Office of Rail Regulation

Engineering Advice on Network Rail's Enhancement Programme

Final Report

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Ove Arup & Partners Ltd
The Arup Campus, Blythe Gate, Blythe Valley Park,
Solihull, West Midlands. B90 8AE
Tel +44 (0)121 213 3000 Fax +44 (0)121 213 3001
www.arup.com

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1 Introduction

1.1 Background

The Office of Rail Regulation (ORR) is responsible for – among other things – regulating Network Rail through periodic reviews, the next of which is the Periodic Review 2008 ("PR2008"). PR2008 relates to Control Period 4 (CP4) – the five-year period from April 2009 to March 2014.

The DfT and Transport Scotland have published their High Level Output Specifications (HLOSs) and Statements of Funds Available (SoFAs), which describe the outputs required from the railway and the funds available respectively.

1.2 Network Rail's Strategic Business Plan

In October 2007, Network Rail published a Strategic Business Plan (SBP), based on an initial SBP (ISBP) which was published in 2006; this outlined emerging plans for operation, maintenance, renewal and development of the network; this was updated to form the final SBP.

Arup was appointed to provide engineering advice on enhancement schemes within the SBP. In parallel, Steer, Davies, Gleave (SDG) were appointed to provide strategic planning advice on programme outputs associated with the SBP schemes.

Arup has, to date, produced three main reports in fulfilment of this commission:

- Office of Rail Regulation, Engineering Advice on Network Rail's Enhancement Programme, Initial Report, October 2007.
- Office of Rail Regulation, Engineering Advice on Network Rail's Enhancement Programme, Interim Report, December 2007
- Office of Rail Regulation, Engineering Advice on Network Rail's Enhancement Programme, Final Report, March 2008.

1.3 Network Rail Strategic Business Plan Update

Following these Arup reports, Network Rail produced the Strategic Business Plan Update, Control Period 4, April 2008. The NR Update was of a supplementary/update nature, rather than a complete re-presentation of the Plan. The SBP update proposes modified versions of a number of schemes, and a number of wholly-new schemes. Our work in this report is based on the updated proposals and, where necessary, work reported in previous reports has been revised to reflect the updated proposals.

1.4 This Report's Level of Detail

It was neither possible nor necessary to investigate every single enhancement proposal. The effort was therefore focussed on the higher-value elements and particular issues. The reader will not find commentary on every proposal in Network Rail's Strategic Business Plan.

The response to the Terms of Reference for the study indicated that we would:

- undertake a high-level review of Network Rail's plans;
- undertake a high-level review of scheme costings;
- give a high-level assessment of the programme and the "feel" in terms of capacity or performance;
- delve more deeply into selected schemes, focussing on those with the greatest cost, the greatest risk, and the largest potential effects.

In many cases, therefore, the costs we quote are generic for a scheme type (e.g. linespeed improvements) and not a detailed re-evaluation of individual schemes.

We posed many questions to Network Rail, the vast majority of which were answered with patience and understanding. A few queries were unanswered, but it is not thought that this is a serious omission in relation to our understanding of the issues.

All our work has been based on a review of the documentation provided by Network Rail through the ORR's office.

In summary, the reader may find certain discrepancies or minor issues; it is not believed that any significant cost implications arise as a result.

1.5 Focus on High-Value Programmes

At a meeting with ORR on January 7th 2008, it was agreed that Arup would focus on four broad areas, as these topics constituted the majority of the proposed expenditure. It was agreed that the key areas for investigation were:

- Platform Lengthening Schemes;
- Stations;
- Power Supply Enhancements;
- ECML Schemes.

In addition to this, it was agreed that further clarification was needed from Network Rail on the cost/risk estimating process, and on the clarity of the presentation of schemes in various tables, figures etc, where there are conflicting titles and classifications.

While these four areas were the main ORR requirement, it was felt that additional insight could be given on:

- Line-speed Improvement schemes;
- Track re-doublings.

Arup has data on these two additional categories which will help to formulate a more complete view of Network Rail's required expenditure.

Further to this discussion, the ORR requested further consideration of:

- Gatwick, East Croydon, West Croydon, Clapham Junction, Waterloo, Redhill,
- IEP,
- GARL,
- Stabling for additional units in Scotland
- Nottingham station and Nottingham capacity enhancement;
- MML speed improvements.

1.6 Grouping of Schemes

In the report, we have followed the sequential presentation of schemes as given in Network Rail's Enhancements Master Spreadsheet (April 8th, 2008). This order is:

- England and Wales – Core Enhancement Projects
    - Baseline Projects;
    - Specified Projects;
    - HLOS Output Projects;
    - DfT Performance;

- England and Wales Optional Enhancement Projects;
    - HLOS Performance Schemes;
    - Capacity and Performance schemes;
    - Journey Time Improvements;
    - Enhancements to Renewals;
    - Seven Day Railway;
    - Longer Term Development;
    - Policy Choices;
- Scotland;
    - Transport Scotland Fund – Core Enhancement Projects;
    - Transport Scotland Fund – Optional Enhancement Projects.

We started at the top the Enhancements Master Spreadsheet list, and worked downwards. We then allocated schemes into common categories, such that this report discusses, for example, all platform lengthening schemes or Line Speed Improvement schemes together. This should allow the reader to understand how, again for example, we have assessed the costs of platform extensions or LSI schemes.

Within each section of our report, we have then retained the sequence, for example, within "Stations" we deal with King's Cross first, because that is the first station on the Enhancements Master Spreadsheet list.

This Enhancements Master Spreadsheet list, is, it may be noted, the nearest thing we have seen that could be described as "The Single List of Enhancements".

1.7 The Layout of this Report

This report is therefore laid out as follows:

- Chapter 1, this chapter, is introductory;
- Chapter 2 summarises the Initial Report, October 2007;
- Chapter 3 summarises the Interim Report, December 2007;
- Chapter 4 refers to the Final Report, March 2008 Version.

The following chapters begin the main content of the Updated Final Report:

- Chapter 5 addresses Cost and Risk Estimate Methodologies
- Chapter 6 describes our methodology for the independent estimate of CP4 expenditure;

The schemes in the SBP were then categorised into type as follows, for projects in England and Wales:

- Chapter 7 addresses Platform Lengthening Schemes
- Chapter 8 addresses Station schemes;
- Chapter 9 concerns Power Supply Enhancements
- Chapter 10 concerns ECML Schemes;
- Chapter 11 addresses Journey Time Improvement (LSI) Schemes;
- Chapter 12 is about Track Re-Doublings;
- Chapter 13 covers Issues Not Covered by Previous Groupings.

- Chapter 14 is perhaps the most important; it provides our Independent Financial Recommendations.
- Chapter 15 deals with schemes in Scotland.

There is only one appendix:

- Appendix A is the Arup "Orange and Green Chart" (whose significance will be explained later).

2 Summary of the Initial Report, October 2007

2.1 Introduction

The Initial Report covered:

- A description of approach to data collection and scheme numbering;
- A summary of Network Rail's schemes in the Initial Strategic Business Plan (June 2006), the November 2006 refresh;
- A reminder about the High Level Output Specification (HLOS);
- A summary of the NR Business Plan of April 2007 and a summary of the Route Utilisation Strategies;
- Issues, Gaps and discrepancies;
- Scheme costs – a high level review;
- Performance and capacity schemes, using Route 8 (ECML) as an example.

2.2 Principal Aim

The principal aim of the Initial Report was to establish a definitive list of enhancement schemes and to collate factual data provided by Network Rail.

In summary:

- The schemes in Network Rail's Initial Strategic Business Plan and the Refresh document helped form the basis of a list of enhancement schemes;
- The High Level Output Specifications (HLOSs) were also checked for enhancement schemes;
- Network Rail's 2007 Business Plan had a series of route plans relating to its 26 strategic routes. The initial data gathering exercise also included identifying enhancement schemes in these 26 route plans;
- Schemes in data received from DfT were added to the list where they had not already been found in the route plans;
- Similarly, data received from NR was treated in the same manner;
- The Single List of Enhancement schemes (SLOE) from 2003 was also consulted and, where appropriate, schemes were added to the list;
- The Route Utilisation Strategies (RUSs) were examined, and where schemes were identified, these were added to the list. It should be noted, however, that the RUSs do not represent a commitment to particular schemes of work, rather, they provide details of the various options under consideration.

2.3 Scheme Numbering and Classification

In the Initial Report, each scheme was given a unique identifier and name based on its strategic route and work content. Some duplication occurred as some schemes cross strategic route boundaries, but this was clearly identified in the master list.

Network Rail generally treats enhancement projects as those that are funded by outside bodies, and notes that internally-funded enhancement projects are normally required generate sufficient payback to recover the capital investment within five years, for example through reduced performance penalty payments/through achievement of reduced operational costs.

2.4 The High Level Output Specification (HLOS)

The DfT's July 2007 White Paper (which contains the HLOS) lists the highlights of the planned capacity increases to be made during and after CP4; in summary these are:

- Great Western Main Line: remodelling Reading Station area, remodelling Paddington and introducing the new Intercity Express train;
- West Coast Main Line: 50% more peak capacity as a result of WCRM, Pendolino lengthening and addressing the remaining capacity pinch points, including Stafford;
- Midland Main Line: 9% increase in peak capacity by 2010 following the implementation of the new East Midlands franchise. Up to 50% more peak capacity from deployment of new Intercity Express trains. 70% more capacity delivered south of Bedford following the Thameslink programme;
- East Coast Main Line: increased service frequencies specified in the ITT for the new East Coast franchise. Around 70% more peak capacity from the Intercity Express train, timetable simplification and work to address bottlenecks. More capacity following redevelopment of Kings Cross station approaches, and Thameslink;
- Cross Country: 35% increase in capacity on the busiest parts of the route under the new Cross Country franchise;
- Trans-Pennine: additional capacity by lengthening trains. Journey time reductions. 30% increase in capacity on the north Trans-Pennine route.

The HLOS also contained specific metrics describing the level of demand to be accommodated by 2013/14.

2.5 The Route Utilisation Strategies (RUSs)

The Initial Report identified that the Route Utilisation Strategies do not commit to individual schemes, but do indicate the options identified for addressing the gaps. The enhancement schemes in the RUSs were added to the Arup list, and the status of those noted. The RUSs give high level cost estimates for some of the schemes, but the costings are often indicative or dependent on the delivery of other related schemes.

The ideal position would be for all the various RUS options and scheme combinations to have been agreed upon at such time as the SBP is being drafted, so that the SBP can specify the right combination of schemes to ensure all the RUS gaps are plugged; however, this may be difficult due to the chronology of the documents and work programmes.

2.6 Other Lists of Schemes

In 2003 the SRA published its Single List of Enhancement schemes (SLOE). It was assumed that the SLOE has been superseded.

2.7 Towards a Single List of Schemes

The main observation in our Initial Report was the identification of a definitive list of schemes. The SBP Update has largely achieved this aim, with an improving record of the scope, specification, GRIP stage, costing, related RUS gaps, related HLOS requirements and funding arrangements.

2.8 The Initial Report's Conclusions

The main conclusions, with commentary on whether these observations have been met, are:

- There was a lack of evidence of how demand forecasting led to the development of options and how the infrastructure elements were selected from the range of

potential infrastructure or rolling stock options. More rigour is required to connect the demand forecasting process to the resulting list of schemes.

- A master list of enhancement schemes is needed; this has now largely been achieved;
- A number of schemes appeared to show regression or little progress rather than progression through the GRIP process. This is still of concern.

3 Summary of the Interim Report, December 2007

3.1 Introduction

The Interim Report covered the following topics:

- Network Rail's Business Plan and the ORR's Requirements;
- An overview of SBP issues:
    - Demand Forecasting and Identification of Capacity Constraints;
    - Capacity Constraints Identified and Not Addressed;
    - Solutions Proposed with No Problem identified;
    - Development Funding for CP5 schemes;
    - Potential Impact in CP4 of CP3 Over-runs;
    - A "Single List";
    - Enhanced Renewals;
    - Adherence to NR's GRIP Process and Industry Procedures;
    - Schemes Reliant or Partly Dependent on External Funding;
    - Scheme Costs and Risk Allowances;
    - Project Timescales/Programmes and programme risks;
    - Timescales for External Approvals;
    - Project Timescales;
    - Annual Spend Distribution;
    - Industry Capacity;
    - Impacts of Schemes on Performance;
    - The 7-Day Railway;
    - Strategic Freight Network;
    - Performance improvement to meet HLOS targets.
- Commentary on Individual Routes: Certain schemes were selected for further analysis, to represent the categorisations, as follows:
    - A Capacity Enhancement Scheme: Capacity Relief to the East Coast Main Line [Peterborough to Doncaster];
    - A Line-speed Enhancement Scheme – North West RUS Line-speed Enhancement;
    - A Large Multi-part Scheme: Reading;
    - A Passenger Capacity Scheme: Birmingham New Street Gateway Project;
    - Platforms and Rolling Stock Scheme: Strategic Route 2 – Suburban Area 10-car Operations to Victoria and London Bridge;
    - A Power Supply Scheme: Route 1 Power Supply Enhancements;
    - A Re-doubling Scheme: Swindon to Kemble;
    - A Regional / PTE scheme: Salford Central New Platforms;
    - Scottish Projects - Glasgow Airport Rail Link (GARL) and Airdrie to Bathgate Reopening;

- A Welsh Scheme: Barry to Cardiff Queen Street (an Enhanced Renewal);
- Multi-Route Enhancements – Inter-City Express Programme.

The report then suggested the approach to future analysis.

3.2 Demand Forecasting and Identification of Capacity Constraints

The report noted that the SBP contains a well-expressed process for the preparation of demand forecasts, and the way the Route Utilisation Strategies have built on and used this data. There was a clear explanation of the process for the preparation of demand forecasts to the route maps and CUI values demonstrating where the capacity problems are most acute.

However, the RUSs and the Route Plans identified a number of capacity constraints with no solutions to address them (eg Malvern to Hereford, Truro to Penzance; Welwyn Viaduct, Carlisle to Workington). There was no explanation of why a solution is not suggested, and what the consequences will be both locally and to the wider network.

The assumption was presumably that the capacity requirements set by the HLOS will be met by other means, such as train lengthening. There may be risks to capacity and performance in not addressing these issues, particularly for the longer term.

3.3 Schemes in Combination

There was no visibility of the process for selecting schemes. If, for example, a route could contain schemes at locations A to E, the SBP may propose schemes at A, C and D to meet the HLOS capacity metric. It was not clear how it was established that this was the best overall solution and how the combination of B, C and E was discounted as possibly being more costly, more intrusive, or environmentally poor. This remains the case.

3.4 Solutions Proposed with No Problem identified

In contrast to the issue above of problems not addressed by solutions, there appeared to be some proposed schemes which did not appear to be in response to a problem. More explanation was, and still is, needed as to why schemes are being advanced (presumably to actually address a capacity problem which is not adequately expressed).

3.5 A “Single List”

There was an emerging “Single List” of schemes, but more rigour is still needed to ensure schemes do not suddenly appear or disappear.

3.6 Schemes with Multiple Funders

A number of schemes have multiple funders. The Interim Report thought it would be helpful if the SBP could contain a full cost breakdown, and if it could show how cost changes are to be shared between the parties. For example, a £100m scheme might have a £20m NR contribution. If the cost rose by 10%, is this 10% shared equally among funders, or does NR suffer the whole £10m increase? This leads to concerns over the possibilities that external funding may not be available ‘on the day’ or may be less than expected. In addition, there is no evidence over how cost and other risks will be apportioned. The risk is that liability for cost overruns and shortfalls in external funding will fall on CP4. In some cases this could be accommodated by deferring or cancelling the schemes, but in many cases they are probably essential to delivering the HLOS outputs. This concern remains.

3.7 Consistency of Unit Rates

Network Rail provided individual scheme estimates from a knowledge (appropriate to the GRIP stage) of the quantities of work involved, multiplied by a unit rate. These unit rates vary across the portfolio; there is, for example, no set rate per square metre of platform

extension. It is not surprising that there is such a large difference in rates for this in different schemes, as rates should reflect the inherent difficulties of access or other site restrictions.

It is suggested that Network Rail could, over time, build up a comprehensive cost database, coded against the GRIP Work Breakdown Structure, to guide future designers, cost managers and cost consultants. This would allow Network Rail to challenge higher rates, and to ask why platforms should cost more in one Territory compared to another. It will also give more consistent cost forecasts for future Business Plans to give the ORR more confidence in the estimating procedures. Network Rail has made some progress in the establishment of a cost database, which is stated to have been used in some of the cost estimates. It is not suggested that this is a major issue of cost understanding in respect of the SBP, but a suggestion for improving confidence and consistency in the future.

4 The Final Report

4.1 The March 2008 Version

Arup prepared a Final Report in March 2008. It was much more numeric in nature than the previous reports. It focused on:

- The estimating basis used by Network Rail to determine scheme cost estimates;
- Network Rail's estimated cost of schemes;
- Network Rail's application of risk in terms of cost estimates;
- An independent Arup estimate of scheme cost;
- An independent Arup review of project programmes;
- A combination of a revised cost and programme, aggregated over the whole Network Rail Business Plan portfolio, to derive an Arup estimate of CP4 expenditure needs.

4.2 The Updated Final Report, April 2008

This report updates the March 2008 version.

It has been revised and extended to include commentary on the SBP Update and to reflect the changes to schemes, scheme scopes and objectives and costs contained in it. It is therefore "complete" and not of a supplementary nature. It tries to set out the logical sequence of assessment through all of the period from October 2007 to April 2008 in one place. The reader should not have to study any of the previous reports to understand our findings and recommendations.

It begins below.

5 Cost and Risk Estimate Methodologies

5.1 Network Rail's Assessments

5.1.1 Network Rail's Cost Estimates

Network Rail provided advice on the item coverage and inclusivity of cost breakdowns, as follows:

Unit Rates: The unit rates were generally based on out-turn costs so may be regarded as including the cost of some risk events; however they are not average (mean) unit rates. The base unit rate was chosen to be below the mean because of an estimating convention that a Point Estimate should reflect likely outcomes rather than extreme occurrences. The Point Estimate is therefore likely to be closer to a "mode" than a "mean". The risk of systematic changes in unit costs, e.g. steel prices, is not included in the CP4 risk modelling. This was the subject of the LEK review and no implicit or explicit allowance for Input Price Inflation was included.

Consistency between Territories: Cost guidance was issued by Network Rail's Head of Estimating for methodology. The estimates received back from the Territories were then reviewed by the Enhancements Estimating Team against the unit costs published within the Enhancements Price Book.

Inclusivity of Costs: The costs include for:

- Scheme development;
- Design, approvals;
- Possessions;
- TOC compensation;
- Contractor's preliminaries;
- Design costs (even though it is not yet certain whether internal or external design teams will be utilised);
- Testing & Commissioning;
- Possession Costs;
- Network Rail Project Management;
- Possession Management;
- RIMINI Costs;
- TOC Compensation/Schedule 4 Charges;
- Site supervision.

Some of these items are percentage mark-ups on the construction cost, typically adding 63% to the construction cost.

The following issues were excluded from the basic cost estimate:

- Risk;
- Optimism Bias;
- Escalation Costs.

Aggregation of Rates: The unit costs used are classified as top-down out-turn costs at Repeatable Work Item or Cost Element level derived from Network Rail's projects using the Cost Analysis Framework.

Unmeasured Items: Allowance for unmeasured items was included within the assessment of confidence level (by asset) and the adoption of a non-symmetrical distribution of the minimum / most likely / maximum range on costs (which recognises that elements of unidentified / unmeasured scope will exist which will have a cost impact). Point Estimates are exclusive of any allowances for "Work not seen / measured" or "Estimator's contingency" (refer to Section 2.2 – Project Estimates of the CP4 Input Price Book, Enhancements).

Price Base: The estimates are at November 2006 prices.

Source of Cost Data: Where Network Rail's cost estimates are quoted in this report, they are those given in the data entitled "Investment Infrastructure: Programme Controls Estimating, Estimate Review Sheet – CONFIDENTIAL" which Arup received on April 4th 2008. This data corresponds exactly with the cost tabulations given in Figure 6.17 (p.65) of the SBP Update, entitled "DfT Enhancement Projects in CP4 (£m)".

5.1.2 Network Rail's Risk Assessment

Network Rail advised that the risk modelling was applied to a validated estimate using equivalent GRIP stage projects. They advised that these historic projects did not have a risk register and therefore no QRA, and that the scope uncertainty is significant.

The key principles used by NR which relate to project cost risk analysis in general are:

- It is not possible to reliably analyse any historic cost to ascertain what the proportion is that relates to risk, again because similar GRIP stage projects did not have a risk register;
- The factors leading to higher costs are stronger than cost-lowering factors.

The key principles which specifically relate to the CP4 modelling are:

- The CP4 project estimate is for a defined output, but there is a high risk of the output being altered;
- No project risk registers were produced for the SBP because the high scope uncertainty means that any risk register would be focused on those issues and it would be difficult to identify risks that relate to design, construction methods, resourcing etc.
- To simplify the modelling the uncertainty in unit price and scope is not being assessed separately. Instead estimate uncertainty is provided that reflects both unit price and scope.

Monte Carlo modelling was used, with a Trigen distribution based on the 10th percentile being the "minimum" and the 90th being the "maximum". For the specific purpose of the CP4 model, the default was that the Most Likely would equal the point estimate.

Network Rail therefore applied an asymmetrical triangular distribution to give a P(mean) value, the asymmetry arising from the application of –10%/+35% or –25%/+50% values. Very typically, these uplift the Point Estimate by 8.5% to achieve the P(mean).

NR's approach was deliberately designed to avoid double-counting, as they took the estimate (which is less than a mean value) and applied a range to it which encompasses:

- Major scope uncertainty: for example, consents issues might mean that a more expensive solution is necessary;
- Minor scope uncertainty: this covers minor refinements such as those dependent on survey data without altering the underlying assumptions;
- Unit cost uncertainty: particularly as initial estimates will make an assumption about construction methods and possession regimes;

- the possibility of projects incurring either less or more cost from risks than the average.

There is no "double-counting" as the three points, minimum, most likely and maximum are representations of a real population of previous projects that encompass the above four types of risk and uncertainty.

Major scope uncertainty is the subject of the Optimism Bias phenomenon, upon which there is DfT guidance in their WebTAG document and there is an on-going study sponsored by DfT in this area.

Network Rail's risk modelling of individual schemes to support the SBP Update in April 2008 was allocated to the various enhancements categories. The risk modelling generated a total risk allowance of £305.093m. This was then allocated to categories proportional to the aggregate cost of schemes with specific risk allocations. This is an eminently sensible way of allocating risk. The following categories of schemes took the following proportions of risk:

- Capacity schemes – 78%;
- Performance gap schemes – 4%;
- Capacity & performance schemes – 5%;
- Journey time schemes – 6%;
- Renewals – 7%.

5.2 Arup's Assessments

5.2.1 Unit Rates, Location, Route and Portfolio Effects

The unit rates used for our cost estimates were derived from an accumulation of data over a few years; specifically using successful tenderer's rates on a variety of contracts.

Naturally, there were variations in rates even for common items, such as a "per metre" rate for drainage works, depending on pipe sizes, depths, complexity etc. Even within a particular contract.

Also, considerable rate variation has occurred where we have analysed different Bills of Quantity from different contracts. One contractor may, for example, price a drain at £55 per metre, and a catchpit at £500. Another contract might show £40 for the drain and £2,000 for the catchpit. When averaged over 1000m of drainage, these produce identical costs of £60,000, but it really is impossible to say what a catchpit costs.

In terms of risk, it is difficult to argue that even the tendered rates are free of risk, since the winning tenderer will have included some element of risk in his pricing.

What we can say is that the figures are not "out-turn" rates, as they are an analysis of tendered figures, not of the final settlements of that contract's Final Account.

Our rates database is therefore based on rounded figures, and averages of other averages. The resulting rates are often aggregations of many individually rated items, such as all activities associated with a drainage run have been aggregated together and divided by just the length to give an aggregate "per metre" rate. For illustration, the rates were values such as:

- for stations, a new "Stop Board" costing £400;
- a LSI works, a metre of drainage costing £65;
- for re-doublings, a new 50mph turnout at £190,000.

It can be argued that these rates are therefore both "reasonable" and "efficient", certainly in terms of efficiencies in today's market, given that we used successful tender rates and not an average of all tenders, and that the rates were competitively tendered. We comment later on efficiencies going forward.

What can be asserted with some confidence is that, although individual rates can be challenged, when a Bill of Quantity is priced using different rates from different contracts, and summated over a scheme, the total cost convergence is very close, with higher rates in some unit rates cancelling out lower rates in others. Moreover, when costs are calculated over a whole portfolio of projects, there is similar convergence on the overall figure. An example of this would be on a major enhancement project, where we produced a cost estimate from our rates library using our quantities from our layout drawings. These drawings (only) were given by Network Rail to an independent cost consultant, who undertook a totally independent measure of quantity, and used their own rates to build up the cost. The difference in cost estimates was about 1.5%, confirming that, while individual rates would never agree, the total for a scheme will be remarkably consistent.

We cannot therefore state with a high degree of certainly that, for example, our estimated cost at “Location A” is correct, but the total for a Route will be reasonable, and when all routes are added to consider a portfolio of like schemes, we are confident of our overall recommendations.

5.2.2 Cost Estimates

Arup developed Point Estimates, at Q4, 2006 prices, which is similar to Network Rail’s basis (November 2006).

We built up the Point Estimate to include the following items, taken from a “standard” Network Rail cost estimate build-up spreadsheet;

- General Site Clearance;
- Fencing;
- Drainage;
- Earthworks;
- Station works and Platforms;
- Permanent Way and Turnouts;
- OHLE;
- Structures;
- Highway Works;
- Signalling;
- Communications;
- Services / Utilities.

The total of the above resulted in a Net Construction Cost.

To these estimates were added:

- Contractor’s preliminaries at 25% of above items (strictly, this could be regarded as included in a tenderer’s pricing);
- Design costs at 15% of above items;
- Testing & Commissioning at 7% of above items;
- Ancillary Items;
- Possession costs;

The total of the above was the Total Construction Cost.

Additional sums were added for:

- Network Rail Project Management;

- Possession Management;
- RIMINI Costs;
- TOC Compensation/Schedule 4 Charges;
- Site supervision.

The total was the Estimated Total Cost.

As Network Rail did, we added some percentage mark-ups on the construction cost, typically adding 62% to the construction cost compared to Network Rail's 63%. For a major signalling job, we added additional design, testing and commissioning, training and spares costs to increase the overall mark-up to 90%.

There was no allowance in Arup's Point Estimate for:

- Risk, except to the extent that our rates database must include some element of contractor's pricing risk;
- Optimism Bias;
- Escalation Costs.

5.3 Cost Comparisons – Point Estimates

In order to compare estimates, we have used Network Rail's Point Estimates and our Point Estimates.

5.4 Overview of Consistency of Costing

5.4.1 Capital Costs

In summary, Arup's and Network Rail's unit costs are consistent in that they:

- agree in terms of coverage for issues such as development and design costs, preliminaries, management costs etc.
- both exclude risk, Optimism Bias and Escalation Costs.
- are both Point Estimates.
- are little different in terms of the Price base.

5.5 A Note on Optimism Bias

Although not of direct relevance to cost estimates as such, the DfT's Transport Assessment Guidance (TAG) Unit 3.13.1 Guidance on Rail Appraisal (August 2007) covers the use of Optimism Bias in the economic assessment of schemes.

The table below shows how risk and Optimism Bias should be treated through the early GRIP stages.

