight services are outlined in the core scheme. Note that the figures describe the theoretical capacity of the route, once constraints elsewhere on the Network have been removed. They are not, necessarily, the services that will be run once the route is commissioned.

- Oxford to Milton Keynes – This service will consist of 1 train per hour either class 4 or 6. Class 4 is a 75mph intermodal service and Class 6 is 60mph bulk freight service; and
- Princes Risborough to Claydon Junction – The service will consist of 1 train per hour, either Class 4 or 6. This will primarily be for Claydon / Calvert waste traffic. However, extension east or west of Claydon Junction can be accommodated by using the Oxford to Milton Keynes / Bletchley paths.

The 'Output Specification' also outlines the following services in the incremental scheme:

- Oxford to Milton Keynes – This service will consist of 3 trains per hour (2 x Class 4 and 1 x Class 6);
- Bletchley to Bedford – This service will consist of 2 trains per hour (1 x Class 4 and 1 x Class 6); and
- Princes Risborough to Claydon Junction – The service will consist of 1 train per hour, either Class 4 or 6. This will primarily be for Claydon / Calvert waste traffic. However, extension east or west of Claydon Junction can be accommodated by using the Oxford to Milton Keynes / Bletchley paths.

The "The Port of Southampton Masterplan 2009-2030" was used to calculate the number of potential additional freight paths from Southampton could be provided via EWR. It was calculated as follows:

- The number of freight services to and from Southampton to the North was taken to be 13 services per day. Destinations included Manchester, Leeds, Teesside, Liverpool and Glasgow;
- Growth in container traffic between 2014 and 2030 was calculated to be 94% using figures from "The Port of Southampton Masterplan 2009-2030";
- "The Port of Southampton Masterplan 2009-2030" also stated that its aspiration was to increase the rail's share of container traffic from the current 25% to 40% by 2030 (which is a factor of 1.6);
- Both of these growth rates were applied to forecast likely number of freight trains to and from Southampton to the North. This was calculated to be 39 per day;
- Therefore, the number of additional trains per day is (39 – 13) 26;
- These number of additional freights paths can be accommodated by EWR as indicated by Network Rail's output specification above; and
- Therefore, freight benefits were evaluated on the basis that 26 additional freight trains would be running via EWR to and from the Port of Southampton per day for 253 days per year.

K.1.4. Marginal External Costs of Rail Freight

Modal shift towards rail will reduce the external costs associated with road transport. However increasing the number of trains running will also impose some external costs. The costs valued for rail freight are:

- Local air quality
- Noise
- Greenhouse Gas emissions
- Indirect Tax

Other costs are assumed to be either not relevant or internalised through relevant charges (specifically infrastructure costs are assumed to be included in Track Access Charges).

Data on rail external costs is less readily available than highway costs. Estimates were derived as follows – applying WebTAG guidance as far as reasonably possible:

- Values of NOx emissions from rail freight were taken from WebTAG (80 grams/km) and applied to the estimated kilometrage of the additional freight trains. The value of NOx damage was taken from the WebTAG Local Air Quality Worksheet;
- Noise costs were taken from the Mode Shift Benefit Technical Note and grown in line with GDP/Capita growth;

- Greenhouse Gas emissions were derived from an assumption of fuel consumption of 4.8 litres/km for a freight train derived from the Mode Shift Benefits Technical Note. Emissions factors and values were then applied using WebTAG guidance; and
- Indirect tax was estimated using the above fuel consumption figures and data from WebTAG on Duty levels for Gas Oil.

K.2. Results

The resulting estimate of benefits of the additional freight paths are outlined in the **Table K-2**.

Table K-2 Benefits of additional freight paths on East West Rail Western Section - Core Scheme (present values, £m, 2010 prices and discount year)

	High	Central	Low
Highway Benefits (£m)			
Congestion	1,090.7	761.0	380.5
o/w Business	*150.1*	*104.7*	*52.4*
Commuting	*151.7*	*105.8*	*52.9*
Leisure	*788.9*	*550.4*	*275.2*
Road Infrastructure	210.7	147.0	73.5
Road Accident	45.4	31.7	15.9
Local Air Quality	2.98	2.08	1.04
Noise	148.3	103.5	51.7
Greenhouse Gases	224.8	156.8	78.4
Indirect Taxation	-415.4	-289.8	-144.9
Rail Benefits (£m)			
Greenhouse Gases	-101.8	-101.9	-101.9
NOx	-15.9	-15.9	-15.9
Noise	-2.4	-2.4	-2.4
Indirect Tax	43.2	43.2	43.2
Highway Benefits + Rail Benefits (£m)			
Total	1,230.6	835.3	379.2

The analysis suggests that two additional freight paths per hour could deliver between £379.2m and £1.23bn depending on the utilisation of the trains and the mix of containers carried. The majority of this would be as a result of lower congestion on the road network, although reduced noise, GHG emissions and road infrastructure costs would also be significant.

K.3. Conclusions

The analysis shows that East West Rail Western Section has the potential to provide significant benefits through enabling additional freight to be carried by rail, and hence reducing the amount of road based freight movements. The scale of the potential freight benefits, when considered alongside the benefits associated with the proposed passenger services, highlight the significant potential of the East West Rail route and provides more evidence to support the case for implementing the scheme.

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[text redacted under FOI section 40]