Table 2: Recommended risk and optimism bias adjustments					
Project Development Level*	Level 1	Level 2	Level 3	Level 4	Level 5
Activity	Pre-feasibility	Project Definition	Option Selection	Single Option Refinement	Design Development
	Capital Expenditure				
QRA	No	No	No	QRA at mean estimate	QRA at mean estimate
Optimism Bias (% of present value capex)	66%	50%	40%	18%	6%
	Operational Expenditure				
QRA	No	No	No	QRA at mean estimate	QRA at mean estimate
Optimism Bias	41% of present value opex	1.6% per annum#	1% per annum#	Evidence based	Evidence based

Sources: Mott MacDonald 2002, Review of Large Public Procurement in UK (HM Treasury website), SRA and Network Rail research
* Definition of project development levels is consistent with Network Rail's project development definition in GRIP (Guide to Rail Investment Projects)
# Added to each set of operational costs in the year that they occur. Not to be taken as a cumulative

It is repeated that Optimism Bias was NOT calculated in Arup's costings, nor was it in Network Rail's.

It should also be noted however that a different approach to risk and inclusion of Optimism Bias was taken for some schemes in Scotland, on the advice of Transport Scotland.

6 Our Independent Estimate of CP4 Expenditure

6.1 Network Rail's "Orange and Green Charts"

The assessment of Network Rail's CP4 expenditure needs started from an analysis of:

- Figure 6.17 (p.65) of the SBP Update, entitled "DfT Enhancement Projects in CP4 (£m)". This figure presents schemes grouped into categories, with a total CP4 requirement of £8.581bn.
- Figure 6.18 (on p67), which presents the DfT Capacity Enhancement Projects in CP4 listed by Route.
- Figure 6.19 (p70) which presents the DfT Optional Enhancement Projects in CP4.
- Pages 74 and 75 of the SBP Update on which is Figure 6.21; this gives a programme and groups schemes into Routes. Within each route is a line item, an orange and green time-line, representing GRIP Stages 1 to 4 in orange, and 5 to 8 in green. We have called these "the Orange and Green Charts" for simplicity of presentation and discussion.

We built up a spreadsheet to replicate Network Rail's data from a series of Estimate Summary Sheets, which gave the scheme's total cost, and the proportion of it in CP4. We used this spreadsheet to deduce an expenditure requirement by item, route, financial year and Control Period.

Finally, we re-grouped the schemes away from the Figure 6.21 format (the "Orange and Green Charts") and into the order of the Figure 6.17 listing (the table that presents Network Rail's £8.581bn total) for ease of cross-reference.

6.2 The Independent Arup Version of the "Orange and Green Charts"

6.2.1 Cost

The main thrust of our review was to make a high-level independent assessment of both the cost of the line-item; we also reviewed the programme associated with it. Cost was our primary concern.

The Arup Chart enables summation of costs by financial year, and Control Period. The chart includes those schemes whose implementation straddles the boundary between CP4 and CP5, such that the CP4 total can be extracted separately from the total scheme cost. Where our programme analysis indicates slippage wholly or partially into CP5, the text relating to that scheme notes that fact.

Where we did not make an independent assessment, Network Rail's data was repeated in the Arup Chart, subject only to a generic amendment if programme-wide issues were revealed by the more detailed analysis.

6.2.2 Programme

Our analysis of the scheme programmes presented two major difficulties:

- For some schemes, the implementation timescales appeared to be unrealistic, especially for those schemes with a substantial statutory / TWA requirement;
- The second issue is that Network Rail provided 3 often-conflicting data sources for the scheme's programme:
    - Network Rail's Orange and Green Chart;
    - Data provided by Network Rail in a file entitled "HLOS 20 March 08 (2).pdf" (this is the P3 programme for each individual scheme, albeit that these files contained programmes for schemes no longer in the SBP);
    - NR Scheme Data Sheets (which show the dates for each GRIP stage).

We had to pick one consistent source for programme dates. We used the Orange and Green Charts, as this is “public” data, as it is contained in the published SBP. For some schemes, we made an independent assessment.

For the GRIP status, we have used the data provided by Network Rail in the document “CP4 GRIP Stage Analysis dated 18/4/08 April Submission GRIP Stage”. We know that there is a range of conflicting GRIP status reports in the documents we received, but again we had to utilise one unique source for this information.

There appears to be a general tendency for programme optimism where TWA or other major consents are required. There is an acknowledgement within the SBP that TWA applications can take 2 years from application to confirmation of orders.

We also reviewed the DfT’s “A Guide to Transport and Works Act Procedures 2006”, where there are many relevant quotes about the timescales required to process a TWA application:

- It is very clear to the Department, from its experience of handling TWA applications, that the carrying out of wide and thorough consultations in advance of an application is a crucial part of the whole authorisation process;
- a thorough consultation exercise before an application is made will be likely to repay 'with interest' the investment of resources involved.
- It is likely to be counter-productive to take forward a TWA application without first having undertaken an extensive consultative process.

All of these observations acknowledge that “do it slowly, get it right, and do it once” is actually faster than “do it quickly, get it wrong and do it twice”.

We therefore set out below the sequence of activities for a scheme requiring TWA powers, for a scheme in an early GRIP3 position, with the Preferred Option not yet identified. Where we believe TWA processes are involved, we have then made specific assessments of durations based on this general approach, depending on its GRIP stage and the complexity (and hence duration) of each stage. The sequence is:

- agree and prepare public consultation material;
- actual consultation period (meeting OGC recommendations);
- response analysis to agree the Preferred Option;
- tender and award the GRIP4 design process to statutory application;
- topographical, environmental and geotechnical surveys (assuming that Network Rail has assembled all the factual land ownership information, and has made all necessary survey access arrangements);
- design development of the preferred option;
- design and agree all the mitigation measures;
- “Design Freeze”;
- undertake the formal Environmental Impact Appraisal (EIA), write the Environmental Statement, prepare the TWA Orders and schedules (including liaison with Parliamentary Agents);
- submit to TWA Processing Unit;
- incorporate all their responses;

Then the Order would be published, and subject to objections. Then:

- objection period;
- pre-Inquiry processes to prepare / exchange evidence, arrange venue, arrange inspectorate etc;

- Public Inquiry;
- Inspector prepare and submit Report;
- Secretary of State to confirm Order;
- Statutory Challenge Period;
- Order “Made”;
- Simultaneous award of construction contract assuming detailed design work (GRIP 5) was carried out in parallel to the TWA process;
- This is “start of construction”;
- construction period (GRIP6), including testing and commissioning.

More advanced schemes may already be at GRIP4, and we have assessed durations accordingly. Others are highly complex and intrusive schemes, and we have used extended durations. We then comment on how this programme compares with that shown on Network Rail’s Orange and Green Charts.

The programme above assumes that detailed design (GRIP 4 and 5) could be carried out in parallel with the approvals process, but this would represent work at risk, relying on the order being granted as submitted. The DfT have previously indicated on similar projects that this is not their preferred approach and that they are unwilling to risk public funds in this way.

We believe therefore that there is some programme optimism on behalf of Network Rail.

Programme slippage is also generally true for early GRIP schemes where there are considerable unknowns. Any potential programme slippage will mean a reduced call for funding in the earlier part of the Plan Period, followed by a general “year-on-year” slippage after that, suggesting that Network Rail will not be able to spend the financial year totals expressed in the Plan.

6.3 Spreading the Scheme Costs over CP3, CP4 and CP5

We spread the scheme cost estimates using data provided by Network Rail in the Enhancement Master Spreadsheet, which breaks down expenditure on a year-by-year basis.

This led to the following allocations, considering Arup’s and Network Rail’s costs and programmes:

- NR’s costs and NR’s programme. We simply repeated their data. This process:
  - retained NR’s temporal breakdown for individual schemes, and indicated CP3 and CP4 expenditure;
  - for some programmes such as Access for All and NRDF, simply repeated Network Rail’s equal spread over each year of CP4;
  - was consistent but odd for issues like the “New Capacity Schemes” where there are equal spreads over CP4;
- Arup costs and NR programme. Where we developed an independent cost, we used the same temporal spread and simply factored the costs in the Enhancement Master spreadsheet by the ratio of NR to Arup costs. This produced allocations in CP3 and CP4;
- NR costs, Arup programme. There were no examples of this combination;
- Arup cost, and Arup programme. We assumed that 10% of the total Point Estimate was for scheme development, and 90% was for construction. We then spread the 10% from “now” until start of construction, and spread the 90% equally over the

construction period. This process sometimes placed some or all of the 90% in CP5, and necessarily always generated development money in CP3.

6.4 The Output

The overall output was an “Arup Orange and Green Chart” aligned with the tabular style of Figure 6.21, but with substitute data based on our assessments.

The Arup Chart enables summation of costs by financial year, and Control Period.

It allows summations against the line entries into the Business Plan categories;

- Baseline Projects;
- Specified Projects;
- HLOS Output Projects;
- DfT Performance Projects;
- HLOS Performance Schemes;
- Capacity and Performance Schemes;
- Journey Time Improvements;
- Enhancement to Renewal.

This allowed a category-by-category comparison against the SBP’s categories.

In addition to the costs of stated schemes, the view was taken of the need for Development funding of a portfolio of schemes for CP5, whose development will need to take place in CP4. The outcomes of these deliberations are described later in this report.

The final manifestation of the Orange and Green Chart is given in Appendix A.

7 Platform Lengthening Schemes

7.1 Network Rail's Costings

Network Rail used a variety of methods for deriving scheme costs, depending on:

- data available;
- assumptions on the length of extension needed;
- the GRIP stage;
- the specific inclusion of engineering content such as signalling, S&C or structures changes, or their exclusion by a generic add-ons;
- inclusion or exclusion of development and design costs.

The resulting costs were then divided by the assumed square metres of extension to give a large range of "rates per metre of extension". This is not at all unexpected.

Network Rail advised that they had used a rate of £5,000 per m run for platform extensions, assuming a 2.5m width of extension; this figure is inclusive of preliminaries and other indirect costs (Network Rail costs) and inclusive of the civil engineering (building) costs, and platform lighting. Their costs exclude works to other "assets" (track works, signalling & E & P). It is not strictly accurate to describe this rate as £2,000 per sq.m.

Network Rail regards the rate of £5,000 per m as a base or lower-range price. They advised that every project will be subject to a significant number of issues specific to each location. These factors are more likely to result in a net increase in costs rather than a decrease. Hence, whilst the high level rate is both a Point Estimate and a most likely figure, the minimum and maximum values unit cost values are not symmetrically distributed (the maximum percentage is higher than the absolute value of the minimum percentage). Principal factors affecting the cost are as follows:

- Scope of works (length of platform extension required);
- Platform width (may be wider than 2.5m);
- Form of construction;
- Specification (finishes etc);
- Foundation requirements (basic, complex etc);
- Site constraints and working restrictions;
- Access availability;
- Possession availability.

Network Rail stated that the rate was an analysis of previous detailed (Stage 4/5) estimates; this was compared with actual cost data, both tender prices and outturn costs. Reasonable correlation was seen between the costs. As the rate was compared with out-turn costs, the cost of risk events and the cost of planned risk treatment will be included in this unit rate.

It should be noted that some estimates that support the CP4 submission assumed a higher base cost. If upon review, an estimate was prepared to a higher level of detail and the rate for platform extensions was generally of a comparable magnitude, then this would be accepted as a valid estimate.

Network Rail found a significant range in costs for platform extensions, many in excess of the base cost. Due to the potential variance in cost that may arise (shown by the confidence range indicated), they felt that the approach adopted, of basing estimates on a 'generic' base cost, was appropriate and that any inaccuracies inherent in this approach would be of negligible overall effect.

7.2 Arup's Costings

To provide our independent assessment, we prepared a cost estimate for each station, then aggregated these to Route totals, and then to portfolio. We made independent estimates of the unit rate per metre of extension, then the quantity of work.

7.2.1 Unit Rates

In terms of unit rate, we started from a cost build-up, principally derived from actual unit rates for a number of modular platform systems, on a "semi-mass-production" basis. We also checked the rates from basic data in "Spon's", the bottom-up standard reference work for developing the cost of railway works.

Initially, we built up costs using the same inclusions and exclusions as Network Rail to identify how close our result was to Network Rail's £5,000 per metre run. We used exactly the same data, for a 2.5m width, and excluded the items they said were excluded; this resulted in a cost of £4,868 per metre, almost exactly in line with their (obviously rounded) £5,000 per metre. There is therefore no real difference between us in terms of the costs, only what is included. We therefore used £5,000 per metre as the basis of costing. As for Network Rail, this cost excludes "one-off" site-specific alterations to other engineering assets.

There is a possible concern that some platform extensions might need to be a little wider than 2.5m, as this dimension is the width required clear of obstructions and busy stations are, in general, those needing extension. Costs could be a little higher, but not proportionately so.

For some routes, Network Rail provided data on the effects and costs of the extension on other assets such as signalling, permanent way, structures and electrification. For these, we undertook an inspection of the extensions using publicly-available satellite imagery to establish the effects on these other assets. In these cases, we calculated the additional costs to compare with Network Rail's estimates. In the vast majority of cases, we validated their data, and therefore used their "add-ons".

For other routes, no data was provided. We therefore made a generic assumption about the proportion of platform extensions which would trigger these works. This gave an overall rate of £8,000 per metre run of extension, including scheme design and preparation costs.

7.2.2 Quantities of Work – The Lengths Needed

In terms of the length of extension needed, Network Rail provided their length estimates, but we decided to independently assess the length required. The required train length was derived from the length per car (i.e. 20m or 23m per vehicle) appropriate to the vehicle types used according to Network Rail's route data. We then used the dimensions quoted in "Railway Safety Principles and Guidance - Part 2 Section B Guidance on Stations", and assumed that the required length would be x metres per car, plus a 5m allowance; a 10-car requirement of 20m vehicles would therefore be 200m + 5m = 205m. This length was compared with Sectional Appendix data to derive the length of extension required.

For the routes where Network Rail provided data on the effects on other assets, we took our assessment of the extension length required, multiplied it by £5,000, then added Network Rail's add-on figures. For routes where no data was provided, we multiplied our assessment of the extension length by £8,000.

The Arup estimates are also Point Estimates.

7.3 Route 1: 12-car Operations, Sidcup and Bexleyheath Routes

The previous Network Rail SBP identified that the proposed works would affect 4 stations (including Dartford) on the Sidcup Line and the Bexleyheath Line; NR estimated that there would be 279m of platform works at a cost of £2.311m, with a CP4 total of £1.814m. In the SBP Update, Network Rail states that the project would also include works at New Cross

station. Although Network Rail is unable to confirm the actual lengths of the platform extensions, the estimated costs have been lifted to £5.986m with a CP4 total of £4.908m.

Network Rail states that this project is planned to deliver the platform extensions required by the Thameslink Programme and hence completed by the end of 2011. This scheme aims to facilitate 12-car operations on the London to Dartford via Sidcup and London to Dartford via Bexleyheath routes. The lines were identified in the 2007 South London Route Utilisation Strategy as requiring 12-car operations to help relieve congestion and enable a 20% increase in capacity for a part of the network that suffers from considerable overcrowding.

Our independent assessment identifies that platform extension works at Hither Green, Eltham, Dartford, Mottingham and New Cross (Platform B extension, existing length 230m) are included in the Thameslink Programme, and the existing platform lengths at Hither Green already cater for 12-car operation according to the NR Sectional Appendix. Therefore, the proposed 12-car operations scheme overlaps with Thameslink Programme.

We assume the scheme should be covered in the Thameslink project, and suggest that no works are required. Our overall estimate is therefore zero.

We have used zero on the “Orange and Green” Charts.

7.4 Route 1: 12-car Operations, Dartford to Rochester Inc. Gravesend

The previous Network Rail SBP identified that the proposed works would affect 4 stations between Dartford and Rochester (including Gravesend), and NR estimated that there would be 390m of platform works at a cost of £8.750m, with a CP4 total of £7.225m. Network Rail states that the updated project would now also include works at Rochester station. Although Network Rail was unable to confirm the actual lengths of the platform extensions, the estimated costs have been increased to £15.925m with a CP4 total of £15.224m.

This scheme aims to facilitate 12-car operation on the London to Gillingham via Dartford route. The line was identified in the 2007 South London Route Utilisation Strategy as requiring 12-car operations to help relieve congestion and enable a 20% increase in capacity for a part of the network that suffers from considerable overcrowding.

The project would involve considerable remodelling work at Rochester and Gravesend. The existing platform length at Stone Crossing and Higham are adequate for 12-car operation according to the NR Sectional Appendix. At Strood Station, Selective Door Operation (SDO) is assumed and therefore a platform extension is not required.

Our independent assessment suggests the length required is 453m, which, using our defined methodology, would give a total of £2.266m. In addition, we estimate that there will need to be significant works at Rochester and Gravesend that would cost £13.4m. Our overall estimate is therefore £15.666m.

We have used our estimate on the “Orange and Green” Charts.

7.5 Route 1: 12-car Operations, Greenwich and Woolwich Route

The SBP identified that the proposed works would affect 8 stations on the Greenwich and the Woolwich route to Dartford. Network Rail estimated that there would be 530m of platform works at a cost of £2.941m, with a CP4 total of £1.513m. Network Rail states that there will be no scope changes for the updated project, and the project estimated costs have been updated to £2.910m with a CP4 total of £2.687m.

This scheme aims to facilitate 12-car operations on the London to Dartford via Woolwich route. In its further response to us Network Rail states that the scope for this project is still in development, but it is likely to include a series of stations between Deptford and Slade Green. Woolwich Dockyard is the only station which will require a SDO solution as it has tunnels at either end of the current platforms, making an infrastructure solution very costly.

Our independent assessment suggests the platform extension length required is 455m, which, using our defined methodology, would give a total of £2.275m. DOO (Driver Only Operation) issues on this route will be considered and also two signals will be relocated in this scheme. These works would cost £1.03m. Our overall estimate is therefore £3.305m.

Our estimate is higher than Network Rail's estimate because we assumed that all stations between Deptford and Slade Green are to be lengthened (except for Woolwich Dockyard).

We have used our estimate on the "Orange and Green" Charts.

7.6 Route 1: 12-car operations, Hayes and Sevenoaks (Stopping) Services

Network Rail's previous SBP identified that the proposed works would only affect Sevenoaks and a cost of £0.550m was estimated for 10m of platform extension works there. The SBP Update does not indicate a scope change but the project estimate has been reduced to £0.548m with a CP4 total of £0.499m due to base date adjustment.

This scheme aims to facilitate 12-car operation for train services to Hayes and stopping services at Sevenoaks. From the NR Sectional Appendix, all stations on this route have platforms for 12-car operations. Therefore, no platform works would be required.

Our independent assessment is that the additional platform length required is 0m, which would therefore have a cost of £0m. Works required in this scheme is for re-location of DOO equipment at Grove Park, we have priced the DOO reposition using the CP4 Price Book rate of £0.035m.

We have used £0.035m on the "Orange and Green" Charts".

7.7 Route 2: Suburban Area 10-car operations to Victoria and London Bridge

Network Rail states that the previous work scope was updated to include the Croydon to Purley route, Tulse Hill station and the former SBP scheme for 12-car operations from Oxted to East Grinstead. As a consequence, the scheme costs increased from £41.399m (the previous SBP estimate of £34.690m plus £6.709m for 12-car operations Oxted to East Grinstead) to £84.012m with a CP4 total of £76.226m.

The project aims to meet the specific targets established by the HLOS for increasing capacity for passengers into both Victoria and London Bridge in the high and shoulder peaks. The target for Victoria is 20% additional capacity by the end of Control Period 4 (April 2014) and 12% for London Bridge. Therefore existing 8-car suburban services into Victoria and London Bridge will be lengthened to 10 cars.

The Sussex inner suburban 10-car train lengthening scheme will be required to interface closely with the Thameslink Programme, and will deliver the capability to operate 10-car services on the routes outlined below:

- All stations Horsham to Victoria via Dorking, Epsom, Sutton, Hackbridge, Streatham North Jn, Balham and Clapham Junction;
- All stations Epsom Downs to Victoria via Sutton, West Croydon, Selhurst, Streatham Common, Balham and Clapham Junction;
- All stations East Croydon to Victoria via Norwood Junction, Crystal Palace, Streatham Hill, Balham and Clapham Junction;
- All stations Purley to London Bridge via Sydenham and New Cross Gate.

The project will also deliver the capability to operate 12-car services for all stations East Grinstead to South Croydon via Oxted. Network Rail has confirmed that the Thameslink project will include platform extensions at Sanderstead and Oxted stations but will not include works at Woldingham, Upper Warlingham or Riddlesdown stations. It is likely these

intermediate stations will be covered by selective door opening, but detailed information on platform lengths and SDO decisions is not currently available.

Other SBP schemes are also planned at West Croydon, East Croydon and Clapham Junction. For example, East Croydon Passenger Capacity scheme, West Croydon Station Development, West Croydon Track Capacity, Clapham Junction Station Capacity and Platform Lengthening, and Route 3 10-Car SW Suburban Railway etc. Network Rail has confirmed that these schemes do not overlap.

Network Rail has clarified the works at Clapham Junction in a note contained within the SBP update. The table below has been produced to illustrate how the different schemes would affect the station. Clearly, only 10-car platform length works are proposed at Clapham Junction, and no scheme will deliver the 12-car platform length in CP4. Platform works at Clapham Junction would only involve Platforms 14-17 realignment (including in the Clapham Junction Station Capacity and Platform Lengthening scheme), Platform 15 and 17 extensions (including in Route 2 10-car operations scheme); and no platform extension works would be required to facilitate the 10 Car SW Suburban Railway scheme.

Scheme	Platform No.	Proposed Service	Assumed Train Length	Current Length	Required Extension
Route3 SW 10 car operations	3	10 car	205m	214m	×
	4			215m	×
	5			213m	×
	6			214m	×
Route2 10 car into Victoria/LB	14	10 car	205m	215m	×
	15			174m	✓
	16	8 car	165m	171m	✓
	17			108m	✓
Clapham Junction Station Scheme	14	Platform realignment			
	15				
	16				
	17				
	10	10 car	205m	210m	×
	11		205m	204m	SDO?
	7	10 or 12 car, extension would be required if services call, TBC		186m	CP5
	8			183m	
	9			220m	
	12			245m	×
	13			253m	×

East Croydon is also included in the Thameslink Programme; works include platform extensions and train-stop board reposition (page 85, Thameslink Programme Scope Definition).

At West Croydon, platform extension works will be included in this Route 2 Suburban Area 10-Car Operations portfolio, while track layout changes and station side alterations will be covered in the West Croydon Track Capacity scheme. As the latter scheme would significantly alter Platforms 1 and 2, co-ordination between projects will be required to avoid abortive work.

The updated scheme includes 10-car suburban services operating via Tulse Hill; however solutions to the infrastructure constraints at Tulse Hill would be very expensive. Costs at Tulse Hill are excluded from this project.

Eastfields station has not been built yet, and it is unclear if it is to be built as an 8-car platform first, then extended to 10-car length. Platform extension works at Hackbridge and Mitcham Junction are also included in the Thameslink Programme, but it seems that 8-car operations are proposed there. Should the Thameslink Programme change the proposed scope of works to 10/12 car operations, these stations could be removed from this 10-car scheme scope.

Our independent assessment suggests the platform extension length required is 4,756m, which, using our defined methodology, would give a total of £23.780m. In addition, we estimate that there will need to be other works at Battersea Park, Balham, Clapham Junction, Streatham Common, West Norwood, West Croydon and South Croydon; they are very difficult platforms to extend and would cost about £58.625m in total. Our overall estimate is therefore £82.405m.

We have used our estimate on the "Orange and Green" Charts.

7.8 Route 3: 10-Car South West Suburban Railway

This scheme is the biggest SBP platform extension scheme in CP4. The programme will allow full 10-car and ultimately 12-car operation on the South West Main Line suburban routes operating into and out of London Waterloo station to the south west to deliver an 18% average increase in seats for the SWML Suburban network.

In our previous report, we identified the project scope overlap at Waterloo International Terminal and a high level unit rates (inclusive of allowance for indirect costs, 50% of base rate) for platform extensions. Network Rail has now removed platform works at WIT from this 10 Car SW Railway scheme and adjusted the unit rate by the removal of allowances for indirect costs.

The October 2007 SBP scheme cost was estimated at £174.300m with a CP4 total of £165.792m. The updated scheme estimate has been reduced to £117.546 m with a CP4 total of £110.362m. However, it seems that Network Rail does not have a complete set of data for all stations.

7.8.1 Waterloo & Vauxhall

Waterloo has been removed from this scheme scope, and the proposed works would only affect Vauxhall Platforms 7-8.

Our independent assessment suggests the platform length required is 28m.

7.8.2 Reading Line

The SBP identifies that the proposed works would affect 9 stations between Longcross and Earley, but no detailed works scopes at these 9 stations are provided other than location. It suggests that further work is required to define the work scope on this line and to validate relevant costs.

Network Rail has informed us that the Sectional Appendix information on this route is incorrect and has sent a spreadsheet (*Wessex ten car updated platform lengths for Arup study.xls*) which highlights the stations and updated platform lengths.

Our independent assessment suggests the platform extension length required is 687.2m.

7.8.3 Main Suburban Stations

There were no scope changes on the main suburban lines. The SBP identifies that the proposed works would affect 39 main suburban stations.

Guildford, Effingham Junction, Bookham and Ashtead are also included in the Thameslink Programme, but the proposed works seem to facilitate 8-car operations. If the Thameslink Programme has changed the proposed scope of works to 10/12 car operations, these stations can be removed from this 10-car scheme scope.

£1.8m of platform extension works are proposed at Clapham Junction. However, the existing lengths for Platforms 3-6 are longer than the proposed 10-car length, and NR indicates that the Platform 7-9 extensions are planned as a CP5 scheme. Therefore no platform extensions would be required for SW 10-car operations at Clapham Junction in CP4. Clapham Junction should therefore be excluded in this scheme scope.

It seems that 12-car platform lengthening costs have been included in this scheme at some stations. Significant extension length differences occur at Fulwell, Thames Ditton, Ewell

West, Leatherhead, Earlsfield, Hampton, Clapham Junction, Raynes Park and Stoneleigh, where proposed extension lengths appear to be longer than required. For example, the Kempton Park Up platform length is 227m and the Down platform length is 321m, so both platforms lengths can meet the 10-car operations requirement, but 55m of platform extension works are proposed. Again, 214m of platform extension works are planned at Ewell West and the platform would extend to 321m after implementation of this scheme.

Our independent assessment suggests the platform extension length required is 2,886m.

7.8.4 Windsor Line

There will be no scope changes on the Windsor line. The Network Rail SBP identifies that the proposed works would affect 30 stations on the Windsor line.

Network Rail has informed us that the sectional appendix information on this railway section is incorrect and has sent us a spreadsheet (*Wessex ten car updated platform lengths for Arup study.xls*) which highlights the stations and updated platform lengths.

Our independent assessment suggests the platform extension length required is 2,675.3m.

7.8.5 Overall Assessment

The above analysis is summarised in the following table.

Line	Waterloo & Vauxhall	SWML (39 stations)	Windsor Line (30 stations)	Reading Line (9 stations)	Total
Arup Suggested Extension Length	28m	2,886m	2,675.3m	687.2m	6276.5m

Our independent assessment suggests the length required for the whole scheme is 6276.5m, which, using our defined methodology, would give a total of £31.383m. In addition, we estimate that there will need to be other works that would cost additional £61.693m. Our overall estimate is therefore £93.076m.

The Check Estimates sheets identified 89 signal moves in the Check Estimate sheet, but Network Rail used a higher number of 99 to price the signalling costs (60 signal moves without overlap/panel alterations, and 39 signal moves with overlap/panel alterations).

The explanation appears to be a potential double-counting in the SBP estimates. The table below highlights the differences between the Network Rail estimated quantity and the Arup suggested quantity.

Asset	NR Estimated Quantity	Arup Suggested Quantity	Arup Recommendation
Track slewing (m)	24,000m (80 stations @ 300m)	23,400m (78 stations @ 300m)	Excluding WIT and Clapham Junction
Signal move (No overlap modifications / panel alterations required)	60	46	Removal 10 from total; Excluding 1@ WIT and 3@Clapham Junction
Signal move (Including overlap modifications /panel alterations required +PSB/IECC modifications)	3		£1.6m direct cost is priced for this item after removal £3m @ WIT from cost build-up sheet.
Platforms extension length	8250.8m	6,276.5m	We have updated our

			suggested extension length in line with Network Rail's response

As discussed above, works at Waterloo International Terminal and Clapham Junction should be removed from the scheme scope, and therefore the relevant costs at these two stations should be omitted. However the Check Estimate sheet shows that Waterloo International Terminal and Clapham Junction are included in the SBP estimates.

Network Rail estimates that the platform extension area is 20,627 sq.m in this scheme, which is equal to 8,250.8m extension length at nominal 2.5m width. Network Rail's estimated platform extension length is over 30% higher than Arup's length.

We have used our estimate on the "Orange and Green" Charts.

7.9 Route 5: West Anglia Outer 12-Car Trains

Network Rail's SBP identifies that the proposed works would affect 11 stations on the West Anglia Outer Suburban Route. They estimate that there would be 1,720m of platform works, and the project costs have been adjusted from the previous estimate of £33.010m to £31.663m with a CP4 total of £27.497m.

This project will provide additional capacity on the West Anglia outer services, which operate to Cambridge and Stansted Airport. The strategy for handling the projected growth in the West Anglia corridor has been described in the Greater Anglia RUS.

To provide for longer-term capacity and service improvements on West Anglia network, the Government has announced that a potential four-tracking option from Tottenham Hale to south of Cheshunt is to be developed and appraised. Network Rail states in "Network Rail's response to the ORR's questions following the publication of the SBP update on 3 April 2008" that the train lengthening on Route 5 is required to deliver regional demand growth and Stansted Airport growth in CP4, and "CP4 only commits to development of the potential four-tracking option on the Lea Valley with delivery, if the project goes ahead, not expected until CP5". It also states the Greater Anglia RUS has identified that the train lengthening is "an incremental solution to capacity in CP4, following which additional trains will be required that can only be accommodated with the construction of additional tracks in CP5, if and when the funding becomes available." A concern here, which needs to be addressed, is that of abortive or very short-life works on extending platforms which then have to be reconstructed to suit the 4-tracking scheme.

Some platforms on the West Anglia route can already handle 12-car trains. The proposed project scope is illustrated in the following table that highlights the stations on the WA Outer route will have platforms capable of taking a 12x20m coach train. Network Rail confirms that Cambridge Platforms 2 and 3, and Stansted Airport Platform 2 will remain unchanged, and Cheshunt Platform 3 is considered an "Inner" platform.

Station	**Current Platform Length (m)**	**Project Extension Works**
Cheshunt	DN 178m, UP 194m Bay 164m	Main to 12, Bay to 9 (Inner)
Broxbourne	P1-P4 172m	Platform extensions to 12 car
Roydon	DN 170m, UP 172m	Platform extensions to 12 car
Harlow Mill	DN & UP 168m	Platform extensions to 12 car

Sawbridgeworth	DN 171m, UP 167m	Platform extensions to 12 car
Stansted Mountfitchet	DN 165m, UP 166m	Platform extensions to 12 car
Stansted Airport	P1 291m, P2 91m, P3 274m	Additional 12 car platform, BAA costs
Stansted 2nd Tunnel		BAA costs
Elsenham	DN 167m, UP 165m	Platform extensions to 12 car
Newport	DN167m, UP 168m	Platform extensions to 12 car
Great Chesterford	DN & UP 167m	Platform extensions to 12 car
Shelford	DN & UP 180m	Platform extensions to 12 car
Cambridge		Island platform (£12.26m)

Our independent assessment suggests the length required is 1,622m, which, using our defined methodology, would give a total of £8,110m. In addition, we estimate that there will need to be other works at Cheshunt, Broxbourne, Roydon and Elseham that would cost additional £7.45m. A new island platform at Cambridge would also cost £12.26m. Our overall estimate is therefore £27.820m.

We have used our estimate of £27.820m on the "Orange and Green" Charts.

7.10 Route 5: West Anglia Inner 9-Car Trains

The SBP identifies that the proposed works would affect 14 stations on West Anglia Inner Suburban routes. Network Rail estimates that there would be 459m of platform works, and the project estimate has been adjusted from previous estimate of £34.229m to £33.190m with a CP4 total of £32.393m.

The project will provide additional capacity on the West Anglia inner services, which operate between Liverpool Street and Chingford, Enfield Town, Cheshunt and Hertford East. Network Rail states that the scheme will cover the minor works required to accommodate the re-introduction of 9-car trains on the WA inner services in the peak.

Network Rail advised that the train lengthening is needed to deliver rising regional and Stansted Airport growth in CP4. The Ministerial Statement (referred to in Section 7.09 above) is intrinsically linked to the Inner services, which, if not undertaken, would increase the load factor on services from Chingford, Enfield Town, Cheshunt and Hertford East.

The following table shows the existing platform lengths from Network Rail's Sectional Appendix and proposed works at each location. Interestingly, the cost information shows that the platforms with 186/187m length at Bruce Grove and Stamford Hill would be able to facilitate 9-car operations (without infrastructure works), but similar length platforms at Seven Sisters, Hackney Downs, Waltham Cross and Rye House would be required to be extended by 15-20m.

Station	**Current Platform Length (m)**	**Project Extension Works**
Bruce Grove	DN 187m, UP 190m	Up remove 2 DOO
Seven Sisters	DN 184m, UP 188m	DN extension 20 metres

Stamford Hill	DN 186m, UP 187m	DN remove 2 DOO
Stoke Newington	DN 152m, UP 151m	Major work or SDO
Hackney Downs	P1 214, P2 192 P3 192m, P4 186m	P4 by 34 metres,P3 raising ramp, P2 S& C
Northumberland Park	DN & UP 172m	UP & DN 20 metres each
Angel Road	DN 193m, UP 163m	UP 20 metres
Ponders End	DN 138m, UP 137m	UP & DN 20 metres each
Brimsdown	DN & UP 138m	UP & DN 20 metres each
Enfield Lock	DN 144m, UP 136m	UP & DN 20 metres each
Waltham Cross	DN 184m, UP 169m	UP & DN 15 metres each
Cheshunt	DN 178m, UP 194m Bay 164m	P3 (Bay platform) 20 metres
Broxbourne	P1-P4 172m	All platforms 10 meters
Rye House	DN 170m, UP 186m	UP & DN 20 metres each
St. Margret's	DN 156m, UP 111m	DN extension 20 metres
Ware	Single 120m	Extension 20 metres
Hertford East	DN & UP 165m	UP & DN 20 metres each, may need DOO

However in its recent responses, Network Rail states that the Sectional Appendix on the Inner route is out-of-date. Ponders End, Brimsdown, Enfield Lock, St Margarets and Ware stations are all currently being served by 8-car trains, and the only station at which Network Rail may consider SDO is Stoke Newington, because of significant structures at either end. Therefore we have re-assessed the quantum of platform extensions required.

Our independent assessment suggests the length required is 389m, which, using our defined methodology, would give a total of £1.945m. In addition, we estimate that there will need to be other works at Stoke Newington, Cheshunt and Hertford East at a cost of £5.6m and power supply reinforcement at a cost of £3.7m. Our overall estimate is therefore £11.245m. Platform extensions could possibly be avoided at Stoke Newington by implementing SDO equipment instead.

Again, Network Rail suggests that the delivery of potential four-tracking scheme, if the project goes ahead, is not expected until CP5 and the proposed train lengthening scheme is "an incremental solution to capacity in CP4, following which additional trains will be required that can only be accommodated with the construction of additional tracks in CP5, if and when the funding becomes available." Again, as with the West Anglia Outer 12-car scheme, there are risks of abortive or short-term platform works.

We have used our estimate of £11.245m on the "Orange and Green" Charts.

7.11 Route 6: Tilbury Loop Platform Extensions

The previous SBP identified that the proposed works would affect 9 stations on the Tilbury loop (Thames-side) and the Ockendon branch, and there would be 1,579m of platform

works at a cost of £17.601m. Network Rail states in the Estimate Review Sheet that the work scope definition has been improved on both platform extensions and the loop line, and the project estimate has been increased to £22,210m with a CP4 total of £20.194m.

The GRIP 2 study Tilbury Line Platform Extensions was completed by Arup in August 2005; the study scope is listed in the following table. The SBP scheme states that *"The project involves the extension of platforms on the Tilbury loop and the Ockendon Branch from 8 cars to 12 cars."* There is no evidence to suggest that NR has changed the project scope; therefore we assume that the SBP scheme scope is the same as the GRIP 2 study scope.

Scope	Extension Length	
	Up	Down
Dagenham Dock	65m	82m
Rainham	78m	84m
Purfleet	72m	89m
Grays (Option 3)	85m	89m, 79m (bay)
Tilbury Town	85m	89m
East Tilbury	80m	86m
Stanford – le – Hope	91m	95m
Pitsea (Option 2)	86m	86m
Ockendon	85m	88m
Total	**1,594m**	

Our independent assessment suggests the additional platform length required is 1,594m, which, using our defined methodology, would give a total of £7.970m. In addition, we estimate that there will need to be other works (S&C and track works) that would cost £7.1m. This scheme is also included £5.6m for the Ockendon Regulating Loop. Our overall estimate is therefore £20.670m.

We have used our estimate on the "Orange and Green" Charts.

7.12 Route 8: FCC Platform Lengthening

The SBP identified that the proposed works would affect 7 stations on the Thameslink route: Welwyn Garden City, Welwyn North, Knebworth, Letchworth, Baldock, Ashwell & Morden and Royston. Network Rail estimates that there would be 1476m of platform works at a cost of £15.000m, with a CP4 total of £14.363m. Network Rail has confirmed that Royston platform works are planned to be done in CP3, and should be omitted. Therefore the revised scheme would cost £13.502m with a CP4 total of £11.526m.

This scheme aims to accommodate growth in commuter passenger traffic between Cambridge and London and make better use of existing track capacity; platform lengthening is required in advance of the Thameslink programme to accommodate 12-car trains.

Network Rail has confirmed that the following platforms will be extended:

- Letchworth: Up 76m extension, Down 76m extension;
- Baldock: Up 92m extension, Down 91m extension;
- Welwyn Garden City: 75m extensions for all 4 platforms;
- Welwyn North: Up 90m extension, Down 90m extension;
- Knebworth: 90m extension for Up Slow/Fast, 91m extension for Down Slow/Fast;

- Ashwell and Morden: Up 92m extension, Down 92m extension.

Our independent assessment suggests the additional platform length required is 1,365m, which, using our defined methodology, would give a total of £6.825m. In addition, we estimate that there will need to be S&C works that would require an extra £2.2m at Welwyn Garden City, and add-ons that would cost £4.095m. Our overall estimate is therefore £13.120m, which is close to Network Rail's project estimate.

However, DfT has made comments on the project that "The FCC platform lengthening is partially already paid for in the Thameslink programme so the costs here should be the extra works plus the early cost of Thameslink capital." Network Rail needs to confirm exactly which costs are potentially covered in the Thameslink Programme.

We have used our estimate on the "Orange and Green" Charts.

7.13 Route 10: West Yorkshire Platform Lengthening

The previous SBP identified that the proposed works would affect about 14 stations in West Yorkshire area. Network Rail estimated that there would be 673m of platform works at a cost of £14,001m, with a CP4 total of £9.551m. Network Rail stated in "*Network Rail response to ARUP platform lengthening 040308.doc"* that *"West Yorkshire and South Yorkshire platform extension GRIP 3 report will be available from 17 March 2008*", therefore the updated project estimate of £12.677m, with a CP4 total of £9.220m is assumed to be from the study findings.

The previous SBP scheme did not specify the number of train cars that the platforms need to accommodate, but the data sheet provided indicated that the majority of the platforms along the route would be extended to 97m which are adequate for 4-car train operation, and there are three stations, namely Crossgates, East Garforth and Garforth, which would have the platform extended to 143m for 6 car operations.

The latest Estimate Review Sheet (LNE014) does not state there will be scope changes, but the provided GRIP document "LNE014 - West Yorkshire Platform Lengthening" shows that the Route 10 West Yorkshire Platform Lengthening Scheme would only affect 7 stations- Castleford, Woodlesford, Normanton, Micklefield, South Milford, Knottingley, and Pontefract Monkhill.

Network Rail has provided GRIP3 reports that cover the above 7 stations. The estimates in the table below are extracted from that report. However, the total cost estimate for these 7 stations is only £1.256m, excluding any allowance for Network Rail's costs, and any allowance for risk.

It seems that the GRIP3 study addresses 4-car operations; 6-car operations in the West Yorkshire area still requires detailed investigations. It is not clear how the updated scheme estimate (for 6-car operations) would link to the GRIP3 estimates (4-car operations). Therefore, detailed cost build up information for this 6-car operations project would be required to support the updated SBP estimate.

Station	GRIP3 Estimate
Castleford	£13,064 (Option 2)
Woodlesford	£959,000
Normanton	£59,000
Micklefield	£24,000
South Milford	£73,466
Knottingley	£27,107
Pontefract Monkhill	£100,.287

Total	**£1,255,924**

Our independent assessment suggests the additional platform length required is 672m, which, using our defined methodology, would give a total of £3.360m. In addition, we estimate that there will need to be other works (add-ons) that would require an extra £2.016m in our initial assessment. Our overall estimate is therefore £5.376m.

We have used our estimate on the "Orange and Green" Charts.

7.14 Route 11: South Yorkshire Platform Lengthening

The previous SBP identified that the proposed works would affect about 11 stations in the South Yorkshire area.

Network Rail estimated that there would be 214m of platform works at a cost of £12.000m, with a CP4 total of £11.386m. NR stated in "*Network Rail response to ARUP platform lengthening 040308.doc"* that the *"West Yorkshire and South Yorkshire platform extension GRIP 3 report will be available from 17 March 2008*", therefore the updated project estimate of £12.169m, with a CP4 total of £10.884m is assumed to be from the study findings.

The latest Estimate Review Sheet (LNE016) does not indicate scope changes, but the GRIP document *"LNE014 - West Yorkshire Platform Lengthening"* shows that the Route 11 South Yorkshire Platform Lengthening Scheme would lengthen the Up and Down Platforms to accommodate 4-car 4 x 23m) trains at the following locations.

Station	Direction	Current Length	Proposed Length	Difference
Thurnscoe	Up	92m	97m	5m
	Down	92m	97m	5m
Goldthorpe	Up	92m	97m	5m
	Down	92m	97m	5m
Bolton-on-Dearne	Up	96m	97m	1m
	Down	96m	97m	1m
Swinton	Down Doncaster (southbound)	92m	97m	5m
	Up Pontefract	92m	97m	5m
	Down Pontefract	92m	97m	5m
Rotherham Central	Up	92m	97m	5m
	Down	92m	97m	5m
Chapeltown	Up	85m	97m	12m
	Down	85m	97m	12m
Woodhouse	Up	84m	97m	13m
	Down	84m	97m	13m
Kiveton Bridge	Up	74m	97m	23m
	Down	74m	97m	23m
Kiveton Park	Up	74m	97m	23m
	Down	74m	97m	23m
Crowle	Up	89m	97m	8m
	Down	89m	97m	8m
Thorne South	Up	90m	97m	7m
	Down	90m	97m	7m

Network Rail has provided GRIP3 reports that cover the above 11 stations. The estimates in the table below are extracted from that report. However the total cost estimates for these station platform extensions are only £0.260m, excluding any allowance for Network Rail's

costs, and any allowance for risk. This £0.260m is very different from the previous SBP estimate of £12.000m with no explanation provided.

Station	GRIP3 Estimate
Thurnscoe	£24,796
Goldthorpe	£25,063
Bolton-on-Dearne	£725
Swinton	£22,263
Rotherham Central	£33,000
Chapeltown	£44,105
Woodhouse	£22,907
Kiveton Bridge	£19,182
Kiveton Park	£24,831
Crowle	£24,349
Thorne South	£18,825
Total	**£260,046**

We have therefore made an independent assessment, which suggests the additional platform length required is 215m, which, using our defined methodology, would give a total cost of £1.076m. In addition, we estimate that there will need to be add-ons that would require an extra £0.645m in our initial assessment. Our overall estimate is therefore £1.721m.

Some of the proposed extensions are trivially small, and safety issues for longer trains might not arise, especially from door locations. The platform extension costs in South Yorkshire area deserve further investigation.

We have used our estimate on the “Orange and Green” Charts.

7.15 Route 16: Chiltern Platform Lengthening

The previous SBP identified that the proposed works would affect 6 stations on the Chiltern Line, and there would be a total of 512m of platform works at a cost of £4.501m, all in CP4. The SBP Update considers 7-car and 8-car operations at 7 stations, and therefore the estimate would increase to £9.634m with a CP4 total of £9.109m.

This scheme aims to extend the platforms to meet long-term growth projections. Current services are operated by a mixture of 3- to 6-car Class 165 and 168 units, but Chiltern Railways intends to run 7-car trains south of Haddenham & Thame Parkway, and 8-car trains north thereof to Birmingham. Network Rail states that Chiltern Platform Lengthening Scheme would extend platforms to accommodate 8 x 23m vehicle trains at the locations listed below.

Station	Platform extension length required
South Ruislip	P3: 71m P4: 53m
West Ruislip	P3: 54m P4: 30m
Saunderton	P1: 47m P2: 47m
Kings Sutton	P1: 72m P2: 76m
Sudbury Hill Harrow	P1: 114m P2: 114m

Sudbury & Harrow Road	P1: 114m P2: 114m
Northolt Park	P1: 71m P2: 71m

A preliminary check was carried out for any constraint in extending the platforms. In general, the stations had space available for platform extensions.

Our estimate suggests the length required is 978m, which, using our defined methodology, would give a total of £4.890m. In addition, we estimate that there will need to be add-ons that would require an extra £2.934m in our initial assessment. Our overall estimate is therefore £7.824m.

We have used our estimate on the "Orange and Green" Charts.

7.16 Route 17: West Midlands Platform Lengthening

The previous SBP identified that the proposed works would affect 37 stations in the West Midlands area, and there would be 2569m of platform works at a cost of £22.775m, with a CP4 total of £22.109m. The SBP Update has revised the scheme scope, and the estimate has increased to £33.340m with a CP4 total of £31.552m.

The stations that require lengthening are listed below:

- **Cannock Line:** 6 car length at Bloxwich, Bloxwich North, Cannock, Hednesford, Landy Wood, Rugeley Town;
- **Cross City Line:** 6 car length at Kings Norton;
- **Coventry Line:** 8 car length at Canley, Stechford and Coventry (proposals for a north-facing bay, but the costs are not included);
- **Lickey Incline Line:** None;
- **Wolverhampton Line:** 6 car length at Coseley, Dudley Port, Tipton and Wolverhampton (Bay Platform 5);
- **Walsall Line:** 6 car length at Bescot, Hamstead, Perry Barr, Tame Bridge Parkway, Walsall and Witton;
- **Stratford Line:** 6 car length at Earlswood, Spring Road, Whitlocks End, Wood End and Yardley Wood;
- **Leamington Corridor:** 6 car length at Widney Manor, Lapworth and Hatton;
- **Stourbridge Line:** 6 car length at Cradley Heath, Droitwich Spa, Kidderminster and Langley Green, Birmingham Snow Hill Platform 4 reconstruction and reconnection to the heavy rail network;
- **Shrewsbury Line:** None.

A preliminary check was carried out for any constraint in extending the platforms. In general, the stations have space available for platform extensions.

Our independent estimate suggests the additional platform length required is 2,019m, which, using our defined methodology, would give a total of £10.095m. In addition, we estimate that there will need to be other track remodelling works at Wolverhampton and Birmingham Snow Hill that would require an extra £7.2m, and add-ons that would cost £6.057m. Our overall estimate is therefore £23.352m.

We have used our estimate on the "Orange and Green" Charts.

7.17 Route 20 & 23: Platform Lengthening

The previous SBP identified that the proposed Route 20 platform works would affect 39 stations. This scheme primarily concentrates on the main corridors between Manchester

and Liverpool. Eight other stations on Route 23 are now also included. The platform lengthening is required to meet the HLOS targets.

The stations that require lengthening are listed below:

- **Atherton Corridor:** 4 car length at Atherton, Hag Fold, Hindley, Swinton, Walkden, Wigan Wallgate;
- **Bolton Corridor:**
    - 4-car length at Blackburn, Bromley Cross, Clifton, Clitheroe, Darwen, Hall in the Wood, Langho, Moses Gate, Westhoughton, Whalley;
    - 6-car length at Adlington, Blackrod, Bolton, Chorley, Horwich Parkway, Kirham, Layton, and Poulton-Le-Fylde;
- **Calder Valley:** 4 car length at Mills Hill;
- **Chat Moss:** 4 car length at Wavertree Technology Park;
- **CLC Corridor:**
    - 4 car length at Glazebrook, Padgate, Sankey, West Allerton;
    - 6 car length at Warrington Central;
- **Hadfield Line:** None;
- **Marple Corridor:** 4 car length at Bredbury and Brinnington;
- **St Helens Corridor:** 4 car length at Bryn, Eccleston Park, Garswood, Thatto Heath;
- **Stalybridge:** None;
- **Stockport:** 4 car length at Chapel-en-le-Frith and Woodsmoor;
- **Cumbrian Coast (Route 23):** 4 car length at Askam, Bootle, Drigg, Foxfield, Green Road, Seascale, Sellafield and Silecroft.

The October SBP estimated that there would be 2,057m of platform works at a cost of £19.262m. The SBP Update has revised the scheme scope to include Route 23, and the estimate was increased to £24.818m with a CP4 total of £23.496m.

The document “LNW015 - Platform Extensions CP4 Data sheet April 08 O2.doc” states that 5-car length platforms will be required on the Atherton and Bolton Corridors, and 6-car length platforms will be required on the Chat Moss and CLC Corridors. Only 4-car length platforms on the Atherton, Chat Moss and CLC Corridors are proposed in the “London North Western Platform Lengthening Strategy (CP4 Submission) (March 2008, Version 10 Submitted)”. By contrast, 6-car length platforms on part of Bolton Corridor are proposed in the “London North Western Platform Lengthening Strategy (CP4 Submission)”.

Passenger demand on Route 23 is low, platform extensions on this route are not required to deliver the HLOS capacity metric. Therefore Route 23 should be removed from the SBP scheme.

Our independent assessment suggests the additional platform length required on Route 20 is 1,214m, which, using our defined methodology, would give a total of £6.070m. In addition, we estimate that there will need to be add-ons that would cost £3.642m. Our overall estimate is therefore £9.712m.

It seems that a number of the stations on Routes 20 already have longer platforms (parts of which are longer being used). Many of these 'long' platforms are the legacy of steam-hauled trains with c. 4 to 6 coaches. Many of the stations would probably need re-surfacing, re-setting coping stones, possibly adding DDA strips (in possession), plus potentially signs, lighting, CIS etc. It might also be necessary to include canopies or shelters, in view of the prevailing climatic conditions in the Manchester area. Some of the stations have wooden

extensions, and these are also susceptible to adverse weathering. If the scheme were to involve reinstatement rather than full "new build", the costs for this could be much less. However, we are unable to produce a definitive list for all the required works due to lack of survey information.

We have used our estimate on the "Orange and Green" Charts.

7.18 Route 2: 8-Car Operations, Victoria Eastern to Bellingham

This is a new scheme in the updated SBP.

Network Rail identifies that the scheme would affect Clapham High Street and Wandsworth Road stations, and estimates that there would be a CP4 cost of £5.0m for the proposed platform works.

The updated SBP states that the existing Victoria Central to Denmark Hill to London Bridge service will be amended to run Victoria Eastern to Denmark Hill to Bellingham, and the extension of this service from 4-car to 8-car will be part of the package of measures contributing to the Victoria HLOS capacity metric. Network Rail suggests that this project will potentially need to be undertaken at the time of the Victoria resignalling scheme.

Our independent assessment suggests the additional platform length required is 264m, which, using our defined methodology, would give a total of £1.320m. In addition, we estimate that there will need to be other works at Clapham High Street and Wandsworth Road that would require extra £3.0m. Our overall estimate is therefore £4.320m.

We have used our estimate on the "Orange and Green" Charts.

7.19 Route 1: 8-Car Operations, Swanley to Ramsgate (via Maidstone East and Ashford)

This is a new scheme in the SBP update.

Network Rail identifies that the scheme would affect several small stations on the Maidstone East line that are restricted to 6-car operation by short platforms. The CP4 cost for the proposed platform works is estimated at £4.0m.

The Kent RUS recommends that the Kent outer train services on the Maidstone East line should be lengthened to 8-car capability, primarily to alleviate crowding between Bromley South and central London, and extension of this service from 6-car to 8-car will be part of the package of measures contributing to both Victoria and Blackfriars HLOS capacity metrics.

Network Rail states that the Networker train fleet used for these services is not fitted with SDO, and DfT have identified that retro-fitting this fleet with SDO equipment would be prohibitively expensive. NR believes that undertaking relatively simple platform extensions at the small stations on the routes concerned is a lower overall cost solution.

Our independent assessment suggests the additional platform length required is 685m, which, using our defined methodology, would give a total of £3.425m. In addition, we estimate that there will need to be add-ons that would require an extra £2.055m in our initial assessment. Our overall estimate is therefore £5.480m.

Our suggested cost is higher than Network Rail's estimate. This is because, at Kemsing, Barming, Hollingbourne, Harrietsham, Wye, Sturry and Charing (which are restricted to 6-car operation), we have assumed they will be extended to 165m.

We have used our estimate on the "Orange and Green" Charts.

7.20 Route 1: 12-Car Operations, Swanley to Rochester (via Sole Street)

This is a new scheme in the SBP update.

Network Rail identifies that the scheme would affect several small stations between Swanley and Rochester (via Sole Street) at Farningham Road, Sole Street and Rochester, that will fill 12-car operations capability gaps on the Kent outer routes. The project costs for the proposed platform works is estimated at a CP4 cost of £5.0m.

Network Rail states that the Kent RUS recommends the Kent outer train services on this route should be lengthened to 12-car capability, primarily to alleviate crowding between Bromley South and central London, and extension of this service to 12-car will be part of the package of measures contributing to both Victoria and Blackfriars HLOS capacity metrics.

Network Rail states that the Networker train fleet used for these services is not suitable for fitting with SDO, and DfT have identified that retro-fitting this fleet with SDO would be prohibitively expensive. NR believes that undertaking relatively simple platform extensions at the small stations on the routes concerned is a lower overall cost solution.

Remodelling works at Rochester has been included in another scheme (Route 1 12-car Operations: Dartford to Rochester). This scheme is also dependent on delivery of the East Kent Resignalling Phase 2.

Our independent assessment suggests the additional platform length required is 327m, which, using our defined methodology, would give a total of £21.635m. In addition, we estimate that there will need to be add-ons that would require an extra £0.981m in our initial assessment. Our overall estimate is therefore £2.616m.

We have used our estimate on the “Orange and Green” Charts.

7.21 Route 10: Ilkley – Leeds Platform Extensions

This is a new scheme in the SBP update, and was not originally included in the scope of Route 10 West Yorkshire Platform Lengthening scheme.

Network Rail explains that it was originally expected that additional services would run to meet the peak capacity metric into Leeds on this route, but it is now proposed to allow train lengthening to cater for 6-car trains under the Small Scale Capacity Schemes heading. The project costs for proposed platform works is estimated at a CP4 cost of £5.0m.

Several small stations on this route (Ben Rhydding, Burley-In-Wharfedale, Menston and Guiseley) are restricted to 5-car operations by short platforms. No detailed work scope information is provided, but we assume above stations will have platforms lengthened to 143m platforms.

Our independent assessment suggests the additional platform length required is 326m, which, using our defined methodology, would give a total of £1.630m. In addition, we estimate that there will need to be add-ons that would require an extra £0.978m in our initial assessment. Our overall estimate is therefore £2.608m.

We have used our estimate on the “Orange and Green” Charts.

7.22 Route 19: East Midlands Platform Extensions

This is a new scheme in the SBP update.

The SBP update states that the scope of this scheme is being developed with CrossCountry Trains and East Midlands Trains, and the stations to be lengthened are Wellingborough, Market Harborough and Loughborough. Further justification provided by Network Rail in the file “Network Rail’s response to the ORR’s current view on enhancement schemes (18 April 2008)” states that the project would include Kettering instead of Market Harborough. The original SBP work scope is used for our assessment. The project CP4 cost for the proposed platform works is estimated at £5.0m.

Although train lengthening on interurban and regional services in the East Midlands has been identified as the proposed strategy to meet CP4 capacity metric for the route, no

enhancement scheme is proposed in CP4 to address this issue. Instead, this scheme and another scheme, "Leicester North Jn to Trent South Jn" is proposed to increase line-speeds on the Slow lines and platform lengthening at Loughborough. This is listed in the table "Candidate NRDF Schemes in CP4" (Route Plan 19, page 23). The project will contribute to the St Pancras International (and in the case of Loughborough, for Leicester as well) peak capacity metrics by ensuring that available train capacity is used to best effect.

Network Rail needs to ensure that any works at Market Harborough are not compromised, by, nor compromise, any re-alignments envisaged as part of the St Pancras to Sheffield LSI works. Platform extensions at Loughborough might be an issue due to an old brick road bridge constraint, which restricts platform widths past the obstruction. The solution is not clear. It seems that a new platform at Wellingborough is under consideration for the Thameslink 12-car operations; Network Rail needs to confirm this issue. If true, platform works at Wellingborough could be covered by that scheme.

Although Network Rail states that this scheme was identified for the SBP Update, a Network Rail Weekly Engineering Notice in 2004 shows that SDO boards for 4- to 9-car trains have been provided to allow Class 222 Meridians to stop at Wellingborough, Market Harborough and Loughborough. It is not clear why Network Rail intends to change from SDO to platform extensions at these stations.

Network Rail has not stated the minimum platform length required (for the train formations on this route). We assumed that the above stations will be lengthened to 143m platforms for 6-car train operations.

Our independent assessment suggests the additional platform length required is 209m, which, using our defined methodology, would give a total of £1.045m. In addition, we estimate that there will need to be other works at Loughborough that would require extra £4m, and add-ons that would cost £0.627m. Our overall estimate is therefore £5.672m.

We have used our estimate on the "Orange and Green" Charts.

7.23 Platform Extension Schemes – Summary of Costings

The results of this analysis are shown in the table below.

SBP Scheme Name	Network Rail Point Estimate	Arup Extension length	Arup Point Estimate	Variance (+ is Arup higher)
Route1 12 car operations: Sidcup and Bexleyheath Routes	£5.986m	0m	£0.000m	-100.0%
Route1 12 car operations: Dartford to Rochester including Gravesend	£15.925m	453m	£15.666m	-1.6%
Route1 12 car operations: Greenwich and Woolwich Route	£2.910m	455m	£3.305m	13.6%
Route1 12 car operations: Hayes Line and Sevenoaks	£0.548m	0m	£0.035m	-93.6%
Route 2 Suburban 10 Car operations	£84.012m	4,756m	£82.405m	-1.9%
Route 3 10 Car SW Suburban Railway	£117.546m	6,277m	£93.075m	-20.8%
Route 5 WA Outer 12-car	£31.663m	1,622m	£27.820m	-12.1%
Route 5 WA Inner 9 Coach Trains	£33.190m	389m	£11.245m	-66.1%
Route 6 Tilbury Loop	£22.210m	1,594m	£20.670m	-6.9%
Route 8 FCC	£13.502m	1,365m	£13.120m	-2.8%
Route 10 West Yorkshire	£12.677m	672m	£5.376m	-57.6%
Route 11 South Yorkshire	£12.169m	215m	£1.721m	-85.9%
Route 16 Chiltern	£9.634m	978m	£7.824m	-18.8%
Route 17 Platform Lengthening	£33.340m	2,019m	£23.352m	-30.0%
Route 20 & 23 North West	£24.818m	1,214m	£9.712m	-60.9%

Route 2: 8-Car Operations, Victoria Eastern to Bellingham	£5.000m	264m	£4.320m	-13.6%
Route 1: 8-Car Operations, Swanley to Ramsgate (via Maidstone East and Ashford)	£4.000m	685m	£5.480m	37.0%
Route 1: 12-Car Operations, Swanley to Rochester	£5.000m	327m	£2.616m	-47.7%
Route 10: Ilkley – Leeds Platform Extensions	£5.000m	326m	£2.608m	-47.8%
Route 19: East Midlands Platform Extensions	£5.000m	209m	£5.672m	13.4%
SAMPLE TOTAL	**£444.130m**	**23,820m**	**£336.022m**	-24.3%

Across the portfolio as a whole, it can be seen that the Arup estimate is about 24% lower than Network Rail's. This is within the bounds of the ±30% associated with GRIP stage 2 and close to the ±20% at GRIP3.

We have taken each independent estimate, and used that in our "Orange and Green Chart" analysis.

7.24 Double Counting and Overlaps

A review was undertaken on whether different SBP scheme work scopes contained overlaps, in the sense of two schemes each naming the same station's platform extension works. The routes of concern were:

- Waterloo Platforms 1-4 between the Waterloo International Conversion Project and Route 3 10 Car SW Suburban Railway;
- SBP platform extension schemes and the Thameslink programme.

Network Rail's major project online information:

(http://www.networkrail.co.uk/aspx/1326.aspx)

shows the Thameslink Programme output includes "*Platform extensions to improve 50 stations outside of central London*". It is not clear how many platform extension works would be affected eventually by the Thameslink programme, which is subject to the changes to the programme scope.

Network Rail advised that *"there are no costs relating to other platform schemes on the Thameslink Route that are included in the Thameslink scheme"*, but the review on Thameslink Programme Scope Definition (Key Outputs 1&2, Version 6.0, 2006) suggests that overlaps do exist between some SBP platform extension schemes and Thameslink programme. These duplications are listed in the table below, which we believe should be covered by the Thameslink Programme.

Route	SBP Scheme	Location
1	Route 1 12 Car Operations: Sidcup and Bexleyheath Routes	Whole scheme (Hither Green, Eltham, Dartford, Mottingham and New Cross)
2	Route 2 Suburban Area 10 Car Operations	Mitcham Jn, Hackbridge
3	Route 3 10 Car SW Suburban Railway	Guildford, Effingham Junction, Bookham, Ashtead
8	Route 8 FCC Platform Lengthening	Part of scheme, confirmed by DfT

If the Thameslink Programme caters for 10/12 car operations on the South West Main Line to Guildford, the scheme cost for Route 3 10 Car SW Suburban Railway could be reduced by £8m.

7.25 Unclear Intended Outputs

Both Route 2 and Route 3 10-car operations schemes consider the feasibility of going straight to 12-car platform lengths at some locations. 12-car services will be able to operate on some Thameslink routes by 2015. If there is a strong business case for 12-car operations on Route 2 and Route 3, there is the potential for these two schemes to be proposed as the 12 car length rather than 10-car option. NR advised that the actual lengths of the platforms extensions are yet to be confirmed and as such it is unable to provide this data at this stage.

7.26 Missing Connections to SBP Estimate

- GRIP Report Estimate

There are no information to explain the significant cost differences for the Tilbury Loop Platform Extensions, and West and South Yorkshire Platform Extension schemes between the SBP update scheme estimates and GRIP Report estimates.

- London North Western Platform Lengthening Strategy (CP4 Submission)

There are some large cost differences also exist between the SBP update estimate and the document “London North Western Platform Lengthening Strategy” information; subsequently Network Rail has admitted that some of its estimates in the SBP update for these routes are not correct.

7.27 Land Requirements

For the platform extension works at some stations, particularly but not exclusively in the London area, both our and Network Rail’s work has identified the need for the acquisition of private land for the required works.

It will be necessary to secure this land through a compulsory process, and Network Rail should identify such requirements and group work packages accordingly, to ensure delivery of the schemes in the required timescales. There will need to be a fully robust process for recording and defending these decisions for use at if there was to be a Public or Planning Inquiry.

8 Stations

8.1 General Methodology

The station schemes within the SBP are generally 'one-off' schemes intended to address specific local issues, such as station overcrowding, redevelopment opportunities on the station or on adjacent sites (including potential impacts on local demand and local aspirations) and opportunities arising from renewals to undertake enhancements at modest cost. As such, the schemes are generally very site-specific, the information in the SBP and its supporting documents does not provide sufficient information to establish scheme scope and content in detail. Following discussions, Network Rail arranged short presentations by the project teams to give a better overview of the scheme purposes and scopes. In a number of cases, further information and copies of information presented at the meetings was given to assist evaluation.

With two notable exceptions, it has proved difficult for us to provide in-depth commentary on costs, although we do offer advice on the effectiveness of the schemes in terms of railway and passenger capacity. The difficulties arise from the fact that most station schemes are building projects, rather than railway engineering schemes. Any cost implications are dependent on many structural condition issues, structures loading assessments, utilities data and information technology systems - calculations and data we simply cannot validate or offer meaningful advice on. We are therefore heavily reliant on advice provided to us by others, which we have questioned and challenged, but we cannot truly offer "an independent costing".

The two exceptions are Reading, and Birmingham New Street, and these will be discussed in depth below. Fortuitously, these two schemes represent about 70% of the total expenditure on this station portfolio, and so we have focussed on these higher-value projects.

In relation to the two major schemes, Reading is very largely a railway track, signalling, platforms and structures project, while Birmingham New Street is highly advanced, is largely at GRIP4, and has considerable detail available.

Below is a summary of our findings on the stations portfolio.

8.2 King's Cross

This is a DfT Baseline Project.

The station at Kings Cross is operating to near capacity in terms of passenger levels and train frequency. In order to cater for future growth and mitigate the existing issues, a number of proposals are planned to make Kings Cross suitable for future demands. These include additional platforms on the east side of the station and remodelling the station concourse. A key part of the Kings Cross redevelopment is the requirement to obtain Planning Permission and Listed Building Consent before any work can be carried out; this process is anticipated to take 2 years.

The SBP explains the project as a new western concourse complete with a mezzanine level for retail facilities, refurbishment of the train shed with the roofs strengthened and reclad. There will be modifications to service tunnels and modernisation of facilities.

It is assumed the project will provide:

- additional concourse space both to deal with present peak overcrowding and future growth;
- The ability to run more services;
- The ability to cater for 12-car trainsets;
- Improvements to passenger flows;

- Improvements to retail provision.

The Estimate Summary Sheet shows a Point Estimate of £217.5m (all in CP4) but all other document sources contain the figure of £175m. A note from Network Rail that we received on April 21st 2008 identified the total King's Cross Enhancement spend as £256.5m and that the CP4 element is £171.7m (not £175m). Network Rail have suggested that this difference could reflect differences in the price base although we note that there appears to be some uncertainty over the precise cost.

There are two significant project interdependencies with the Kings Cross project as well as associated issues:

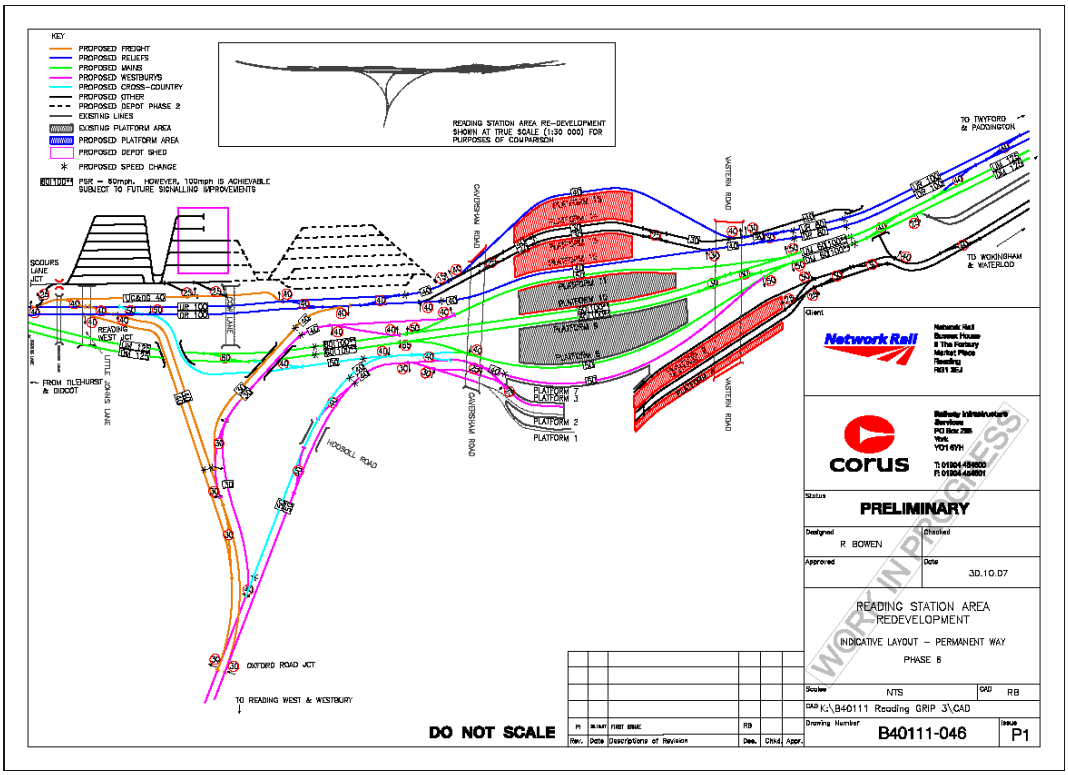
- Kings Cross Platform Renewals – No information supplied other than it is linked to the above scheme.
- Kings Cross S&C Plus Signalling Equipment Renewals - No information supplied other than it is linked to the above scheme.

We were not asked to review this scheme, but, for our assessment, and in order to maintain compatibility with the Figure 6.17 analysis, we have used £175m. The timescale with work continuing to 2014 is likely to be achievable.

8.3 Reading Area Redevelopment

8.3.1 A Plan of the Reading Area

Network Rail supplied, via the ORR in February 2008, a Powerpoint presentation, which contained the following schematic diagram of the proposed layout; this is presented below. This layout was used for indicative costings.



8.3.2 The Remit

The remit set for Network Rail by the DfT contains many requirements, of which the following are most significant in terms of cost implication:

- To provide for medium term (2015) and long term (2035) requirements;

- To deliver 92% PPM on long-distance services, 93% on London & South East services and 92% on regional services by the December 2014 timetable;
- To deliver a minimum of 4 additional train paths per hour and a minimum of nine through platforms;
- station capable of accommodating a doubling of passenger movements;
- allow for future OLE electrification;
- reduction in delays of 50% of the December 2004 average;
- Passive provision for Crossrail from Maidenhead, and Airtrack;
- Oxford Road Junction to Southcote Road Junction capacity enhancement is not a part of the programme;
- Main Lines to deliver 125mph with the capability to rise to 140mph where viable;
- Relief Lines to deliver 100mph;
- CUI (Capacity Utilisation Index) not greater than 75%;
- 1 new platform face to support 12x20m trains on the Reading to Waterloo Route;
- Platforms 4a & 4b to be extended to support 12x20m trains;
- transfer to/from platforms shall be level or by Footbridge;
- station compliant with DDA requirements;
- Reading Triangle FGW Turbo Depot to close;
- Reading Train Care Facility transferred to a new depot on the north side;
- Network Rail Maintenance Depot at Reading to move;
- Crossrail Stabling Facilities for 10 x 240m trains;
- Airtrack - no stabling or depot facilities;
- High Output Ballast Cleaner to be relocated;
- Gradients no steeper than 1:100 where practicable.

8.3.3 The “Core Scheme”

The “core” engineering elements of the scheme therefore consist of:

- two new island platforms (adding 4 platform faces) to the north of the existing layout providing a create a total of 9 through platforms instead of 4 through platforms and 3 bay platforms. To achieve this, there will be extensive station construction work and track remodelling at both the western and eastern approaches;
- Restoration of the eastern underpass from the Southern lines;
- To the west, a new bridge span over Caversham Road;
- To the west, grade-separation of the chord lines from Oxford Road Junction to the Relief lines to the west (to benefit freight services from Southampton etc);
- To the west, grade-separation of a new chord from Oxford Road Junction to the two new island platforms;
- the closure of two highway under bridges and their replacement with a widened third bridge and new Relief Road;
- a new bridge over Vastern Road for the Southern lines (wide enough to allow future expansion to three tracks and three platforms) to create a two-track throat to the Southern platforms 4a and 4b and to allow their lengthening to cater for 12-car trains;

- the abolition of the signalling control centre which is being undertaken as part of the Thames Valley signalling renewals project to create the Thames Valley signalling centre;
- the construction of a new "First Great Western" depot to replace that lost in the triangle of lines west of the station. This will have passive provision for future IEP train servicing and stabling. The depot will have to be re-sited at an early stage of the works, to accommodate the proposed grade-separated layout;
- a new depot for the High Output Ballast Cleaner (re-sited from Moreton Cutting);
- new platform access arrangements between the existing and new platforms.

We consider this scheme is required to give operational and performance benefits to:

- the Great Western;
- Southern (South West);
- strategic freight network requirements for Southampton to the West Coast.

8.3.4 Southern Platform Extensions

This project involves the extension of Platforms 4A and 4B and the creation of a third platform. The third platform is required for Airtrack and is not an HLOS requirement, but the works in the core scheme are the same for both. The provision of a third platform would appear to help the Airtrack case, but there could be operational and performance advantages in having a three-track terminal station, helping to manage late running and for the storage of defective trains. The Route 3: 10-Car South West Suburban Railway scheme affects the Reading line, but works at reading are excluded from this scope.

Network Rail advised that, while lengthening the Southern platforms is HLOS-driven, provision for the third platform may not be, but they assert that it would be grossly inefficient not to undertake these works at the same time.

8.3.5 Track Renewals

Track renewals are proposed, but not considered further in this report; they are not an HLOS requirement.

8.3.6 Signalling and Telecomms Renewals

S & T renewals are proposed, but not considered further in this report; they are not an HLOS requirement.

8.3.7 Platform 1 - 8 Renewals

The renewals element is designed to bring the existing platforms where practical up to an equivalent standard to the new platforms proposed in the core scheme. Whilst undertaking this work currently with the core works will be efficient it is not required to deliver the HLOS requirements.

8.3.8 Oxford Road Junction to Southcote Junction

Although included in the SBP at a cost of £47m, this scheme was removed from the SBP Update.

Performance and capacity modelling for the core Reading scheme has indicated that an enhancement over this route section will be required but it is as yet uncertain if the scheme is required to meet the HLOS requirements. The scheme is at a very early GRIP stage of development.

The layouts being considered involve the addition of a third track between Oxford Road Junction and Southcote Junction. All three lines would be capable of bi-directional operation. The variants consist largely of the form of the connections between the three lines and the twin-track routes which fan out to the north and south. All options involve work

outside the railway boundary, especially involving a new bridge over Oxford Road; hence all will need some statutory powers to construct.

The important point in relation to the planned Reading works is to ensure the absolute minimisation of abortive work on the Reading Core Scheme if this scheme was to be proceeded with at the same time. There are difficult earthworks, levels, track and tie-in issues at the northern end of this length, where a reconfigured junction would be required where the widened tracks meet the south-facing connections from the Relief Lines and the station lines in the Oxford Road junction area. Network Rail needs to ensure, as far as is reasonably possible, that the detailed design of the core Scheme can be readily adapted to the potential subsequent requirement for the Oxford Road Junction to Southcote Junction scheme.

As Network Rail removed this scheme, we have made no provision in our Orange and Green Charts.

8.3.9 Station Concourse

The proposed station concourse works include replacing the existing concourse possibly by the incorporation of the original station buildings into the re-sited station access. It would link into the platform access proposed in the Core Scheme. It is most likely that this would be funded by third parties and as a result is not required to meet the HLOS requirements.

We have not included any cost provision in our Orange and Green Charts.

8.3.10 Overall Costs

The Network Rail presentation also contained updated cost information, compared to that information reported in our Interim Report of December 2007. The image below is a reproduction of Network Rail's February 2008 Powerpoint slide.

	Control Period 3	Control Period 4	Control Period 5	TOTAL
Reading Station Enhancement Programme	£63.4m Network Rail	£425.0m HLOS	£36.8m HLOS	£525.2m
Southern Platform Enhancements	£0.5m Network Rail	£20.5m HLOS	£0.0m	£21.0m
Track Renewals	£0.0m	£5.9m Renewals	£0.0m	£5.9m
Signalling & Telecoms Renewals	£16.0m* Renewals	£49.9m Renewals	£0.0m	£65.9m
Plat 1- 8 Renewals (Canopies, platforms buildings, CCTV, CIS & PA etc)	£0.0m	£26.2m Accelerated Renewals	£0.0m	£26.2m
Total	£79.9m	£527.5m	£36.8m	

We do not propose to discuss that December 2007 information any further, as we can base our observations on the slide above and the Estimate Summary Sheet provided with the SBP Update. This Update amended the cost to £456m, an increase from a previous figure of £435m. Network Rail advised that the above Powerpoint slide reflected the actual DfT

HLOS determination £425m in Control Period 4, rather than the SBP submission of £435m, which is predicated on an accelerated programme of delivery agreed with the DfT in May 2007. The £456m figure in the SBP includes input price inflation (£435m + £21m) for the main Reading enhancement programme. The £21m for the Southern platform extensions is shown separately. We note that the inclusion of Input Price Inflation is not consistent with all other costings quoted by NR in this report.

As a result of all these considerations, we have independently assessed the cost of the works, as listed below for the individual elements;

- Core Scheme station area: £396m. As in all previous estimates, there was no allowance in this Point Estimate for risk (except as noted previously), Optimism Bias or escalation costs. It is noted that Network Rail's costs include a contingency allowance of £113.5m, reducing their £525.2m to £411.7m Given that we have very little design information from which to develop estimates, this comparability between our £396m and Network Rail's £411.7m is remarkable. The question of "contingencies" remains as the distinguishing feature. We have therefore used the Network Rail estimate in our Orange and Green Charts, although we note that it should be possible to undertake the work in CP4 within the HLOS maximum HLOS determination;
- Southern Platform Extensions: We estimate that the southern platform extensions may be achievable within Network Rail's estimate of £21.0m. There may be a number of reasons for these differences in particular around contingency and scope of works. We have therefore used Network Rail's estimate in our Orange and Green Charts. If desired, our estimate could be split between the 2 platforms needed for "Southern" and the one required for Airtrack. These costs are additional to the Route 3: 10-Car South West Suburban Railway scheme;
- Track Renewals: These are not HLOS works. We have made no provision;
- Signalling and Telecomms Renewals: These are not HLOS works. We have made no provision.
- Platform 1 – 8 Renewals: These are identified as Enhancements to Renewals, and the SBP includes £26.2m for this purpose.

The Oxford Road to Southcote Junction scheme requires a special mention. It was included in the SBP at a cost of £47m. However, the SBP update has deleted the scheme, and makes no provision. Our independent estimate comes in some way below this estimate although we are not at all confident about scheme content at this stage. As we do not yet know if this scheme is required to deliver HLOS, we have not included a cost for this scheme in CP4.

8.3.11 Programme

As a TWA Order or Planning Permission will be required, we believe there is some programme optimism.

Network Rail has expressed concern over these programme comments. They advise that the project is not expected to require a full TWA order as most of the land is within Network Rail or Reading Council ownership. The TWA is being sought as a risk mitigation measure in relation to a number of minor CPOs that are required, rather than needed for the full scheme. Network Rail and Reading BC are both confident that the planning issues are compatible with the delivery programme which is outlined below.

- Dec 2010 - Signalling Enabling Works/Signalling Re-control;
- Dec 2011 - Southern platforms to12 car and expanded from 2 to 3 in number;
- Dec 2012 - 4 new relief line platforms with dive under to Southern and station works - bridge(s) etc;

- Dec 2014 - GWML and Cross Country grade separated;
- Dec 2015 – Eastern Chord - Scheme completion with Westbury - Paddington grade separated.

In summary, Network Rail's position is that most of the land required is in NR or Reading Borough ownership; we agree, but it is important to note some land is not in either ownership. We therefore recommend that Network Rail sets off on a path towards a comprehensive TWA application.

If a comprehensive TWA application was pursued then the scheme could still deliver in CP5 although more expenditure may be required towards the end of the programme. We therefore consider that there are risks to Network Rail's programme although we have retained it at this stage.

8.3.12 Overall Financial Summary

For our financial assessment (based on point estimates), we used:

- £425m (DfT determination) for the Core Scheme;
- £21m for the Southern Platform Extensions, spread over our programme assessment;
- Platform 1 - 8 renewals – no provision;

all spread over our programme. We have not made any provision for Oxford Road to Southcote Junction.

8.4 Birmingham New Street Gateway Project

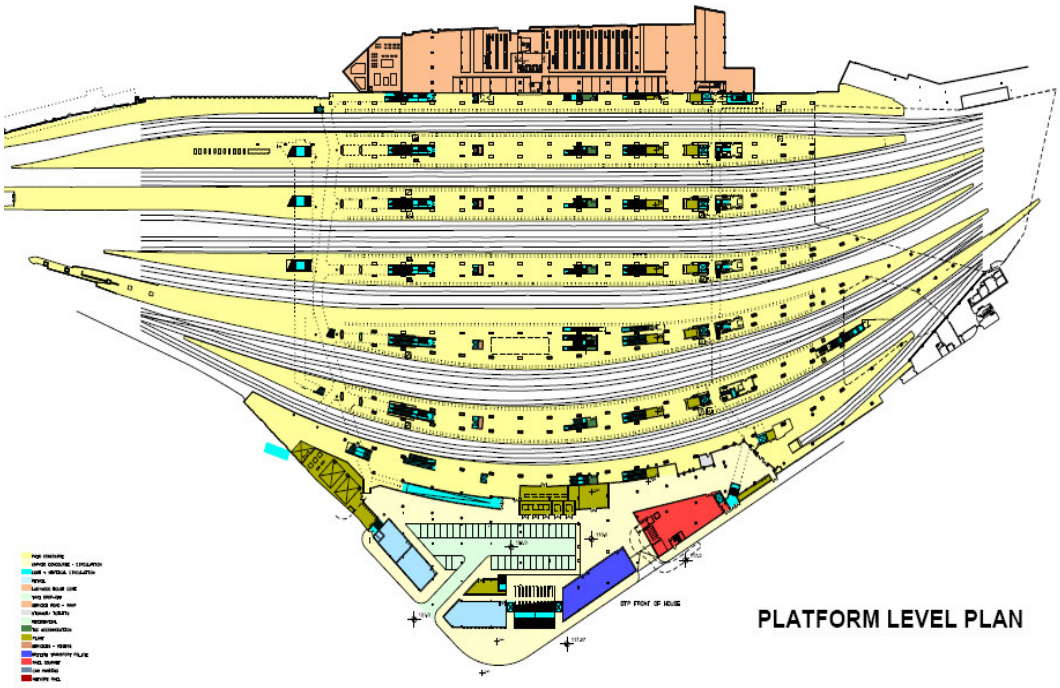
8.4.1 Introduction

The improvements planned at Birmingham New Street are aimed almost entirely at enhanced passenger movement capacity to mirror forecast increases in train services. The proposals have had a long gestation period, and resulted in a scheme known until recently as "Gateway". They are now known as "Gateway+", to reflect continuing design development. New features include:

- The extension of Navigation Street footbridge to the north, the south and to Platform 12;
- The relocation of train operators accommodation and British Transport Police to increase retail areas and revenues;
- The inclusion of Platform 8/9 widening as a separate item;
- The inclusion of a public accessway running east-west to connect the station to the Bull Ring, thereby severing the eastern platforms and creating two paid areas. Interconnection north-south across the eastern end of the platforms will be by an overbridge.

Although new features will be added onto the Gateway+ scheme, the project team states that the proposed delivery date will be the same as for the Gateway scheme, June 2013.

We attended a major presentation, by a range of Network Rail project staff and their consultants, on March 3rd. This meeting provided a wealth of detail that would not have been possible to digest merely by studying drawings. We were able to pose all the questions we required.



8.4.2 The Purpose of the Scheme

The Birmingham Gateway Business Case Executive Summary Report (May 2006, Page 6-7) states that the Gateway+ scheme will deliver there are both transport and regeneration benefits, namely:

- Train Service Performance benefits: Addresses the problem of trains, which have been re-platformed, extending their dwell time as passengers are delayed in getting to the new platform and boarding the waiting train; Reduces reactionary delays across the UK rail network.
- Rail user and non user walk time benefits: Reduces walk times between platforms and to and from station entrances; Provides greater permeability of the station; Aids city centre connectivity; Provides for enhanced public transport interchange (bus, metro, station heavy rail).
- Highway and safety impacts: Mode shift from road to rail will reduce congestion and road accidents.
- Value of Station Facilities: Addresses current poor provision of station facilities; Provides a high quality journey experience for all, including the mobility impaired.
- Revenue impacts: More rail passengers will result in greater revenue income for the train operating companies; leading to a revenue boost for DfT Rail as a result of a claw-back mechanism in future franchise agreements; Improved retail facilities will result in higher retail revenue levels for Network Rail.
- Ticket-less travel: Addressing loss of revenue due to ticket-less travel on train services.

8.4.3 The Project Partners

The scheme is seen as a catalyst for redevelopment and regeneration of the area to the immediate south of the station, and a major improvement in accessibility and connectivity across the barrier presented by the present station layout. It also affords a major increase in passenger capacity arising from more or longer trains, and has local, regional and national

train service implications. It is this combination of circumstances that has resulted in many organisations having an interest and financial involvement in the Gateway + proposals.

The main project partners are:

- Network Rail;
- Birmingham City Council;
- Advantage West Midlands;
- Centro;
- Department for Transport.

8.4.4 Passenger Growth Forecasts

Scott Wilson undertook passenger modelling using PAXPORT software. Operation of the station, in the AM and PM peak periods, with the existing and the proposed layouts, was tested for the years 2005, 2016, 2026 and 2035. Additional analysis was performed for the 2035 PM models, including a surge in demand of an additional 20% and a 15min train perturbation test. Subsequently Scott Wilson were requested to provide sensitivity tests, where 2035 demand was calculated as 100% and 150% on top of the 2005 demand.

In principle, the methodology used to derive base year matrices is correct and provides a robust estimation of station movements. However, the matrices are grouped by island platforms, so it is not clear how this aggregated demand was subsequently distributed between various platform sections. The model implicitly indicates that no passengers interchange between the A and B ends but by vertical circulation elements and concourse areas. This could be addressed in a refinement of the model.

The demand forecast for the year 2035 was delivered from 2005 base demand increased by 63%, which corresponds to 1.6% per annum. Additional sensitivity tests correspond to an average growth of 3.1% per annum. It is unclear why such growth rates were applied, as other data sources reviewed by Arup all indicate higher anticipated demand growth.

It is unclear whether PAXPORT models included any passenger management. No sign-posting or management seems to be included in the models.

Having reviewed the data presented, the following concerns are expressed:

- The island platform structure shows no distinction between the A and B ends;
- There is a concern that the ‘within island’ interchange movements were not modelled leading to underestimated passenger movements at platform level;
- All demand forecasts are lower than those indicated by all other documents reviewed by Arup. The future demand may well be underestimated;
- No signposting / management seems to be present in the model, although use of concourses to manage platform accumulation is crucial for the success of the future station operation;
- The 15-minute perturbed operation test should be refined to allow for the frequent train re-platforming at short notice that takes place;
- PAXPORT models the average levels of service over a block area. We would recommend a LEGION simulation, which models movements of individual passengers, and highlights localised design deficiencies and / or requirements for operational management.

8.4.5 Business Case

The Business Case for the scheme has been developed using standard WebTAG methodologies, and both benefits and costs have been subject to intense study by DfT

specialists and advisors acting for each of the funding contributors – there is nothing we can add to this level of scrutiny.

8.4.6 Project Delivery

Network Rail and Birmingham City Council is establishing an integrated project delivery team called "PRIME". They are about to appoint a Delivery Partner organisation consisting of technical advisors. The Delivery Partner will not undertake actual works, but will be responsible for the tendering and award of series of Works Package contracts, sub-dividing the construction work into location-specific or discipline-specific packages. Most of the work will be in a "high street" environment, behind platform screens at platform level, or in a genuine non-railway environment at the upper building floors. Designs will be developed in-house to GRIP5 (approved Form B), and then competitively tendered, a process we wholeheartedly commend for achieving genuinely value for money. All suppliers will be "Link-Up" accredited. Network Rail has undertaken considerable in-house liaison with other station redevelopment teams, in order to share best practice.

8.4.7 Costs and Funding

Data provided by Network Rail at the March 3rd meeting showed the following cost breakdown.

OVERALL PROJECT COST BREAKDOWN	
Overall Project Cost	£596m
Deduct South Towers (Private Developer)	-£150m
Project Cost (Design and construction)	£446m
Capital Receipts from Private Sector (see breakdown below)	
• Southside Site	£15m
• Eastern Retail	£4m
• Warner Contribution for betterment	£12m
• S106 Contribution (BCC)	£17m
Total Capital Receipts from Private Sector	-£48m
Net Public Sector Total	£398m
Breakdown of Public Sector Contributions	
• HLOS	£128m
• Birmingham City Council	£160m
• Advantage West Midlands	£100m
• Centro	£10m

Network Rail provided a construction cost breakdown, as tabulated below.

Design and Construction	£392m
Compensation & Loss of Income	£33m
Rail Costs	£4m
Land & Lease Acquisition	£1m
Other Costs	£16m
Project Cost	**£446m**

The table below presents a breakdown of the £392m design and construction total, to show how much of this total is represented by risk allowances.

Works Cost	£187m
Preliminaries	£30m
Sub – total	**£217m**
Fees	£27m
Sub – Total	**£244m**
Risk (P80)	£37m
Inflation	£99m
Inflation Contingency	£12m
Design and Construction Total	**£392m**

The costs have been developed at out-turn prices (which is what the ORR requires for regulatory purposes), and have been built up from a detailed Bill of Quantities with unit rates taken from similar station schemes, noting that the majority of costs are building rather than railway engineering works. The costs were estimated at 2005 prices, and were then inflated to the year of spend using the BCIS Tender Inflation Price Index to derive the Out-Turn cost. In addition to the priced BoQ, a detailed QRA was undertaken to derive a P80 risk allowance of £56m. We are not certain how the £56m is derived; it appears from the above table that the risk allowance is £37m + £12m = £49m.

This use of P80 is not identical to the cost analysis in the rest of this report, which has used Point Estimates. If the ORR wishes to regulate on P80 values, no adjustment to the £128m contribution is needed.

The mechanism for controlling project cost risk is that Network Rail and Birmingham City Council are bound together in a contractual arrangement, to share and manage risk. We understand that other contributors are not at risk. If the scheme cost were to rise by say 10% (about £44.6m) all the increase would therefore be shared only between Network Rail and Birmingham City Council. Although their risk exposure would rise, this ought not to adversely affect HLOS exposure. Network Rail advised that, as the costs are expressed as a P80 value, the chance of this excess is modest. This point was clarified in a presentation to ORR in April 2008 that identified the risk share in the proportion Birmingham City Council (40%) and Network Rail (60%).

We have included £128m as the Network Rail cost and repeated that figure in our Orange and Green Charts to replicate Network Rail's analysis.

8.4.8 Programme

Network Rail provided the following programme dates:

- Outline Planning granted: July 2007
- Funding secured in Principle: February 2008
- CPO Process complete: April 2009
- Detailed Planning approval granted: October 2010
- Enabling works on station: August 2008 to February 2009
- Phase 1 Westside: February 2009 to September 2011
- Phase 1 "B" Platforms: May 2009 to September 2011

- Phase 1 Concourse fully operational: November 2001
- Façade works: October 2009 to March 2013
- Phase 2 Eastside: September 2011 to December 2013
- Phase 2 “A” Platforms: September 2011 to November 2011
- Phase 2 Concourse fully operational: December 2013.

At the time of this report (effectively April 2008) the programme date for completion of CPO procedures by April 2009 may be optimistic, given the need to set up a potential Public Inquiry, hold it, await the Inspectors report and the ultimate decision.

8.4.9 Our Assessment

There are a number of issues which Network Rail needs to address (and indeed their advice was that they were doing this).

8.4.9.1 Where Passengers Should Dwell

While the overall concept is that passengers will be encouraged to dwell at the concourse level, the Gateway+ scheme widens Platform 8 / 9 and a waiting room will be provided on the widened platforms. Any passengers will therefore have a choice of location, and it will not be possible to hold passengers at concourse level if they are not willing to do so. The pedestrian modelling should address this as a sensitivity issue, as there is a risk that benefits might be eroded or crowding occur at currently “unexpected” locations.

8.4.9.2 Performance Improvements

The Business Case Technical Note (Appendix A) claims that the scheme will deliver train performance benefits due to an increased number of vertical accesses, and thus reduce the reactionary delays across UK rail network.

Of itself, the Gateway scheme will not increase the number of trains using the station, though they will generally be longer. It is difficult to envisage how re-platforming will be reduced. When a train is re-platformed, waiting passengers will try to reach the new platform quickly, and may be in conflict with alighting passengers if the re-platforming announcement is made late. The modelling needs to address this issue. The increase in numbers of passengers may enforce additional dwell times in the platform, leading to worse, rather than improved, performance. Information management systems need to be much “earlier” in response, such that re-platforming is announced much earlier than is customary now.

8.4.9.3 Operational Issues

The eastern paid concourse is to be split into two segregated areas, north and south of the east-west public accessway. A pedestrian link overbridge is proposed for interchanging between these two areas. We agree with the Design Report (Appendix B) findings that this change will cause adverse operational issues.

For example, when a train scheduled to depart from Platform 3A is rescheduled to depart from Platform 8A just prior to departure, passengers will have to use the stairs / lift to rise to concourse level, then go up a further level to the link bridge, then down two levels to reach the revised platform. Network Rail advised us that the numbers of people undertaking this move will be less than 2,500 in the 3-hour peak. We believe this is still a substantial flow, and will occur in "bursts" rather than spread over time. The single lift could quickly become congested and thus hinder the movement of passengers. Some passengers might seek to avoid this by using the western platforms to undertake the change, thus prolonging the interchange time and hindering train service recovery.

8.4.9.4 TOC Revenue and Network Rail Retail Revenue Impacts

The Gateway+ scheme will create extra space but use significant parts of this for retail purposes rather than passenger circulation. It is clear that TOC and Network Rail additional revenue generated are significant impacts in the Business Case, but improvements in station capacity and passenger facilities should be afforded a higher priority, particularly as the demand model is rather "average" rather than "peaky" in its nature. We are not convinced the correct balance has been struck.

The automatic ticket gates will address ticketless travel and in turn help the TOCs to gain the revenue benefit, but Network Rail needs to ensure that the barrier operation will not force reduced passenger flow rates or hinder interchange.

8.4.9.5 Gateway+ Scheme GRIP Stage

There are conflicting documents about the GRIP stage the project has reached.

Appendix B to the report "Amendments to Gateway Scheme (version 11th October, 2007)" suggests a GRIP2 stage.

A CP4 Data Sheet provided by Network Rail suggests that GRIP4 was completed in June 2006, and the project is now at GRIP5. We consider it unlikely that there are approved Form As across all the disciplines, nor evidence of Inter-Disciplinary Design Reviews (IDC) to demonstrate compliance with the completion of GRIP4.

The March 3rd presentation contained a slide entitled "Next Steps" which describes taking the design forward to GRIP4, implying the scheme is currently at GRIP3.

The overall implication is that GRIP Products have not been brought forward on an even basis, with some being much more advanced than others.

8.5 Gatwick Airport Remodelling and Passenger Capacity

An overall scheme is being developed for Gatwick. This consists of three main elements:

- Improvements to passenger circulation, concourse, links to the airport and links to other transport modes;
- Improvements to passenger circulation in the Platforms 5 & 6 area which currently give rise to some safety concerns due to crowding;
- Some remodelling and resignalling to increase rail capacity.

The aims of the scheme are:

- reduced congestion in the station area, resulting in improved journey times for passengers;
- high quality lifts and escalators to all platforms for passengers interchanging between plane and train;
- enables increased industry revenue through a 60% increase in passenger numbers through the station;
- facilitates future growth in passenger numbers on the route and in connection with any expansion of the airport;
- improved passenger distribution at the station and reduced boarding delays;
- reduced train delays through elimination of conflict between fast lines and terminating trains from London;
- enables modal shift from car (principally) to rail for journeys to the airport, with resultant road congestion and environment improvements; and
- improved connectivity between rail station, bus/coach station, taxi rank and airport.

In addition, the implementation of Brighton Main Line RUS includes minor works at Gatwick Airport station by December 2008 which are not included in the works reviewed here.

The concourse works would be designed to accommodate the 60% air passenger growth currently predicted by British Airports Authority.

The track remodelling and signalling works are intended to increase rail capacity, since the existing track and platform layout does not suit efficient operation of terminating services. Proposals to provide a 7th platform, which would provide additional passenger and train service capacity are also included. This additional capacity would facilitate the introduction of a 2tph shuttle service to Guildford, which Network Rail understands to be a Franchise commitment for First Great Western, but which cannot currently be fulfilled due to capacity constraints at Gatwick and Redhill. However additional trains to London would be dependent on additional capacity being available elsewhere on the route.

Significant track and signalling renewal work is stated to be required in the station area over the next few years – the 'Gatwick Interlocking Renewal Scheme' and 'planned S&C renewals'. Rolling up these renewals with the proposed remodelling would allow scheme benefits to be realised at modest additional cost.

The Estimate Review Sheets give the Project Point estimate as £60.131m, (CP4 not modelled) and the SBP Update gives an allocation of £30m. It is proposed that the

remaining costs would be covered by contributions from BAA and signalling and permanent way renewals rolled up into the scheme.

The scheme does not contribute directly to HLOS metrics, but that the scheme would deliver capacity and performance benefits and address potential passenger crowding and safety issues. The project is not included in the South London RUS.

Network Rail believes that not investing in the scheme would put at risk the achievement of the passenger-km growth requirement of HLOS, as the station will become increasingly overcrowded, resulting in increasingly frequent closures. The growth in demand from the airport is predicted to rise considerably faster than the background growth from the remainder of the Sussex route.

For our financial assessment, we have used the £30m SBP allocation and re-profiled the expenditure to match Network Rail's programme in the "Orange and Green Charts".

8.6 East Croydon Passenger Capacity Scheme

East Croydon is one of the busiest stations on the London – Brighton corridor, with significant volumes of passengers using the station to access the town centre and residential districts, interchange with Croydon Tramlink and heavy rail interchange on the station itself. Currently the only access to the station is from the concourse which is located at the extreme southerly end of the platforms, leading to issues with passenger crowding on the platform ramps and at the southern ends of the platforms.

Redevelopment proposals are being developed for the area of land on the west side of the station (towards the town centre), the Croydon Gateway scheme, and Network Rail are proposing to use this opportunity to link station improvements into that scheme in order to improve access to the station and capture developer contributions. This would include:

- Sale of air rights over the station to allow the developer to extend the proposed commercial development over the station, and hence provide a developer contribution to help fund the station works;
- Construction of a new station concourse, nearer the centre of the station with new passenger access routes linked through the development to the west (Croydon Gateway site) and east (residential area) to complement the current southern access;
- Platform canopy extensions;
- Construction of high density residential led mixed use development comprising commercial floor space, car parking and public realm;
- Infrastructure works to provide DDA access to all platforms;
- Track slues to facilitate a reduction in the stepping distance to platform 2;
- Signalling changes to allow parallel moves between Up services departing platform 5 and Up services arriving platform 4.

Consideration is also being given to providing passive provision for future rail capacity improvements through the station area, in the design of the air rights development.

The main aims of the scheme are:

- reduced passenger congestion;
- enhanced station facilities associated with larger station concourse, new footbridge providing a second exit, and platform canopy extensions;
- reduced journey times associated with larger station concourse and provision of new entrances;
- safety benefits: DDA access to all platforms and reduced stepping distances;

- improved security: enhanced CCTV, improved passenger flow;
- environmental benefits;
- capacity benefits by allowing parallel moves;
- regeneration benefits;
- increases in retail revenue, car parking facilities revenue and station access income; and
- proceeds from land disposal.

This scheme is not included in the South London RUS. Network Rail states that "*This scheme is at the station side of the concourse development. The South London RUS (Final) refers to this scheme; however it should be noted that the scheme is not core to the RUS and consists of concourse work."*

The project has confirmed that the scheme is not required to meet the HLOS metrics, but that the scheme would deliver capacity and performance benefits and address potential passenger crowding and safety issues. Network rail have stated that they consider it important that the passenger capacity enhancement work is undertaken to accommodate passenger growth in the CP4 period.

Network Rail has provided a copy of a report 'East Croydon Capacity Assessment, Passenger Simulation Modelling, Dated January 2005. This demonstrates that passenger overcrowding will occur around the gate-line, on the dispersal bridge and in the subway within the next 10 years. Therefore a passenger capacity enhancement scheme will have to go ahead within CP4.

Network Rail has recently supplied a copy of a report, 'East Croydon capacity Assessment, dated March 2008. This states that East Croydon is No. 6 in the top 10 most congested stations on the network, and the busiest station on the Brighton Main Line. This report considers options for a new concourse and set of platform accesses to the north of the existing concourse.

The preferred option appears to be designed to accommodate a proposal to expand the 'railway' part of the station from 6 platforms to 8 platforms. Such a scheme is not part of the HLOS or SBP proposals. It is presumed to be an aspiration for CP5. East Croydon is recognised as a particular pinch point on the Brighton Main Line so it is commendable that some work has been done to consider options to address this. It will be important that the developed station upgrade scheme is designed to accommodate such remodelling and that the adjacent redevelopment and proposed air rights developments make provision too. Otherwise, once they are constructed future expansion is unlikely to be possible. The report notes some potential shortcomings in the railway proposals which will need to be addressed now as they will affect land requirements and space for track and signals.

There are other schemes which impinge on East Croydon. It is also included in the Thameslink Programme which provides platform extensions, train stop board reposition, platform lighting and CCTV facilities etc. At least one task *"improved security: enhanced CCTV, improved passenger flow"* overlaps between Thameslink and this SBP scheme. Moreover, a CP4 NRDF candidate scheme "East Croydon Platform 4 and 5 signal overlap" includes signalling works and possible platform extension work.

It would seem highly desirable to integrate all the works proposed at East Croydon which should allow efficient implementation and potentially reduce overall scheme costs, including the SBP contribution. The air rights and the close linking of the station into the proposed development, would suggest significant potential advantages to the developer. There may be merit in considering whether the developer contribution could be increased in order to reduce the SBP funding requirement.

It appears that work to address passenger crowding needs to be undertaken in CP4. The schemes are currently in development, and are likely to affect final outputs and costs. Provision for future capacity enhancement of the rail facilities needs to be allowed.

Network Rail believes that not investing will, as at Gatwick Airport, put at risk the HLOS requirements into both Victoria and London Bridge, as a result of station closures. The growth will generate revenue increases intrinsic to SOFA.

The Estimate Review Sheet shows an overall scheme Point Estimate of £37.432m (CP4 cost not modelled) and the SBP Update shows a £12m funding allocation in CP4. It is understood that the remaining costs will be funded by a combination of developer and Section 106 contributions.

For our financial assessment, we have used the £12m SBP allocation and re-profiled the expenditure to match Network Rail's programme in the "Orange and Green Charts".

8.7 West Croydon Station Development

This section of the report addresses both the West Croydon Station Development and the West Croydon Track Capacity Schemes.

The schematic plan below shows the proposals.

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Although West Croydon is a secondary station for Croydon town centre, the extension of the East London Line to West Croydon and the Thameslink Programme will trigger additional use of the station. East London Line services are planned to terminate at West Croydon, and to provide for this proposals have been developed to construct a turnback siding between the existing Up and Down lines at the country end of the station (Right hand end of diagram above). This work is being funded by TfL and work is in progress as part of the current ELL scheme.

The South London RUS identified that 10-car platforms at West Croydon will be required to facilitate the suburban 10 car operations, but that multiple suburban routes operations into Croydon area will be constrained by the limited capacity for turning trains round. Work on the London Bridge options for Thameslink has identified a shortage of locations in south London where 12 car trains can be turned back. Therefore remodelling at West Croydon to provide additional capacity and the turnback of 12 car trains from London Bridge via Sydenham is proposed.

The scheme aims to create a 3rd through platform at West Croydon, by reconstructing and extending up through Platform 3 and bay Platform 1 into a 12-car capacity island platform with two through lines (Platforms 1 and 2 in the 'Proposed' diagram above), thus providing the station with three through platforms. This would improve platform availability at peak times for both through and terminating services, allowing more trains to operate through the station area. The creation of the island platform will necessitate the provision of new passenger access to these platforms.

The Station Development project scope includes the development of railway land at the existing West Croydon Station located between London Road and Station Road; new egress arrangements to West Croydon Tram-stop and Bus station; improvement on station facilities, including ticket office, platforms, new access arrangements to the reconstructed platforms, DDA access to platforms, station canopies and concourse; infrastructure works to provide a new station concourse at an upper level; track and platform layout remodelling to provide for 12 cars and the additional through line.

The existing passenger access to the platforms is by means of a footbridge and staircases at the west end of the platforms (right hand side of the diagrams above). It can be seen that the island platforms 1 & 2 scheme will sever the existing access to these platforms and require alternative access provision. Compatibility between the Station Development project

and the Capacity enhancement projects will therefore be important in ensuring an efficient and cost effective overall solution and the avoidance of abortive work.

The aims of the scheme are:

- direct step free interchange between trains and Tramlink. This improved interchange between transport modes would give overall journey time savings. It would also result in a DDA compliant station;
- enhanced station facilities;
- increased station pedestrian flows at peak times;
- improved TOC fare box income, retail revenue and station maintenance costs;
- increased station access income;
- the project would enable 10-car trains to use this station;
- additional track capacity through the West Croydon to London corridor;
- rail punctuality improvements;
- economic regeneration of the West Croydon area;
- environmental benefits;
- safety benefits and improved security – enhanced CCTV.

A significant increase in future patronage at the station could be argued to originate from extension of the East London line, leading to the issue of whether some, or all of the station improvement works should have been funded by the ELL scheme. In addition there is mention of adjacent redevelopment (see below), while the station works, at £5m, could potentially be funded under NRDF rather than through the SBP.

There are several significant project interdependencies or associated issues with the West Croydon project:

- The redevelopment of railway land at the existing West Croydon Station located between London Road and Station Road. This could potentially provide funding for some of the station improvements. However the current project team state that they have not allowed for the possibility of developer funding in their present proposals. The land development options are understood to be in the early stages of consideration, and it may be unlikely that they could be developed on a timescale which would allow developer contributions to the initial station scheme. Opportunities will need to be explored however, possibly to contribute to funding further improvements;
- 10-Car operations to Victoria/London Bridge – The 10-Car scheme will only be of significant benefit once the 10-Car project for the Gipsy Hill and Norbury routes into Victoria are completed in addition to the Sydenham line into London Bridge.
- Route 2 Power Supply Enhancements – This scheme is required to facilitate the West Croydon station redevelopment project;
- 10 Car Suburban operations into Victoria and London Bridge project (Up bay and platform 3 extension, and S&C);
- West Croydon is also included in the Thameslink Programme (platform 3 extension, new ramp, lighting and CCTV facilities etc.). The linking of the third 12 car platform to Thameslink might suggest that some or all of the track and platform remodelling should have been included in, and funded by, the Thameslink project;

As well as considering potential alternative sources of funding, it would seem highly desirable to integrate all the works proposed at West Croydon which should allow efficient implementation and potentially reduce overall scheme costs, including the SBP contribution.

Project Costs for the two packages of work are:

- For the track capacity scheme: £16.065m, which we have re-profiled according to the NR programme;
- For the station development: £8.276m of which £5m is identified as the CP4 SBP contribution.

8.8 Waterloo International Conversion - Medium Term

Although Waterloo has 19 platforms available for domestic services, they are very highly used at peak times, while the approaches to Waterloo also operate close to capacity due to the restrictive layout of the station throat. There are aspirations to run longer (10 or 12 car) trains on a number of routes, which is constrained by the limited length of some platforms at Waterloo. Current platform lengths are.

Platform	Capacity, cars	Platform	Capacity, cars
1	8	11	12
2	8	12	12
3	8	13	12
4	8	14	12
5	10	15	12
6	11	16	12
7	11	17	8
8	12	18	12
9	12	19	8
10	12		

The transfer of Eurostar services to St Pancras has created the opportunity to release five platforms at Waterloo International Terminal for potential future use by domestic services. It is expected that this will provide the operational capacity and flexibility necessary to meet anticipated demand growth.

The CP4 proposals for Waterloo envisage platform extensions to meet the requirements of the South West Suburban railway 10-car scheme (Section 4.10) and bringing into use Waterloo International Terminal for limited domestic services. The key to the SW Suburban proposals is Platforms 1 to 4, which currently can only accommodate 8-car trains. Network Rail believes that all can be extended to accommodate 10-car trains. The longer term aspiration is for a 12 car railway. Platforms 1 to 4, as a group cannot realistically be extended to 12 cars. Extension therefore requires Platforms 1 and 2 to be closed in order to create space in the station throat to extend Platforms 3 and 4. The capacity lost through closure of Platforms 1 and 2 would be offset by making available equivalent capacity in Waterloo International Terminal and effectively shuffling services and platform uses across the station.

As a first stage in creating additional capacity and flexibility, an interim scheme, bringing into use, for limited services, of one of the WIT platforms, is proposed. This would only require minimal alterations to passenger facilities. This is understood to be outside the CP4 and SBP proposals.

Beyond CP4, Network Rail has plans for a much more comprehensive redevelopment of the station, involving major reconstruction of the concourse area and access to the underground

to increase passenger capacity. Developer contributions would fund a significant portion of such a major scheme.

The SBP CP4 scheme covers initial conversion of Waterloo International Terminal to domestic use and platform extension works. This includes the following:

- bridge over WIT 'Orchestra Pit' to allow a level access between WIT and Waterloo domestic station;
- partial use of WIT arrivals facility;
- access to LUL directly from WIT;
- track and signalling works leading into WIT to accommodate Windsor Line services;
- extension of platforms 3 & 4 at Waterloo; and
- closure of platforms 1 & 2 at Waterloo and replication of track functionality.

The scheme's aims are:

- all platforms at Waterloo to be of at least 12 car length or more;
- passenger concourse capacity increased;
- interchange provision between Rail, Underground and bus routes to be enhanced; and
- Improved operational flexibility.

There are four significant project interdependencies with the Waterloo International project as well as associated issues:

- 10-Car SWML Operations; this scheme supports the adaptation of Waterloo International to permit longer trains to operate.
- Depot Facilities; a review of depot operations and stabling provision is required to cater for 10 and ultimately 12-car train sets.
- Clapham Junction Station Capacity; this scheme is being conducted to cater for future growth in rail transport for the busy mainline station.
- Power Supply Enhancement (Route 3); in order to cater for longer trains on certain sections of this route, it will be necessary to carry out power supply enhancements.

The review on 10 Car SW Railway scheme scope shows that £30.336m has been included in the estimates for Waterloo platform 1-4 extensions in the 10 Car SW Railway scheme. Platform extensions, in a different form, are included in the Waterloo scheme described above. It should therefore be appropriate to remove the Platform 1 to 4 works from the 10 Car SW Railway scheme. The WIT conversion scheme allows for the creation of 12 car platforms, which are not fully needed for the 10 car scheme. A further saving of £10m could potentially be realised by extending platforms to 10 car length only.

The estimate review Sheet shows a cost of £57.236m with £52.613m in CP4.

For our financial assessment, we have used the £57.236m and re-profiled the expenditure to match Network Rail's programme in the "Orange and Green Charts".

8.9 Clapham Junction Station Capacity and Platform Lengthening

Clapham Junction is a key interchange station. It is severely congested – especially in the central subway and the stairways leading to it. The station is not DDA-compliant, and passenger facilities such as retail outlets, toilets and ticket offices and machines are poor. Platform lengthening is required to allow platforms to accommodate 10 and 12 car trains as required by the train lengthening schemes. Platforms 14 to 17 (and particularly 16 and 17) are located on sharp curves and stepping distances are non-compliant. A commercial development is proposed on the land on the east side of the station (adjacent to Platform 17)

and it is proposed to negotiate some land swaps along the site boundary to allow some track realignment and straightening of the platforms to achieve compliance. New station entrances and access would be incorporated in the development.

There would also be infrastructure works to lengthen platforms 3-6 and 10-15 to 12-car and passive provision for works to lengthen the South West Main Line up direction Platforms 7&8 to 12-car at a later date. Congestion relief measures to encourage people to use the overbridge rather than the subway would be introduced, together with the reopening of the St John's Hill entrance and provision of additional steps between the footbridge and the platforms to relieve congestion. There will also be provision of a new station concourse with retail and ticket hall etc. and provision of step-free access to all platforms.

The scheme's aims are:

- reduce congestion throughout the station;
- lengthen platforms to accommodate 10/12-car trains;
- achieve DDA compliance and straighten the curved platforms;
- reduce safety risks, reduce passenger congestion and improve the station environment.

Clapham Junction is involved in several SBP schemes, such as Route 2 suburban 10 car operations and Route 3 SWML 10 car operations. Network Rail provided a note to explain the works at Clapham Junction contained within the SBP update in March 2008 to make the scope clearer; see the table in Chapter 4.9. Clearly, no scheme is proposed to achieve the 12 car platform length in CP4; platform works at Clapham Junction would only involve platforms 14-17 realignment (covered in Clapham Junction station scheme), platform 15 and 17 extensions (covered in Route 2 10 car operations scheme).

In view of the constrained site, it is likely to be inefficient and wasteful to undertake platform works at Clapham Junction in two or more stages, and consideration should be given to undertaking one comprehensive scheme, delivering the above and 12 car capacity where it is likely to be required, which should lead to overall cost savings. A single fully defined scheme for Clapham Junction is needed.

Other significant project interdependencies include;

- Depot Facilities – A review of depot operations and stabling provision is required to cater for 10 and ultimately 12-car train sets.
- Power Supply Enhancement (Route 2/3) – In order to cater for longer trains on certain sections of route, it will be necessary to carry out power supply enhancements.

The Estimate Review Sheet shows a cost of £61.237m of which £56.473m is in CP4.

For our financial assessment, we have used the £61.237m and re-profiled the expenditure to match Network Rail's programme in the "Orange and Green Charts".

8.10 Salford Crescent New Station

Salford Crescent is a key capacity constraint on the North Manchester rail network, with the station located between the converging junction of the lines from Piccadilly and Victoria stations and the diverging junction to Wigan and Bolton. The two platform layout restricts route capacity and the high platform utilisation has introduced performance issues. The station has grown into a significant interchange point and a key destination for the University of Salford and businesses in the area. The station is therefore now used by large numbers of passengers, and there is demand for a wider range of train services.

The existing platforms are only 2m wide for much of their length, compared to the current minimum standard of 2.5m. This gives rise to passenger crowding and safety problems, and

an interim scheme, to provide additional passenger standing capacity by removing waiting rooms and other platform buildings is to be implemented to provide some 'breathing space' until a permanent solution can be developed and implemented.

The station platforms are only capable of accommodating trains of up to 5 cars, and a number of trains on the route are already longer than this, principally the Trans-Pennine Express services. These trains cannot call at the station. The number of such trains is expected to increase significantly over the next few years. This leads to the erratic calling patterns, service gaps and removes connections between trains.

Network Rail has developed an outline business case which supports the redevelopment of the station to provide more passenger and rail capacity. The principal project objectives include:

- Redevelop the station to provide a station designed to meet foreseeable rail demand – both passenger and train services – over the next 50 years. It should be future proof in respect of future train service patterns and related developments such as Manchester Hub.
- Provide a station which will improve connectivity to and from the surrounding area, as well as connectivity through the station by way of train/train interchange.
- Improve bus/rail interchange.

Network Rail is working closely with Salford Urban Regeneration Company, Salford City Council, Salford University, and GMPTE in identifying requirements and developing proposals. GRIP1-2 study work undertaken in 2007 identified two redevelopment options for the station, one a reconstruction on the existing site and an alternative to relocate the station to the north. These are to be investigated in detail and evaluated to identify a single preferred option in a GRIP 3 level study to be undertaken during 2008.

Project interdependencies include:

- Bolton corridor package;
- Manchester Hub issues including options for alternative train terminating and passenger interchange options at Salford Central, Manchester Victoria and Piccadilly.
- Manchester Hub, possible Ordsall Lane Chord option.
- North West area platform lengthening; longer platforms at Crescent will be an essential element in delivering the increased capacity. The reconstruction scheme will provide the future requirements for platform length.

Manchester Hub issues are referred to briefly in Section 10.39.

Network Rail's Business Plan, identifies a Point Estimate of £22.645m, of which £21.834m is in CP4. This is for a basic reconstruction. Network Rail is in discussions with project partners on possible sources of funding to deliver additional benefits in terms of station quality, additional capacity and improved interchange.

We consider that reconstruction of the station would be required to meet passenger capacity requirements. For our financial assessment, we have used the £22.645m and re-profiled the expenditure to match Network Rail's programme in the "Orange and Green Charts".

8.11 Liverpool James Street

Network Rail states that James Street has capacity issues at peak times and at times when the station is used as a turn back for Wirral line services during closures of the loop system. The station is very close to a number of major retail and leisure developments in the city, most notably, Liverpool One; a forty two acre retail, residential and leisure development, the Museum of Liverpool and the Kings Dock Arena. The passenger implications of these

developments will be included in the Merseyside RUS study work. The station is on a constrained site and the only access to platform level is by lifts. The lift capacity is noted as already insufficient to meet passenger demand at peak times. Therefore this project is proposed to address passenger crowding and access problems.

This scheme is at a very early stage of development and was developed without the benefit of an existing RUS. The full scope of works is unclear, but the scheme is likely to address the station access issues between platform level and street level.

The scheme seeks improvements to:

- overall journey time due from avoiding the need for long waits for access to and from the platforms and due to the need to shut the station;
- the passenger environment.

The only interdependency of the scheme noted by Network Rail is the requirement to extend platforms as a result increasing overall train lengths in the entire Merseyside area, and platform lengthening at other locations. However, it should be noted that these schemes do not affect the lines service.

Network Rail states that the cost estimate for James Street is based upon a very high-level appraisal of what could be undertaken; e.g. additional passenger lift capacity and upgrading, improvements to pedestrian and emergency access/egress to cater for increased passenger numbers, and re-configuration of the station concourse to provide more space. The estimates are high level.

The Estimate Review Sheet shows a cost of £9.100m of which £8.320m is in CP4.

Network Rail had agreed that this scheme is not required by HLOS. They have stated that no developer contributions are expected to be achieved. We assume this project will be funded locally, probably from Merseytravel. The issues of funding need to be explored with Merseytravel and Liverpool City Council, and particularly the possibility of capture of some developer contributions.

For our financial assessment, we have not therefore included any allowance.

8.12 Salford Central New Platforms

We were not asked to undertake a detailed investigation into Salford Central.

Salford Central station has not been the focus of attention for many years, and despite being the closest station to parts of Manchester City Centre (as well as Salford), until recent times it had relatively poor train services. Major redevelopments are now taking place in the area, and staged schemes for the upgrading of the station have been developed, the first of which – the reconstruction and upgrading of the station entrance has now been implemented. The station improvement works are externally funded and are not a SBP requirement.

Two Rail routes pass through the Salford Station area – The route from Manchester Victoria to Wigan, Bolton and Preston and the route from Victoria to Liverpool. There are station platforms on the former route but not on the latter. Preliminary work by Network Rail indicates that there is a business case for provision of platforms on the Liverpool line. This would have journey time benefits for a significant number of passengers who work within the Central station catchment but who currently have to travel through the area and interchanging at Victoria. The scheme was recommended in the North West RUS.

Potential project interdependencies include:

- Salford Central Station Enhancements – primarily sponsored and funded by GMPTE and Salford Urban Regeneration Company – The platform scheme needs to be integrated with the station works;

- Possible options for relocating some terminal capacity from Victoria to Salford central or Crescent;
- The Manchester Hub proposals, most notably the option for an Ordsall Lane Chord which could have track realignment and remodelling impacts on the station;
- The North West area train and Platform lengthening proposals. Network Rail have provided reassurance that the proposed platforms would be long enough for foreseeable future requirements. There would therefore be no funding requirement from the NW Platform Extension scheme.

Manchester Hub issues are referred to briefly in Section 10.22.

Network Rail has agreed that this scheme cannot be justified against HLOS capacity requirements. However, the growth implicit in these requirements will, in the professional judgement of Network Rail and Train Operators, imply traffic levels that will require the works at Salford Central. There would be benefits of reducing passenger loadings on trains into Manchester Victoria. The Estimate Review Sheets show a cost of £11.279m of which £11.280m (cannot be higher, but this is what the Sheet records), all in CP4.

For our financial assessment, we have used the £11.279m and re-profiled the expenditure to match Network Rail's programme in the "Orange and Green Charts".

8.13 Liverpool Central Passenger Capacity

Liverpool Central has experienced the difficulty to handle the existing level of passenger numbers during the busy peak hours, and on some weekends during major public events in the city. Passenger congestion is exacerbated at platform level by the narrow platforms inside the constrained tunnels. The passenger capacity issue will escalate with the opening of the new commercial developments in the next few years. Network Rail is working closely with Merseytravel to identify options to relieve this congestion.

Earlier studies for Liverpool Central have been carried out by Merseytravel to assess the implications based upon then forecast levels of increases in passenger demand which have since been exceeded. It was recognised that there was a need in the light of the substantial commercial, retail and residential growth in the city centre to re-appraise the contemporary status and future forecast growth in passenger numbers; and this is to be examined further in the Merseyside RUS.

Like the James Street scheme, this project is also at a very early stage of development and was developed without the benefit of an existing RUS. It is proposed that the main works will improve the platform environment on the Northern line platforms to enable Liverpool Central to handle more passengers by improving the layout, increasing circulation areas and passenger flows, and potentially altering train services.

The scheme's outputs are:

- Increased passenger capacity – allowing the potential for an increasing number of lengthened services to call at the station;
- reduced overcrowding; improved station layout by increasing circulation areas and passenger flows
- improved train performance.

The NR documentation states that the Liverpool Central and Route 20 platform schemes are interdependent. However, Merseyrail (route 21) is effectively a closed DC network with its own rolling stock and without any other TOC using the infrastructure. No platform lengthening is proposed for Route 21 in CP4. The Route 21 Route Plan states that "the service provision is expected to remain broadly unchanged through CP4, with train lengthening as required. The network is built for 6-car operation, and many services currently operate as 3-car. Consequently, within CP4, train lengthening is not expected to

provoke a need to change any infrastructure – such as lengthening of platforms." Moreover, the Liverpool Central scheme is purely a passenger capacity (recirculation) scheme - removal of huts and buildings etc on the platform. There would not appear to be inter-dependency between the Routes. Route 20, on the other hand, includes the non-DC suburban routes on Merseyside and is a mixed traffic/stock route, so there is potential for platform lengthening there.

NR states that the cost estimates were provided ahead of the findings of the Merseyside RUS study in the expectation that something would have to be done based upon the knowledge of the present circumstances and earlier work coupled with the widespread known development in the city. Feasibility studies based upon the findings of the RUS study are planned to be undertaken to assess a number of options to increase capacity at each of the stations. This will provide greater definition of what can or cannot be done and the likely cost of so doing.

NR states that the estimates included in the SBP submission for Liverpool Central are founded upon a review by the stakeholder group and in part the earlier work carried out under the Merseytravel studies.

The Estimate Review Sheet shows a cost of £11.990m of which £11.519m is in CP4.

Network Rail has agreed that this scheme is not required by HLOS. They have also stated that no developer contributions are expected to be achieved. We assume this project will be funded locally, probably from Merseytravel. The issues of funding need to be explored with Merseytravel and Liverpool City Council, and particularly the possibility of capture of some developer contributions.

For our financial assessment, we have not therefore included any allowance.

8.14 Leeds Area Schemes

At the time of publishing the October SBP, work on the Yorkshire & Humber RUS was at a fairly early stage, but growth into Leeds was likely to be an issue. The SBP Update therefore included a batch of schemes in the Leeds area. In this report, this is the first place at which a discussion of these inter-related schemes is possible, so we deal with the issues generically here.

Based on the December 2006 timetable, Network Rail estimated that there would need to be around 120 additional vehicle arrivals in Leeds by 2014. The RUS has identified a problem in terminating high-peak-hour services.

Network Rail has been in discussions with Northern Rail, the ToC for local services, over the issues of meeting growth, meeting the HLOS capacity metrics and the most suitable deployment of the additional rolling stock expected through the DfT rolling stock strategy. In this regard, Network Rail notes that its discussions with Northern on rolling stock are currently somewhat further advanced than with other Train Operating Companies.

The original base strategy was for demand increases to be met principally by train lengthening. More detailed analysis has indicated problems in accommodating the longer trains in the peaks due to platform length restrictions (some trains are ‘double-stacked’ on platforms at present and will not fit when lengthened). The large number of terminating services that have to be accommodated also means that some of the through platforms are not used as efficiently as they could be.

Northern’s view was that there would be advantages in running more shorter trains, rather than longer trains, on some routes, and particularly some shorter distance ‘turnback’ stopping trains, while the issue of platform accommodation at Leeds could be addressed by running more trains through Leeds, rather than terminating them there. This strategy would have the following advantages:

- The need for platform lengthening could be reduced;

- The trains could be better accommodated in the platforms at Leeds;
- The increased frequency would lead to increased patronage and revenue;
- Running additional short distance stopping services would allow stops to be removed on longer distance services, with journey times or revenue advantages;
- Additional rolling stock could be concentrated on shorter distance services around Leeds, making better use of vehicles, and avoiding largely empty mileage on the outer ends of longer distance services. This would save operating costs and potentially reduce the number of vehicles required.

The outcome is a proposal to provide a combination of additional bay platforms, turnback facilities and through running of services to a new station in east Leeds near Micklefield. The new station would be needed to more evenly balance numbers of services into and out of Leeds to the east and west.

The commentary does not however discuss the potential disadvantages of this strategy, which could include:

- The requirement for additional train paths into and out of Leeds, where the RUS stated that most of the capacity created by Leeds First has already been used, and operation of more short trains may not be the best use of that limited capacity;
- The need for additional turnback platforms/facilities at additional capital cost and which might only see use by one or two trains in the peak periods only;
- The additional operating costs of running short distance trains due to the extra train crew and potentially high proportion of time spent in turnback layovers.

The above approach has led to a proposed strategy which proposes the following overall approach:

- Train lengthening will be employed on the following lines, although in some cases additional services will also be needed:
    - Doncaster – Wakefield – Leeds;
    - Huddersfield – Dewsbury – Leeds;
    - Selby – Micklefield – Leeds;
    - Knottingley – Castleford – Leeds;
    - Ilkley – Leeds.

The length of the Huddersfield – Leeds stopping services will require an additional platform at Huddersfield as the existing bay platform cannot be extended sufficiently. On other routes more intensive use of rolling stock would be achieved by “turning short” and allowing some units to form more than one peak arrival. Turnback facilities are therefore proposed at:

- Keighley;
- Horsforth, with reduced signalling headways between there and Harrogate;
- Todmorden;
- Additional bay platforms at Leeds Station;
- A new station with turnback bay platform at Micklefield: Leeds East Parkway.

Network Rail also states that the passenger growth projections indicate that passenger congestion in the station will become an increasing problem in the peaks, particularly around the exit. They have therefore included proposals for a new ‘Leeds Southern Entrance’.

In terms of funding, bids for rail funding in the Leeds area have been made to the Transport Secretary by the Yorkshire and Humberside Regional Transport Board. The Board rejected improvements at Bradford Interchange, and stations on the Airedale route but approved applications for Leeds Station Southern entrance (£10.978m), East Leeds Parkway (£19.4m) and Yorcard (travelcard)(£28m).

We comment on the individual proposals in the following sections.

8.15 Leeds Southern Entrance

8.15.1 Delivering the HLOS Capacity Metric

Network Rail believes that passenger growth will cause congestion on the station itself, especially around the exit. This is a little disappointing in view of how recently the station was extensively reconstructed and enlarged. In consequence, Network Rail has included a Leeds Southern Entrance Scheme in the SBP Update to address the crowding issue by spreading passenger movements.

8.15.2 Leeds Southern Entrance

As briefly introduced above, this project aims to improve the circulation of people using Leeds City station. The main feature of the scheme will be the construction of a bridge over the River Aire. The development involves earthworks, the construction of new retaining walls, S&C renewals, and the installation of extra plain line track as well as lifts, stairs, escalators, toilets, booking office, ticket gates and information screens. To supplement this work, the existing western footbridge will be extended to permit access to/from the southern entrance. Planning permission will be needed for the access and consent required from the Environment Agency for the bridge over the River Aire.

The scheme objectives are as follows:

- to reduce pedestrian journey times accessing Leeds Station to/from the south;
- to meet existing and future passenger flow requirements to the south of Leeds Station;
- to ensure current passenger flows within the station are maintained or improved;
- to ensure Network Rail's operational safety is maintained or improved and
- to ensure Network Rail's operational performance is maintained or improved.

The scheme is at GRIP Stage 3. It is anticipated that it will be completed by June 2011. It has a Point Estimate of £9.862m of which £9.177m is in CP4.

The scheme is reported to include funding by West Yorkshire PTE (CP4 Data Sheet, Feb'08, p.4) although no monetary values were provided in the documentation reviewed. As the scheme will create better access to the station from the southern area of the city there should be revenue benefits from its provision which should be reflected in the costs.

For our financial assessment, we have used the £9.862m and profiled it in accordance with Network Rail's programme.

8.16 East Leeds Parkway

This scheme involves the construction of a Parkway station in the vicinity of the existing Micklefield station. The need for the scheme to be in the SBP arises from the train service strategy described in Section 8.14.

This project is being promoted due to insufficient track capacity being available at Leeds station for longer terminating services, therefore prompting a revised train operation to be developed for the Bradford, Huddersfield and east Leeds rail corridors as a result of future growth forecasts. The work includes the construction of new modular platforms and a new ticket hall. Other aspects of the work include extension of the Leeds area electrification, and the construction of a turnback facility (bay platform).

The scheme objectives are as follows:

- meeting HLOS peak passenger growth through a revised train service operation on the Huddersfield / Bradford and East Leeds corridors due to insufficient track capacity at Leeds for longer terminating trains;
- To provide an alternative strategic access into both Leeds and York, encouraging modal shift;
- Provide new journey opportunities to both local and Regional destinations;
- Providing sufficient capacity to accommodate growth;
- Provide sufficient parking to overcome problems at adjacent stations;
- Potential strategic connectivity to destinations outside the region, including London and Birmingham.

The scheme would provide 'Inter-City' length platforms and would thus provide a diversionary route to a rail head east of Leeds for diesel rolling stock during perturbed workings. Network Rail reports that, to supplement the scheme, line-speed enhancements will be carried out as part of the track renewals process for the area and combined with the 'Timetable' development strategy.

While the Project Data Sheet indicates that the scheme is at GRIP3, it is also noted that the GRIP3 Stage Gate Review has been completed, and the next one due is GRIP4. The planned implementation date is January 2013. According to the Estimate Review Sheet, the Point Estimate is £11.378m of which £10.880m is in CP4. This appears to be the SBP contribution only.

We have prepared two independent estimates for the scheme, one without electrification eastwards from Neville Hill depot, and one with (over a distance of about 12km). For both schemes, we have assumed:

- a 260m length 2-platform station with waiting and customer facilities;
- a station footbridge;
- modifications to signalling;
- a 500m length access road;
- a 250-space car park;
- a central turnback siding to the east of the site, with the existing lines slewed to accommodate it;
- other civils works such as fencing, drainage and utilities.

Our estimate without electrification is £20m and with electrification is £61m. As Network Rail's cost is £11.378m, it was assumed this would not involve electrification. In addition, the £11.378m is shown as the SBP contribution, so we assumed that any gap would be funded by organisations such as West Yorkshire PTE and Yorkshire Forward, or by the netting out of revenue gains from the new train services or retail outlets.

In respect of electrification, we suggest that it would not appear to be needed to meet HLOS requirements, as the "Leeds Cross-City" concept could be met by linking the Manchester Victoria 2tph service through Leeds station to Micklefield. An alternative of routing the diesel Harrogate line trains to Micklefield would potentially cause problems in the western Leeds throat to run through the station. At Micklefield, these 2tph would be supplemented by 4pth Trans-Pennine services, 1tph Cross Country, and 2tph Northern services from Selby to Halifax and York to Blackpool, to create a total of 9tph at the Parkway.

As noted above, the proposed strategy has potential benefits for the operator which should be reflected in the costs. No evidence has been provided to indicate relative capital, operating and revenue costs and benefits of adopting alternative strategies.

A final issue concerns the location of the station. A location nearer Leeds would reduce electrification costs. It is however possible that the proposed electrification could extend to Hambleton Junction (on the ECML), negating the point.

For our independent financial assessment, we have only allowed the £11.378m identified by Network Rail as representing the SBP requirement, the remainder coming from other sources.

8.17 Leeds New Bay Platforms

It is proposed to construct 4 new platforms at Leeds City station; two on the East side capable of 4 x 23m car trainsets and two on the NW side to accommodate 8 x 23m car trainsets. The scheme objectives are as follows:

- To allow longer and additional peak services to operate;
- Meet HLOS peak growth targets for Leeds;
- Improve station capacity at Leeds;
- Improve train performance at Leeds.

A key benefit is the reduction of operational conflicts at either side of the station which will come to fruition once the turnback provisions (see below) is completed. This will not only benefit those trains that terminate at Leeds, but also give greater flexibility to services operating on the through lines which are currently hindered by the existing layout.

The scheme has a number of interdependencies with:

- West Yorkshire Stabling;
- Horsforth Turnback;
- Keighley Turnback;
- East Leeds Parkway station;
- Huddersfield Platform 9;
- Leeds Station Multi-Storey car park & NW side access;
- West Yorkshire platform extensions.

The project also aims to meet HLOS requirements particularly at peak times as well as easing pressure on existing services and hence promoting growth.

Platform capacity at city terminals is always at a premium, and therefore, in principle this scheme seems desirable. However it is designed to fit with the 'more trains' strategy reviewed in Section 8.14, and is thus dependent on additional train paths being available into and out of the station. This capacity match is not addressed in the documentation provided. Network Rail needs to provide more evidence to justify the need for these platforms and how they fit with the other elements of the strategy.

In any event it would seem highly desirable to safeguard the land on which the platforms would be built for future use should they not be built now.

The scheme is at GRIP Stage 0, and it is anticipated that it will be completed by December 2013. The Point Estimate is £16.782m, all of which is in CP4.

For our independent assessment, we have used the £16.782m quoted by Network Rail.

8.18 Birmingham New Street New Bay Platform

The scheme would convert the West Dock line (currently only used for rolling stock storage) into a bay platform allowing West Country services to turn back without occupying a through platform.

The only information we have received to date for this scheme is that on the Enhancements Master Spreadsheet supplied by the ORR in April 2008. The cost identified was £3m. The scheme is noted in summary Table 20 for Route Plan 17 SBP April 2008, p.24. It is quoted as being at GRIP Stage unknown and expected to be completed in 2014.

At presentations given to us by the Birmingham New Street Gateway team, it was explained that a new feature of the 'Gateway plus' scheme was that the current Navigation Street footbridge would be retained for public access to the station and new accesses from it would be constructed to Platforms 1 and 12. For the Platform 12 access, the proposal would be to close the West Dock and use the space to construct the staircase access.

From this description, the Gateway+ and the Bay platform proposals are incompatible. Network Rail need to review the issues to determine if a compatible scheme can be devised, or to develop an alternative proposal. It is noted that Network Rail has previously stated that there is adequate capacity at New Street and that all demand increases can be met by train lengthening.

Network Rail agrees that this scheme is not required to meet HLOS requirements.

8.19 Crewe Remodelling / Resignalling

We understand that this project is being reviewed by others as part of the West Coast schemes. Network Rail's latest estimates show the cost excluding risk as £428.6m, and we have included this figure for the ORR's consideration.

8.20 East Midlands Resignalling - Nottingham Station Area

The SBP contained two projects at Nottingham: the Station Masterplan development, and a track and signalling remodelling scheme. The Station Masterplan proposal was removed from the SBP Update, leaving only the remodelling and capacity improvement scheme, now titled 'East Midlands Resignalling – Nottingham Station Area'.

Related Projects include:

- Nottingham Express Transit Extension;
- Nottingham Station Masterplan;
- Nottingham to Grantham/Newark Resignalling.

A series of projects is in progress under the overall title of "East Midlands Resignalling", the principal purpose of which is to replace life-expired signalling. Network Rail intends to take advantage of this work to undertake enhancements to layouts and capacity where they can be carried out at marginal extra cost at the same time as the resignalling.

The Nottingham station area represents a significant capacity constraint on the region's rail network, and the station operates close to capacity at peak times. Although the station is largely laid out as a through station, there is a considerable imbalance of services between the west and east ends, with a significant number of services from the west terminating at the station, leading to a large number of conflicting train movements. The western approach is 4-track and is laid out as a 'up, up, down, down' layout. This results in a large number of train conflicts in the Mansfield Junction area, through the routeing of trains in the station throat to reach their respective platforms.

Rather than develop a 'like-for-like' scheme, Network Rail correctly proposes to take advantage of the need for substantial renewals to develop a scheme which will deliver capacity and performance benefits at modest incremental cost. The track layout would be

remodelled to reduce conflicts and allow an increased number of parallel and bidirectional movements. Increased junction and turnout speeds would allow journey time savings of 1.5 minutes for trains to and from Sheffield, and lesser amounts on other routes.

In addition to the Trent Power Box area resignalling, there are also proposals for the resignalling of the Newark and Grantham lines to replace the current Mechanical signalling. The remodelling will deliver capacity and performance benefits outside the HLOS, but will facilitate service improvements planned for December 2008, including:

- New Nottingham – Sheffield – Leeds Service;
- Extension of Matlock service from Derby;
- Strengthened service on Liverpool - Norwich axis.

The resignalling east of Nottingham will facilitate the provision of a turnback arrangement at Bingham, which will allow a 'cross-Nottingham' shuttle service with park and ride opportunities, which would also have the advantage of removing some terminating trains from Nottingham station.

The project is listed in The SBP Update in Figure 6.19 under 'Enhancement to Renewal. The Estimate Review Sheet shows a project Point Estimate of £19.209m, of which £18.770m is in CP4. Although not contributing directly to HLOS the scheme has benefits in terms of capacity and performance. To achieve value for money, the scheme needs to be carried out at the same time as the track and signalling renewals.

For our independent assessment, we have included the £19.209m spread over NR's programme.

9 Power Supply Enhancements

9.1 Our Understanding of Network Rail's Assumptions

Network Rail provided some commentary on issues associated with the power supply enhancements, with the following assumptions and clarifications. Network Rail advised that:

- The enhancements are at GRIP Stage 1, and therefore the assessments were made in the light of the completed Southern Power Supply Upgrade Project.
- The scope of works to National Grid infrastructure was determined by assessing where the likely changes to Firm Service Capacity (FSC) are needed; one site has been identified as a possible new supply point at Staines. Some of the FSC changes will lead to physical works and therefore considerable cost. Other locations will have a simple DNO assessment. DNO estimates will be needed for the next stage of development. Network Rail and the DNO (EDF) have regular liaison meetings and the principle of these changes has already been discussed.
- In terms of regenerative braking, assumptions around rolling stock were made and the benefits of regenerative braking were considered, but this has probably not been taken into account in detailed modelling. The extent to which it would offset the need for enhancement of the power supply will be known at the next design stage.
- In terms of detailed project scope and cost estimates, a further review into aligning renewals and the enhancements is on-going. Key to the development of the next level of detail is a clear service change specification and assumptions with timescales of changes.

9.2 The Background Assumptions

The outputs/project remit, scope, cost and timescale sections for each of the routes are extracts from the document titled 'Network Rail Project Summaries Control Period 4' and are included purely to facilitate the determination of the comments and to put them in context.

We have provided comments which relate to a draft document titled 'Traction Power Supply Requirements for CP4' which we received from Network Rail. We assume that the costs stated in the document are based on recent project experience; however, when the document is finalised it would be prudent to ask Network Rail for the supporting justification for the asset unit costs including examples of the out-turn costs of similar works.

The 2007 RSSB report titled 'Study on Further Electrification of Britain's Railway Network' was used as a guide in assessing AC electrification costs. It states that 'an Optimism Bias has been applied in accordance with DfT guidelines the level of which, considering the detail of the estimates, is considered cautious'. The costs quoted in the RSSB report are thus higher than, and inconsistent with, Network Rail's cost estimates.

For DC works, we used knowledge gained by our sub-consultants working on NR DC projects, such as the 'Southern Region Power Supply Upgrade Project'.

Thameslink Programme and North London Line power supply enhancements were not part of the remit for this review.

9.3 NR Cost Estimates

It is likely that there will be some changes in the costs quoted in the document titled 'Traction Power Supply Requirements for CP4' before it is finalised The outputs/project remit, scope, cost and timescale sections for each of the routes below are extracts from the document titled 'Network Rail Project Summaries Control Period 4' and are included purely to facilitate the determination of the comments and to put them in context.

The outputs/project remit, scope, cost and timescale sections for each of the routes below are extracts from the document titled 'Network Rail Project Summaries Control Period 4' and are included purely to facilitate the determination of the comments and to put them in context.

For DC scheme costs on Routes 1, 2 and 3, the overall accuracy for the estimated costs is quoted as -30%/+50% which suggests that in most cases detailed power loading calculations have not been undertaken, and that the proposals are based on the professional judgement of NR electrification engineers. Network Rail therefore seems to accept that the costs estimates may well be on the high side.

For AC costs on Routes 5, 6, 7, 17 and 18, the costs were derived from the 2007 RSSB report titled 'Study on further electrification of Britain's railway network', in which it is stated that "Optimism Bias" was applied.

There is no evidence to suggest that Network Rail has over-specified the scope of the work required, except to repeat that their estimates are skewed to the higher end of the -30% / +50% range. They have not undertaken detailed power modelling calculations, and they have derived the estimates on a "pro-rata" basis from the Southern Region Power Upgrade (completed about 2 years ago).

9.4 Conservative Specifications

We have some concern that Network Rail's cost estimates are based on unduly conservative assumptions on train performance, component failures, or include inappropriately-high standards. The cost estimates are skewed to the higher end of the -30%/+50% range, which correlates with the lack of detailed power modelling. Modern power supply equipment is both reliable and easily switchable, and modern trains can be instructed to limit the traction current draw in an area considered to be 'delicate' in the high peak. However, very high standards of power supply reliability are needed to achieve the train service performance needed in dense suburban networks, and to meet a 92% PPM.

9.5 Power Supply Upgrade (Route 18 Auto-Transformers)

The WCML Auto-transformer (AT) technical proposals include:

- two new feeder sites;
- telecommunications links to the distribution equipment operating remotely via the SCADA sub-system;
- equipment and software to control the autotransformer system of electrical supply to the rail infrastructure on the West Coast Main Line;
- equipment to support the introduction of new auto-transformer distribution sites.

The Enhancements Master Spreadsheet quotes the costs at £463.412m of which £272.410m is in CP4.

Initial system design considerations have established a principle of 10km (nominal) spacing between AT sites, each containing two transformers to permit routine or unplanned outages. Detailed switchgear configuration and autotransformer feeder sectioning, etc. will be developed as part of the system design for each feeding area and submitted for approval under the defined acceptance procedures for the project under single option development. At that stage, a full range of switchgear options will be presented and considered for best value, taking into account the existing switchgear type and condition. Further system modelling will also be undertaken to validate the design proposed and ensure that compliance to standards is achieved including electrical system compatibility. Our independent analysis would suggest that new 25kV supply points for AT systems are generally provided from the 400kV NG transmission network rather than from the 132kV NG transmission network in order to minimise the disturbance effects of the larger railway single

phase loads on the NG transmission network. The cost of 400kV/25kV supply points is much higher than that for 132kV/25kV supply points.

Although the document titled 'Traction Power Supply Requirements for CP4' include £15m for one new 400kV/25kV supply point at Catterall, no allowance has been made in the document for the second new 400kV/25kV supply point as implied by the above statement that "Technical outputs include: two new feeder sites…".

We understand that this scheme is being reviewed by others as part of the review of route 18 schemes.

9.6 Power Supply Enhancements (Route 1)

The project would provide sufficient power to allow all services operating into or via London Bridge to run as 12-car. 12-car operations would benefit the following lines and services:

- Sidcup and Bexleyheath lines to Dartford;
- Greenwich line to Dartford;
- the Hayes line stopping services to Sevenoaks;
- beyond Dartford to Rochester.

Provision is to be made for DC regenerative braking.

Network Rail's SBP identifies a Point Estimate of £20.344m of which £18.900m is in CP4.

The project scope includes the following:

- HV system reinforcement, including a new cable from Elmers End to West Wickham;
- HV equipment upgrades at New Beckenham, Bromley, Chelsfield, Knockholt and Elmers End;
- TPH conversions to substations at Swanscombe, Gravesend, Uralite and Tunnel;
- protection and ETE reinforcement with an allowance to be made for 10% ETE reinforcement and protection upgrades.

Delivery is projected in 2011.

The proposed works for Route 1 assume that the New Cross supply point works in CP3 are complete and adequately reinforce the inner London area for 12-car operation.

It is not clear which GRIP stage applies to these enhancements and whether or not any power loading simulations have been undertaken.

The overall content however would seem to address those areas requiring reinforcement but it is unclear why Littlebrook TPH was not included in the group of TPHs to be converted between Dartford and Strood.

The cost of the two-track TPH to substation conversions seems high at £3m per TPH. It would be prudent to request examples of the conversion cost of similar TPHs on the recently completed NR Southern Region Power Supply Upgrade Project.

DC protection upgrades are required to enable regenerative braking and an unspecified provision has been included in the £2m total for 10% ETE reinforcement and for protection upgrades.

Control arrangements will be required if regenerative braking is permitted. This will ensure that trains do not regenerate outside the permitted area so that dc track circuit breaker trippings due to track short circuits are not inhibited by trains regenerating into a fault. Such control arrangements may result in costs to TOCs, and should result in a relatively lowered power demand.

9.7 New Cross Enhancement to Power Supply

The following statement is on page 18 of the document titled 'Traction Power Supply Requirements for CP4': 'The completion of New Cross in CP3 is critical to the achievement of the outputs in CP4'.

Network Rail's Business Plan identifies a Point Estimate of £17.881m of which £15.183m is in CP4.

9.8 Power Supply Enhancements (Route 2)

Power Supply Enhancements are required to facilitate the following enhancements:

- Brighton Main Line: an extra 2 TPHs south of Gatwick Airport and all services via Clapham Junction and East Croydon to be 12-car;
- all services into London Bridge via East Croydon to be 12-car;
- Sussex suburban network to increase from an 8 to 10-car operation, for services into Victoria and London Bridge, including the potential for an extra 2 TPHs on the Selhurst to Victoria route;
- Oxted to East Grinstead route: to increase from 8 to 12-car operation.

Network Rail's Business Plan identifies a Point Estimate of £19.351m of which £18.041m is in CP4.

The scope inputs include:

- various FSC increases;
- rectifier equipment upgrades at Tulse Hill and Purley;
- TPH Hut conversion at Burgess Hill;
- amendments to Shepherd Hill TPH;
- TCR removal by installation of TPH at Hooley and Quarry;
- protection and ETE reinforcement with an allowance to be made for 10% ETE reinforcement and protection upgrades;
- upgrade of the New Cross Grid feeder connection to the national power distribution system at the time of the planned renewal.

The assumed delivery date is 2012.

The proposed works for Route 2 assume that the New Cross supply point works are completed in CP3.

The replacement of TCRs by the provision of TPHs at Hooley and Quarry is essential to prevent single end load trippings due to higher traction loads.

There is no mention of regenerative braking, nor of the protection upgrades required. As for Route 1, control arrangements will be required if regenerative braking is permitted to ensure that trains do not regenerate outside the permitted area. Such control arrangements may result in costs to TOCs.

9.9 Power Supply Enhancements (Route 3)

On Route 3, the following Wessex Suburban services to Reading, Windsor & Eton Riverside, Woking and Guildford require power supply strengthening in order to facilitate an increase in train length operation from current 8 to 10-car then to 12-car.

Network Rail's Business Plan identifies a Point Estimate of £37.214m of which £35.450m is in CP4.

The project scope includes the following items:

- HV system reinforcement, including a new cable from Elmers End to West Wickham;
- FSC increases;
- new supply at Staines;
- upgraded Twickenham switching station;
- upgraded rectifier transformers at Leatherhead and Queens Road A;
- TPH to substation conversions at Earley, Emmbrook, Buckhurst, Whitmoor, Sunningdale, Addlestone, Glanty, Ashford, Feltham, Isleworth, Chiswick, and Mortlake;
- protection and ETE reinforcement with an allowance to be made for 10% ETE reinforcement and protection upgrades.

The delivery date is described as 2010-2014.

The £1m cost for the 'HV system reinforcement, including a new cable from Elmers End to West Wickham' included in scope for route 3 above is already included in the scope for route 1.

As for Route 1, the assumption of £3m for each two track TPH to substation conversion seems high.

There is no mention of regenerative braking, nor of the protection upgrades required. As for Route 1, control arrangements will be required if regenerative braking is permitted to ensure that trains do not regenerate outside the permitted area. Such control arrangements may result in costs to TOCs.

9.10 Power Supply Enhancements (Route 5)

This scheme is for the provision of enhanced power supplies to cater for increases in train service frequency and longer trains. Parts of the SBP link these together, while the "Orange and Green Charts" list the schemes separately.

The SBP identifies a Point Estimate of £3.573m of which £3.410m is in CP4.

On Route 5, a total of £3.573m has been included for a major 25kV supply point works by the DNO including works at Ugley and at Northumberland Park. £1.2m is included as a contingency should other 25kV supply works be required by the DNO at Rye House and Milton 25kV supply points if studies indicate that the disturbance levels created by the additional loads are outside of the disturbance limits set by the DNO. In order to maintain parity of approach to costing, this £1.2m has been removed.

9.11 Power Supply Enhancements (Route 6)

This scheme is for the provision of enhanced power supplies to cater for increases in train service frequency and longer trains. Parts of the SBP link these together, while the "Orange and Green Charts" list the schemes separately.

The SBP identifies a Point Estimate of £0.521m of which £0.496m is in CP4.

9.12 Power Supply Enhancements (Route 7)

This scheme is for the provision of enhanced power supplies to cater for increases in train service frequency and longer trains. Parts of the SBP link these together, while the "Orange and Green Charts" list the schemes separately.

The work includes improved supply points so that there is sufficient traction supply. This includes strengthening the feeder at Springfield on the Great Eastern as well as an improved power supply north of Cambridge and some minor works on the Thames-side route. The delivery date is quoted as 2009 to 2013.

The proposal to convert the Shenfield to Colchester section to an auto-transformer system would seem inappropriate unless it is the only way forward to meet the additional loads.

The SBP identifies a Point Estimate of £6.053m of which £5.779m is in CP4.

Our independent review suggests that the £6m included to upgrade the existing Springfield 25kV supply point is too high. It equates to the basic NR estimate for the DNO costs for the provision of a new double circuit 132kV to 25kV supply point. It may be that the DNO is unable to provide the capacity required from the existing 132kV circuits without significant reinforcement of their existing 132kV network or additional works are required to minimise the disturbance effects of the increased single phase railway loads on other DNO consumers. Until the load profiles are known for the increased train lengths and for the additional train services meaningful discussions cannot be held with the DNO to determine the best way forward and thereby the cost.

9.13 Power Supply Enhancements – Summary of Costings

For DC costs on Routes 1, 2 and 3, the overall accuracy for the costs is quoted as +30%/-50% which is not in accordance with GRIP. It also suggests that there may be a risk allowance because detailed power loading calculations have not been undertaken. This belief accords with previous OSLO power studies (at later GRIP stages than the present studies) where refinement of power loadings usually results in a lower cost design. We also believe that there is an acceptance within NR that OSLO will result in lowered funding requirements, hence the skewed distribution, suggesting that the present costs estimates are too high. We have therefore reduced the costs by 10% to lie in mid-range, consistent with the symmetrical distribution in GRIP.

For Routes 5, 6, 7, 17 and 18 (as we described earlier), AC costs include “Optimism Bias”, but the percentage value was not stated. We assume it would be about 40%. There may also be an additional risk allowance included in the estimate. For example, if the true cost were 100 units, NR have probably added 40 units for Optimism Bias, and a further 10 units for the risk allowance, giving a cost of 150 units. To restore the underlying figure of 100 units, we have reduced the Network Rail estimate by 33%.

The table below summarises our independent estimates.

Route	Network Rail Point Estimate	Amendment made	Arup Point Estimate
			.
Route 1	£20.344m of which £18.900m is in CP4	Deduct 10% for skewed risk distribution	£18.310m
New Cross	£17.881m of which £15.183m is in CP4	Deduct 10% for skewed risk distribution	£16.093m
Route 2	£19.351m of which £18.041m is in CP4	Deduct 10% for skewed risk distribution	£17.416m
Route 3	£37.214m of which £35.450m is in CP4	Deduct 10% for skewed risk distribution	£33.493m
Route 5	£3.573 of which £3.410m is in CP4m	Deduct £1.2m contingency; deduct 33% for Optimism Bias for skewed risk distribution	£1.590m
Route 6	£0.521 of which £0.496m is in CP4m	Deduct 33% for Optimism Bias and skewed risk distribution	£0.349m

Route 7	£6.053m of which £5.779m is in CP4	Deduct £3m. Deduct 33% for Optimism Bias and skewed risk distribution	£2.046m

10 ECML Schemes

10.1 The RUS Programme

The Route Utilisation Strategy identifies the following, staged, provisions.

10.1.1 Control Period 4

Medium term steps proposed for increasing peak capacity on passenger services involve operation of more trains or longer trains with alterations to the infrastructure at defined pinch points. In addition, work will commence on the development of the longer term options. The following are the key elements:-

- New power feeder station at Regent's Canal and upgrade at Potters Bar to allow increased 12-car outer suburban operation and growth in other electric passenger services, including Intercity Express Programme (IEP);
- Additional long platform at London Kings Cross to allow increased long Distance High Speed (LDHS) services to be delivered as part of the Kings Cross redevelopment;
- Additional up platform at Finsbury Park and conversion of Up Goods to passenger use Alexandra Palace - Finsbury Park (to improve performance, reduce pathing time, allow additional Finsbury Park calls and inner suburban services);
- Hitchin Cambridge Junction grade separation to allow optimisation of capacity over two-track section Digswell - Woolmer Green, improve journey times and reduce adverse performance impact and junction safety risk;
- Improved layout at Peterborough including an additional island platform to separate East Anglia services from down LDHS, provide stabling for increased outer suburban 12-car operation and allow an increase in freight traffic;
- Cambridge layout enhancement including additional island platform to allow increased outer suburban 12-car operation and additional in freight traffic (also recommended in the Greater Anglia RUS);
- Platform lengthening at outer suburban stations to accommodate 12-car operation on most or all services;
- Peterborough - Doncaster capacity increases through enhancing the parallel 'Joint Line' route via Spalding and Gainsborough to mitigate journey time and performance effects of delivering LDHS and freight growth;
- Doncaster station - capacity enhancement for increased LDHS and freight paths. Will be considered further in Yorkshire & Humber RUS;
- Shaftholme/Joan Croft reconfiguration or flyover for freight growth (and LDHS growth if additional paths operate to Leeds via Hambleton or to York), for performance and Immingham to Aire Valley coal train journey times plus environmental benefits);
- York Holgate - fourth line to give entry to Platform 11 without conflicting with up passenger services, primarily to give performance benefits;
- Programme of level crossing enhancements or closures to allow increase in LDHS and freight paths;
- Hertford Loop resignalling, loop enhancements and additional crossovers at Stevenage. This would allow an increased level of service when trains need to be diverted via Hertford North when the main line with its two-track section in the Welwyn North area is blocked by engineering works or an incident affects all lines;
- W9 and W10 gauge enhancement in some key arteries;

- IEP infrastructure works.

The general pattern of train service will entail:

- Additional London LDHS services (6 trains per hour off-peak with 8 trains per hour peak) and a standard hour (or 2-hour) timetable (off-peak only south of Doncaster) to meet growth, improve connectivity, make best use of capacity and reduce long-distance journey times;
- 6-car operation of all inner suburban peak services;
- Additional 6-car services to/from Moorgate;
- Train lengthening in the North East;
- Increased freight paths;
- Introduction of pre-series IEP on some services.

10.1.2 Control Period 5

Beyond the CP4 proposals which are the key feature of this report, the RUS also envisages the following schemes in CP5:

- Planned completion of the Thameslink programme allowing many ECML outer suburban services to run through to destinations in Kent, Surrey and Sussex, freeing up capacity at Kings Cross and allowing passengers from south of the Thames easier access to ECML services;
- Inner suburban growth may need to be accommodated by operating some service to new destinations east of the ECML or running additional trains to Kings Cross using platform capacity released by Thameslink;
- Replacement of Class 313 fleet is likely to fall due, giving opportunity to renew with higher capacity trains with improved acceleration;
- IEP replacing all franchised LDHS rolling stock with trains giving improved performance characteristics, greater passenger capacity and train formation flexibility;
- Potential improvements in linespeeds, capacity and performance through deployment of ERTMS;
- Further growth in freight, especially traffic from Felixstowe and Bathside Bay;
- Optimising the track layout at Kings Cross when the S&C and signalling is renewed circa 2015.

10.1.3 After 2019

The RUS identifies the following works after CP5:

- Future LDHS growth will be met with a mixture of additional services and, to the extent possible, longer IEP trains. Inner and outer suburban growth would require additional services;
- Resignalling with ERTMS and the introduction of IEP are expected to bring opportunities for higher speeds for LDHS services;
- The two-track section in the Welwyn North area will be the main constraint in increasing train paths in the peaks. If ERTMS cannot deliver the required reduction in headways then four-tracking will become necessary;
- As critical layouts come up for renewal/resignalling, the opportunity will need to be taken to lengthen yards/loops so that longer trains can operate, thereby increasing capacity without requiring additional paths;

- Freight growth may need to be addressed by increasingly innovative use of parallel routes, such as the north end of the Midland Main Line accessed via Stamford and Syston.

10.2 Alexandra Palace to Finsbury Park 3rd Up Line Project

10.3 Finsbury Park to Alexandra Palace Downside Enhancements

The SBP Update has included a Down side project as well as the previously-identified Up side project. These are reviewed together. They are inseparable in terms of train / platform lengths and capacity requirements. The two schemes' titles are:

- Alexandra Palace to Finsbury Park 3rd Up Line Project;
- Finsbury Park to Alexandra Palace Downside Enhancements.

Network Rail advised that the schemes can accommodate 6-car operation on the Inner Suburban services (with additional platforms at Alexandra Palace, Hornsey, Harringay and Finsbury Park) and 12-car on the Outer Suburban services (by the provision of an additional platform at Finsbury Park).

The FCC platform scheme only covers those outer suburban stations that are not currently in the Thameslink scope i.e. this scheme does overlap as existing platform extensions to 12 cars are within Thameslink scope.

NR states that both schemes are required to deliver the DfT HLOS outputs at Moorgate, and to meet the LSE PPM (for 2014) of 93% HLOS target. The project will increase capacity by:

- Segregating the Inner Suburban, Outer Suburban and Long-distance Services;
- Reinstating the disused east side platform at Finsbury Park;
- Upgrading existing platforms at Finsbury Park;
- Providing a higher speed crossover north of Finsbury Park;
- Modifying signalling;
- Upgrading the Up Goods line to passenger status;
- Upgrading the Down goods to passenger status;
- Provide 6-car platforms at Alexandra Palace, Hornsey & Harringay (on both up and Down sides, including new platforms on the Up Goods Line);
- remodelling Wood Green North Junction.

There are potential interdependencies with:

- Kings Cross;
- Hitchin: the grade separation eases the pathing on the Wood Green Junction to Hitchin section and potentially allows more paths through the Welwyn two-track section;
- Moorgate Branch Improvements.

The project also allows an increase in Hertford Loop to Moorgate services subject to signalling modifications between Drayton Park and Moorgate (see Chapter 13.23 and 13.35).

Network Rail's Business Plan identifies a total Point Estimate of:

- For the Up side project - £48.349m of which £45.618m is in CP4;
- For the Down side project - £13.890m, of which £13.775m is in CP4;
- A total of £62.239m, of which £59.393m is in CP4.

Based on Network Rail's scope, for the Up and Down sides, we have independently estimated the costs as £39.389m for the Up side, and £12.659m for the Down side (added in the SBP update). This would give a total cost of £52.048m.

We have also considered what we believe will be required in scope terms to meet HLOS requirements. This consists of the following scheme elements:

- Reinstating the disused up platform at Finsbury Park to 12-car length;
- Extending the Down side island to 12-car length;
- New 2-faced 6-car island platforms at Harringay and Hornsey with new footbridges etc;
- An additional 6-car platform face at Alexandra Palace;
- Remodelling Wood Green North junction;
- Upgrading the Up goods to passenger use;
- Upgrading the Down Goods to passenger use;
- Associated OLE and signalling alterations.

Our independent estimate for the above scope is £90.682m.

In our Orange and Green Charts, however, we have used Network Rail's £62.239m despite our reservations about insufficient scope.

The implementation timescales may be optimistic; this is a part of the network where access to train maintenance depots is required on an almost full-time basis, and therefore possessions are more challenging to obtain. We believe that construction will take place between September 2011 and September 2013, all still in CP4.

10.4 Hitchin Grade Separation

NR states that this scheme is required to deliver the DfT HLOS outputs.

The SBP explains this project is to increase capacity by:

- Grade separation by means of a flyover from the Down Slow Line to the Down Cambridge Line;
- Remodelling of Hitchin Junction to enable Up Cambridge Line trains to gain the Up Fast Line before the station.

The potential interdependencies are;

- Alexandra Palace to Finsbury Park 3rd Up Line;
- Finsbury Park to Alexandra Palace Downside Enhancements.

The Hitchin project will meet its objective by removing the services crossing from the Down Lines to the Down Cambridge Line and by allowing improved presentation of services through the Welwyn two-track section by improving the flexibility in the timetable.

Network Rail's Business Plan identifies a Point Estimate of £51.629m, of which £50.308m is in CP4.

We have made an independent assessment of the cost of the scheme. We assumed:

- A new 2km single-track Down Cambridge line, diverging from the Down Slow, passing over ECML and running on embankment to join the Cambridge branch near Stotfold Road;
- Associated signalling and OLE alterations;
- No alterations at Cambridge Junction;

- No station works.

Our independent estimate is £52.400m. This is almost identical to Network Rail's assessment, and validates it.

A Transport and Works Act Order is required. As outlined earlier in this report, we believe there is some programme optimism. We have made an independent assessment of the programme requirements at Hitchin, where there is broad agreement on the alignment and basic form of the Preferred Option and the scheme is at GRIP4. We consider that the following programme dates may be appropriate:

- Remaining topographical, environmental and geotechnical surveys(July 2008);
- 3 months design development of the preferred option (October 2008);
- 3 months "formal" consultation (public and statutory)(March 2009);
- 1 month to modify the design in the light of consultation (April 2009)
- 3 months to undertake the EIA, write the ES, and prepare the TWA Orders and schedules (July 2009);
- 1 month to submit to TWA Processing Unit (August 2009);
- 2 months to incorporate all their responses (October 2009);

Then the Order would be published, and subject to objections. Then:

- 2 months objection period (December 2009);
- 9 months pre-Inquiry processes (September 2010);
- 1 months of Public Inquiry (to October 2010);
- 4 months for Inspector to prepare and submit Report (February 2011)
- 4 months for Secretary of State to confirm order (June 2011);
- 1 month Statutory Challenge Period (July 2011);
- 1 month to award construction contract (August 2011);
- Allow 4 months for GRIP5 approvals (December 2011);
- This is "start of construction";
- 24 months construction period (GRIP6) including testing and commissioning (December 2011 to November 2013).

According to the table in Appendix D of the "CP4 Enhancements: description of risk assessment process" report, Hitchin is due to open in April 2013. This is about 7 months earlier than our assessment, but is still all in CP4. We have re-profiled the expenditure needs.

10.5 ECML Level Crossing Closure Programme

This scheme concerns the 17 User Worked Crossings, and the 100 Bridleway and Footpath crossings, but no public highway crossings. Traditionally, the crossings in this scheme present the highest risk to either trains or users as they are unsupervised. All level crossings are subject to a risk assessment and it is assumed that a prioritised list exists. A closure programme has been running on the ECML for some years.

Network Rail advised that the ECML Level Crossings scheme makes provision for the works listed in 10.5.1 to 10.5.5 below. All the Level Crossings are 'User Worked' mostly associated with farms but others such as East Road have other users. All have Red/Green light protection which can of course be ignored by the user.

Network Rail needs to undertake a detailed risk assessment of the effects of the train service changes, and translate these into practical engineering solutions. The solutions may be bridging, or total closure by purchasing the user's interests. Without these assessments, it is difficult to be certain that expenditure on these crossings is required. The DfT appear to recognise that a serious incident at any of these or similar crossings on the high speed network could lead to reappraisal of the risk assessments and likely pressure for a high profile programme of removal.

We add our observations against each crossing, as follows:

10.5.1 Kings Cross Area

- East Road: There are multiple users and bridging is probably the only option;
- Holme Green: This is 51 chains north of East Road, and one bridge could eliminate both and probably two bridleway crossings as well;
- Lindsells: Previous proposals were for diversion or bridging;
- Cardells: Possible diversion via a cattle creep.

10.5.2 Peterborough Area

- Plants: This serves a non-operating ballast extraction area but this could restart. Possible diversion or bridging solutions. This will be subject to greater risk as a result of HLOS requirements with increasing train numbers.

10.5.3 Doncaster Area

- Thompsons: This is a farm crossing and will require diversion or bridging. It will be subject to greater risk as a result of HLOS requirements with increasing train numbers.

10.5.4 York Area

- Earfit Lane: This is a farm crossing, requiring diversion or bridging. It will be subject to greater risk as a result of HLOS requirements with increasing train numbers.
- Parvins: Farm crossing. Whilst passenger train numbers are not likely to increase significantly on this route section, freight could increase resulting in an increased risk.
- Picks: Farm crossing. Comments as for Parvins.

10.5.5 Tweedmouth Area

- Adderstone Mains
- Smeafield Farms
- West Goswick Farm

All these are farm crossings, and HLOS does not appear to greatly increase the risk at these crossings.

This listing removes the uncertainty in the SBP about what is included in this project. All public highway level crossings on the ECML with the exception of Markle, an AHB near Dunbar, have full barriers or gates. This listing confirms that they are not involved.

10.5.6 Costs

Network Rail's Business Plan identifies a Point Estimate of £21.376m of which £20.146m is in CP4.

Network Rail advised that no major highway alterations are proposed; we do not agree with this view. Many will require bridging out to resolve the problems. If a side road had to be closed, Network Rail advised that an approximate cost would be £3m per site.

Our independent estimate includes the following works:

- A new bridge over the ECML;
- Re-profiling OLE to suit;
- Approach roads / paved tracks 600m in length;
- No signalling or track alterations;
- Modest utilities works.

Our estimate was a generic cost per site of £2.779m. Overall, considering each location, our estimate is:

- East Road: new bridge at £2.779m;
- Holme Green: combine with East Road – no additional cost;
- Lindsells: new bridge at £2.779m;
- Cardells: new cattle creep at say £2m;
- Plants: new bridge at £2.779m;
- Thompsons: new bridge at £2.779m;
- Earfit Lane: new bridge at £2.779m;
- Parvins: possible bridge at £2.779m;
- Picks: possible bridge at £2.779m;
- Adderstone Mains: no HLOS-required works;
- Smeafield Farms: no HLOS-required works;
- West Goswick Farm: no HLOS-required works.

Our total estimate is therefore £21.453m, which effectively validates NR's costs. The timescales look realistic if development and consultation with crossing users has already commenced and is fully resourced.

Further work is required on the risks at these crossings. This should consider whole life costs of maintaining the crossings against their removal.

10.6 York: Holgate Junction 4th line

The York Holgate Junction 4th Line project aims to alleviate the performance and capacity bottleneck that exists on the ECML between Holgate Junction and York Station. It will include a 4th line from Holgate Junction to the station and other works which will provide a significant capacity enhancement which will deliver the DfT HLOS outputs. The scheme is required to meet the increase in train frequency resulting from the introduction of additional peak and off-peak LDHS services should those services extend to York and north thereof. Not providing this intervention would limit these additional services to destinations to the south of York.

The scheme includes the following primary infrastructure enhancements:

- An additional running line from Holgate Junction to York Station;
- Removal of restrictive overlaps on various signals;
- An additional main to main crossover at Holgate Junction; and
- An additional running line north from Platform 11 to the Down Main line.

The scheme includes signalling/overlap alterations and current project costs allow for this signalling work.

Network Rail's Business Plan identifies a Point Estimate of £13.174m.

Our independent estimate of the work required is:

- 1800m of new track
- 7 new turnouts;
- 1800m of OLE alterations;
- 6 new signals;
- Other minor drainage and civils works.

Our cost estimate validates NR's costs. The timescale appears reasonable, as the scheme is compact, well understood and achievable within a normal possession programme.

10.7 Peterborough Station Re-development and Additional Island Platform

Network Rail states that this scheme is required to deliver the DfT HLOS outputs.

The scheme will extend Platforms 2 and 3 and include a new face to the Fast lines, to be called Platform 3A. Platforms 4 / 5 will remain. A new island platform will be constructed to serve the Midlands to East Anglia movements.

The SBP update confirmed that the scheme includes the extension of the Nene Sidings. No developer contributions have been assumed in the SBP project costs, as those costs only reflect the railway enhancement. If developer contributions are obtained, it will likely be for enhanced station facilities and bridge provision works. There is no mention of a north-facing bay platform for Spalding Line services, which has been considered previously.

The Estimate Review Sheet shows the cost estimate as £55.554m but the CP4 element was not modelled. The Enhancements Master Spreadsheet includes £28.0m element in CP4, and it is assumed that the difference in cost (£27.554m) is to be funded from elsewhere. The scope includes:

- A new 2-faced island 150m length platform with extension to existing footbridge;
- A new 260m platform on the Up Fast;
- Lengthening Platforms 2 and 3 (noting the Thameslink issue);
- A new north-facing 2-car bay platform for the Spalding service;
- A turnback facility north of the station for the Cambridge service;
- Track and signalling alterations on the Spital ladder;
- Lengthening some of the Nene Sidings;
- Remodelling of Peterborough East Junction.

Our independent estimate is £40.524m. Therefore, the SBP contribution could be regarded as £40.524m less the £27.554m external contribution, namely £12.970m. We suggest that the SBP allowance could lie between this £12.970m and the £27.554m figures. We have included £27.554m on our Orange and Green Charts.

Subject to the development component of the project going forward the timescales appear achievable.

10.8 Shaftholme Junction Re-modelling

Network Rail state that this scheme is required to deliver the DfT HLOS outputs.

The SBP explains the project as:

- A new junction north of Joan Croft Junction and grade separation to provide a double track route from the Applehurst to the Askern Lines;

- Paralleling of Applehurst Junction.

Passenger services on the ECML are the main beneficiaries of the scheme; the removal of freight trains between Joan Croft Junction and Hambleton Junction is merely the mechanism by which this will occur. There will be some freight benefits, as the scheme will offer a more direct route from the Humber Ports to the Aire Valley Power Stations. The grade-separated scheme clearly provides more capacity than an at-grade option and would certainly deliver the objective. It is also certain that it would cost less in aggregate than a staged solution. The scheme would allow the increase in the quantum of LDHS services required to meet both the peak and off peak capacity requirements should such services run to York and north thereof.

The content of the scheme is as follows:

- A new twin-track flyover route from the Askern Line to the Skellow Line near Applehurst Junction;
- A new single-track link from ECML towards the Askern line, diverging at Joan Croft Junction;
- a double junction at Applehurst Junction;
- Side road and private access alterations;
- Modifications to signalling and OLE;
- Removal of the existing Shaftholme Junction.

Network Rail's Business Plan identifies a Point Estimate of £51.891m, of which £42.245m is in CP4. This is for a grade-separated junction.

We have made an independent assessment of the content of the scheme. Our cost estimate validates Network Rail's assessment.

As a Transport and Works Act Order is required, we believe, as outlined earlier, there may be some programme optimism. We have therefore made an independent assessment of the programme requirements at Shaftholme Junction. We propose the following dates moving forward:

- Award GRIP4 Design to TWA Submission (by March 2008);
- 12 months of topographical, environmental and geotechnical (February 2009);
- 4 months design development of the preferred option (June 2009);
- 3 months "formal" consultation (public and statutory)(September 2009);
- 1 month to modify the design in the light of consultation (October 2009)
- 3 months to undertake the formal EIA, write the ES, and prepare the TWA Orders and schedules (January 2010);
- 1 month to submit to TWA Processing Unit (February 2010);
- 2 months to incorporate all their responses (April 2010);

Then the Order would be published, and subject to objections. Then:

- 2 months objection period (June 2010);
- 9 months pre-Inquiry processes (March 2011);
- 1 months of Public Inquiry (to April 2011);
- 3 months for Inspector to prepare and submit Report (July 2011);
- 3 months for Secretary of State to confirm order (October 2011);
- 1 month Statutory Challenge Period (November 2011);

- 1 month to award construction contract (December 2011);
- Allow 3 months for GRIP5 approvals (March 2012);
- This is “start of construction”;
- 24 months construction period (GRIP6), including testing and commissioning (March 2012 to February 2014).

Network Rail provided a programme, showing scheme completion in December 2012. This is about 14 months earlier than our assessment, but is still all in CP4. We have re-profiled the expenditure needs.

10.9 Enhanced Capacity between Peterborough and Doncaster (Capacity Relief to ECML)

Network Rail states that this scheme is required to deliver the DfT HLOS outputs.

The SBP describes this as improving the capacity of the two-track section of the ECML between Peterborough and Doncaster by upgrading the alternative route, known as the GN/GE Joint Line, which runs via Spalding and Lincoln. The scheme includes track upgrading, level crossing upgrading, restoration of the Down Sleaford Avoiding Line, re-gauging to W10 and improving the RA capability and possibly provision of some intermediate block signals (IBS).

Network Rail’s SBP Update identifies a Point Estimate of £262.946m, of which £248.029m is in CP4. This is a £48m increase on the SBP cost.

The documentation supporting the SBP notes that the alternative to upgrading the Joint Line is an on-line improvement of the Main Line, by providing lengthened loops or re-providing multi-track sections of route.

One area requiring clarification is how northbound freights are to be handled at Peterborough (Werrington Junction) to reach the route to Lincoln. There is also the issue of how southbound freights would cross from the Up side north of Peterborough to reach the west side of Peterborough Station, and hence the route to Ely and beyond. The proposed increase in numbers of both these types of trains heading for the Haven Ports and increased Main Line services will make this movement more challenging. The potential adverse effects on road traffic in Lincoln itself were addressed in our November 2007 Interim Report. A recently-implemented NRDF scheme for bi-directional running on the Up Slow from Peterborough Station northwards to Werrington Junction has successfully removed conflicts between the Lincoln service and Up Fast services; this scheme will continue to provide this benefit irrespective of the chosen option between Peterborough and Doncaster.

An option not mentioned is to operate the freight services via Oakham and the Midland Main Line, Erewash Valley and either Worksop or Chesterfield into Yorkshire. The Midland Main Line RUS claimed there was capacity for additional freight services on the MML, however the gauge is W8 and would need to be modified to W10. Part of the route is being re-gauged between Peterborough and Syston. This would avoid crossing movements at Peterborough but would mean a longer routing for the services diverted.

It is interesting that the supporting Business Case document comments that the costs of the Joint Line upgrade were comparable to an on-line ECML upgrade and with potentially comparable benefits; it is not certain whether the recent increase in cost between the SBP and the SBP Update has changed this view. Therefore, as an alternative means of testing the value and cost-effectiveness of the Joint Line upgrade, we have considered what the project scope and costs might be for an ECML main line option.

An overview of the scheme is an upgrade of the ECML from Stoke Tunnel to Newark (Peterborough to Stoke already being 4-track), and then running freight trains from Newark to Lincoln and then on the joint Line to Doncaster.

This could consist of:

- restoring multiple tracks north from the Stoke Tunnel / High Dyke area to Grantham;
- dynamic loops between Barkston to Claypole, where there are few property and level crossing constraints;
- remodelling at Newark to allow freight trains to turn north-east towards Lincoln;
- use of the Boultham Junction to Pyewipe Junction (Lincoln avoiding line);
- upgrading the Joint Line between Pyewipe Junction and Doncaster.

Four-tracking the main line would:

- Have a lesser adverse effect on freight journey times and FOC operating costs;
- provide an electrified 4-track route from Peterborough to Newark, with the benefits of increased capacity and operating flexibility for passenger services;
- avoid road traffic delays in Lincoln.

We have made an independent estimate of the cost of ECML main line provision. Our estimate is £191m, compared with Network Rail's estimate for the Joint Line upgrade of £263m. This alternative approach benchmarks that the cost of an upgrade scheme between Peterborough and Doncaster is likely to be in excess of £200m. However, the difference between our £191m for the main line and NR's £263m for the Joint Line suggests that this may not be optimum solution.

We believe that consideration of ECML Main Line works should continue, and that there should be a more detailed comparison of the options.

10.10 Doncaster Loversall Carr Junction Revised Operational Layout

This is a Performance project which provides bi-directional routes from the Down ECML and Lincoln routes to the Up Yards and station at Doncaster. This will benefit freight services into Doncaster Railport, Network Rail maintenance trains into Up Decoy Yard and East Midlands Trains services. It would ease the operation of a future Doncaster Robin Hood Airport service. The track infrastructure is present, and it only requires the appropriate signalling modifications.

Network Rail's Business Plan identifies a Point Estimate of £6.600m, of which £6.327m is in CP4.

The estimate and timescales appear achievable, so we have included £6.600m and re-profiled it according to NR's programme.

10.11 ECML Schemes – Summary of Costings

The table below presents a summary comparison of Network Rail's estimates and our independent estimates.

	Network Rail Point Estimate	**Arup Point Estimate**	**Difference / Comment**
Alexandra Park to Finsbury Park 3rd Up Line AND Finsbury Park to Alexandra Palace Downside Capacity Enhancements.	£62.239m	£90.7m	Arup 46% higher (greater scope). NR £62.239m used.
Hitchin Grade Separation	£51.629m	£52.400m	NR estimate used.
Level Crossing Programme	£21.376m	£21.453m	Scottish Schemes not required for HLOS. NR

			estimate used.
York Holgate 4th Line	£13.174m	£11.027m	NR estimate used.
Peterborough Station	£55.554m	£40.524m	£27.554m used as NR contribution.
Shaftholme Junction	£51.891m	£50.752m	NR estimate used.
Peterborough to Doncaster	£262.946m	£191.000m	Scheme insufficiently defined – both ECML main line and Joint Line Upgrade options need to be pursued. £191m used.
Doncaster Loversall Carr	£6.600m	£6.600m	NR estimate used.
Portfolio Total	**£525.409m**	**£464.456m**	**Arup 12% lower**

Across the ECML portfolio as a whole, it can be seen that the Arup Point Estimate is about 12% lower than Network Rail's. This is well within the bounds of the ±30% associated with this GRIP stage 2 or the ±20% at GRIP3.

We have effectively validated Network Rail's costs except for the higher estimate for the combined Finsbury Park to Alexandra Palace schemes, and for the lower estimate for the Peterborough to Doncaster capacity improvements (to resolve the ECML v GN/GE Joint Line Upgrade choice).

On timescales, we suggest there may be programme slippage on the following schemes:

- Alexandra Park to Finsbury Park 3rd Up Line;
- Hitchin Grade Separation;
- Shaftholme Junction.

We have incorporated that slippage into our overall "Orange and Green" Charts.

11 Journey Time Improvements (LSI Schemes)

11.1 General Methodology

LSI schemes can vary substantially, but some of the major issues affecting costs would be:

- Track condition improvement to support higher speeds, by fettling the alignment to higher standards of top and line;
- Sub-grade condition or drainage works to provide stability;
- Re-siting of signals, or more likely, the incorporation of Banner Repeater Signals to give greater sighting distances;
- Re-tensioning of OLE / contact systems;
- Alterations to Level Crossing controls;
- Strengthening of structures for increased dynamic loading.

There is insufficient detail to establish a robust budget for each individual route, so our effort was focussed on developing indicative "cost per km" ranges to allow comment against each Route proposal.

The table below shows the assumptions.

Heading	Assumption
General Site Clearance	20% of the overall route length (£200 per km).
Fencing	None required
Drainage	50m of drainage renewals per 1km of track, including chambers etc (about £5000 per km)
Earthworks	None
Platform Construction	None
Permanent Way	200m per km of general improvement of line / level / top (at £300 per m)
New 50mph Turnout	1 crossover assumed every 10 km (equivalent to 2 turnouts)(at £190,000 per turnout)
OHLE	None
New Structures	1 structure to be strengthened every 5 km (cost £200k per structure)
Highway Works	None
Signalling	1 banner repeater signal every 10 track-km (at £45,000 per location)
Communications:	None
Services / Utilities: none	None

The following percentage "add-ons" were then included:

- Preliminaries: contractor's preliminaries about 25% of above items;
- Design costs: about 15% of above items;
- Testing & Commissioning: about 7% of above items;
- Ancillary Items: environmental mitigation measures at 2% of above totals;

- Possession costs: 10 possessions per track-km.

Additional sums were then added for Network Rail Project Management, Possession Management, RIMINI Costs, TOC Compensation / Schedule 4 Charges, and site supervision.

There was no allowance for:

- Risk;
- Optimism bias factor;
- Escalation Costs.

This gave a final total of £0.29m per single-track km (i.e a 100 km twin-track upgrade would involve 200 km a total of £58m).

11.2 Westerleigh - Barnt Green Line-speed Upgrade

This project is to enhance the Great Western Main Line (BAG2/BGL2) from Barnt Green to Westerleigh Junction (68 track miles) up to a maximum of 110mph where feasible. The overall aspiration would be to achieve a 5-minute saving in terms of journey time between Birmingham and Bristol. It is intended that the scheme will piggy-back onto the High Output track renewal due to be delivered in CP4 (2010 earliest) which will drive the construction completion date of 2011. This date is inconsistent with Network Rail's Orange and Green Charts.

An issue is that the lifting of line speeds for the fastest trains may erode capacity, by the run-down effect on slower services. Network Rail needs to ensure that capacity is not compromised by the LSI works.

Network Rail's Business Plan identifies a Point Estimate of £33.220m. Of this sum, £31.578m is the CP4 Point Estimate.

Our independent calculations suggest that, of the 68-mile (217 single-track km) route, about 66 route-km, or 132 single-track km may need to be the subject of line speed improvement. This would suggest a funding requirement of 132 x £0.29m = £38.3m. This is somewhat higher than Network Rail's estimate.

11.3 Wrexham to Marylebone (Formerly LSI Chilterns)

11.3.1 Main Scheme

Network Rail has worked with key stakeholders to identify locations where beneficial line speed improvements could be delivered. There are many relatively low Permanent Speed Restrictions across the route that add to journey time and utilise excess network capacity. Some of these locations are as follows:

- Birmingham Moor Street – Jewellery Quarter;
- Up line Bicester North to 9 milepost;
- Various modest line speed improvements south of Bicester; and
- Loop entry and exit speeds.

The SBP describes a £5.857m total spend, of which £5.341m is in CP4.

Our independent estimate suggests that this would achieve about 16 single-track km of line speed improvement, or about 8 km (5 miles) of route. This is entirely consistent with Network Rail's proposals. At such a level of expenditure, these works could be NRDF schemes.

11.3.2 The "London – Birmingham in 100 Minutes" Aspiration

In addition to the above modest line-speed improvements, the SBP data sheets contain a long-term aspiration for a 100-minute London to Birmingham journey time, compared with

current best journey times of around 120 minutes. Contrarily, in relation to the time savings, the SBP supporting document "London North Western Platform Lengthening Strategy (CP4 Submission), March 2008, Version 10 (Submitted)" refers to a 90-minute aspiration. We have commented on the 100-minute alternative.

The Plan refers to a 100mph line speed limit, suggesting that it is not a "high-speed line" that is envisaged.

In order to achieve a 20 minute reduction, a substantial programme will be needed such as:

- Raising speeds from Neasden to South Ruislip, and on to High Wycombe;
- Raising speeds between Saunderton and Princes Risborough;
- Fast through lines at Princes Risborough;
- A realignment at Aynho Junction to provide a higher speeds from the Oxford line;
- Speed improvements between Banbury and Leamington Spa including embankment works at Fenny Compton / Knightcote;
- Remodelling Dorridge Station to provide faster through lines and a Centro turnback.

We calculated a time saving of about 10 minutes by fewer stops, and about 10 minutes from enhanced infrastructure. It is unlikely that such a scheme could be delivered in time to meet HLOS requirements. It could cost about £172m. We suggest that development funding is provided for such a scheme.

11.4 MML St Pancras - Sheffield LSI

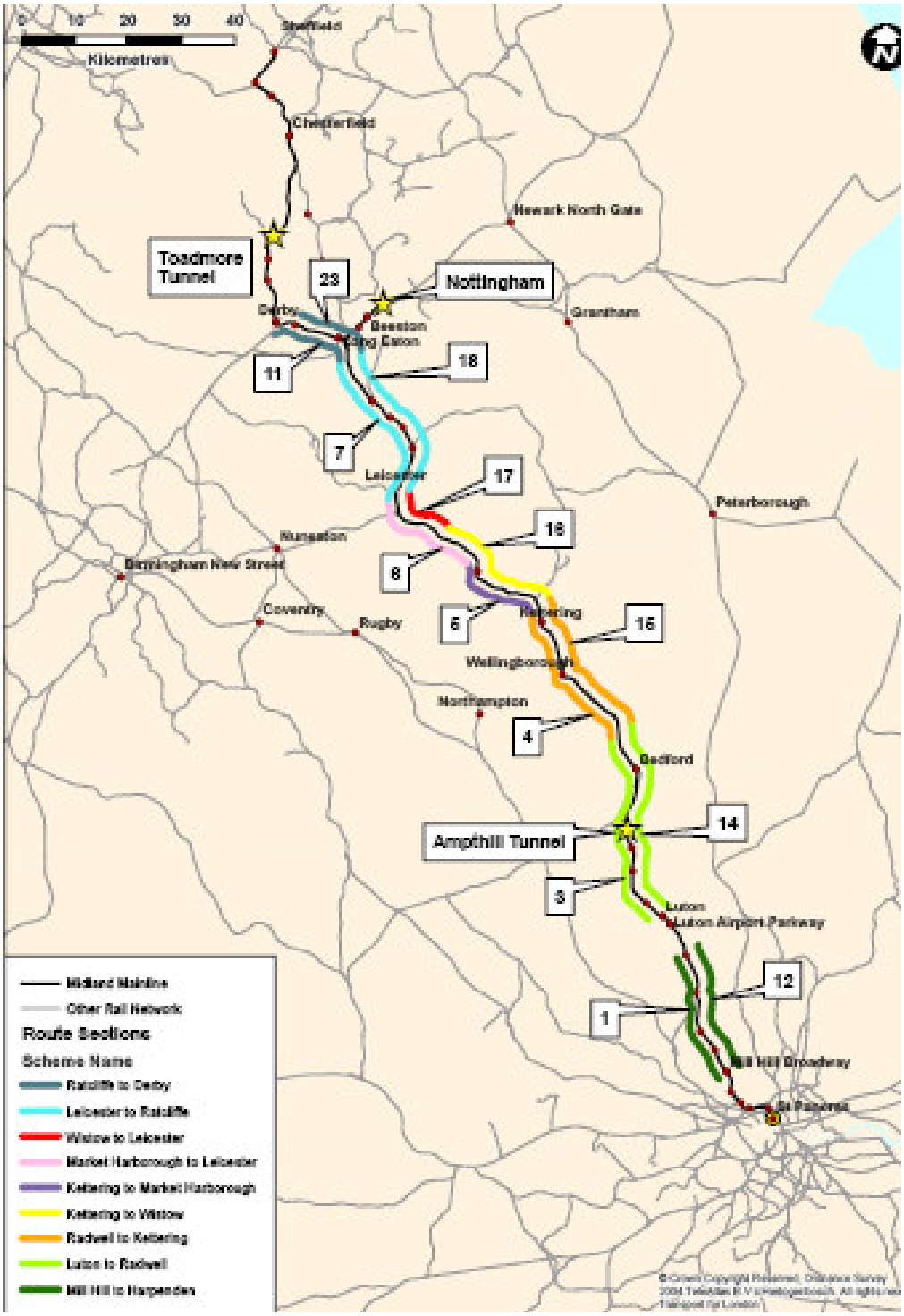
The main aim of this project is to increase line speeds and reduce journey times between London St. Pancras and the East Midlands and South Yorkshire. Journey times on this route are seen as being less competitive than those on other main routes to and from London. The project will facilitate a reduction in journey times and provide potential additional capacity on the route, particularly in Bedford and south thereof to meet growth arising from major housing developments along the MML.

A capacity benefit to ECML may arise if the MML upgrade is sufficiently attractive to induce some South Yorkshire travellers to change routes, relieving capacity pressures on ECML south of Doncaster, but this is not an HLOS requirement.

A 10-minute journey time benefit is proposed in conjunction with track and signalling modifications which will also deliver additional capacity and performance benefits. The project will help to meet any changes in the future East Midlands franchise train service specification.

Network Rail's Business Plan identifies a Point Estimate of £64.000m. Of this sum, £58.902m is the CP4 Point Estimate.

We have reviewed the data provided by Network Rail on 4th March 2008 which showed that the actual proposals are a mixture of general speed improvements (whose lengths we estimated independently) and improvements at specific locations – see map below.



The schedule of schemes included in the 4th March package was a list of line speed changes but the accompanying map includes the removal of Toadmoor Tunnel (not Toadmore as on map above). This would be a major speed gain, not only for MML but also for Cross-Country services. The notable scheme absentee is Derby Station, where the southern throat is capable of a major speed-up, most likely to be achieved at a major track and signalling renewal. This opportunity should not be missed.

Our independent estimate is that, on a conventional line speed enhancement basis, about 102 route-km of plain line (204 single-track-km) could be upgraded, at a cost of about £59m. This is in close agreement with Network Rail's estimate. If Toadmoor Tunnel is to be included, we would suggest the inclusion of an additional £12.0m.

11.5 TPE Route Enhancements – Linespeed Improvements

The project consists of a package of work to enable non-stop journey times of 30 minutes between Liverpool and Manchester Oxford Road via Chat Moss (currently 43 minutes via Warrington Central) and of 45 minutes between Manchester Piccadilly and Leeds (currently 54 minutes). This is in line with the DfT white paper aspiration for improved journey times between Manchester and Leeds. This scheme forms a component part of the TPE journey time improvement project which will be delivered through the implementation of higher line speeds and improvement of permanent speed restrictions (PSRs) along the route.

These are required by 2010, with incremental improvements towards these times introduced as part of the new Dec 2008 timetable.

A report was produced for Network Rail, in July 2007, entitled "Trans Pennine Express Franchise Extension, Journey Time Improvements, Pre-Feasibility Report" which outlined specific potential linespeed improvement sites. The report notes that other solutions could be considered if more appropriate to achieve the journey time objectives.

Network Rail's Business Plan identifies a Point Estimate of £28.208m. Of this sum, £26.338m is the CP4 Point Estimate.

Our independent estimate suggests a total of 65 route-km, or 130 single-track-km need LSI works, at a cost of £37.7m. In order to maintain consistency, we have used our estimate. Because the Trans-Pennine route is busy and carries a range of services with different speeds and stopping patterns, Network Rail will need to ensure that the speed increases do not erode capacity.

11.6 Line Speed Improvement Schemes – Summary of Costings

The results of this analysis are shown in the table below.

Project Name	**Network Rail Point Estimate**	**Arup Point Estimate**
Westerleigh to Barnt Green	£33.220m	£38.3m
Wrexham to Marylebone (LSI Chilterns)	£5.857m	£5.857m
MML St Pancras to Sheffield	£64.000m	£59m
TPE Route Enhancements	£28.208m	£37.7m
Portfolio Total	**£131.285m**	**£140.857m**

Across the portfolio as a whole, it can be seen that the Arup estimate is about 7% higher than Network Rail's, well within the bounds of the ±30% associated with this GRIP stage 2 or the ±20% at GRIP3.

As Network Rail's calculations and our independent analysis are so close, we have effectively validated Network Rail's data. We therefore used their costs in the Orange and Green Charts.

12 Track Re-Doublings

12.1 General Methodology

For this analysis, costs were initially compared on a "per-km" basis, with data on the schemes being extracted from Network Rail's Estimate Review Sheets (provided on April 3rd for the SBP Update). It must be stated that there will always be site-specific issues affecting scheme costs, particularly:

- the location of the existing single track: on the location of one of the former two lines; slewed to a central position; oscillating from one side to the other to make maximum use of previous higher-quality track or to improve alignment;
- the condition of embankments and cuttings, and stability issues often associated with drainage requirements;
- structures replacement, including gauging, especially if the one remaining track has been slewed to a central position for gauging reasons;
- signalling positions and cable routes, which might require multiple re-siting as track works proceed;
- the number of intermediate stations and the need for their re-siting, additional platforms or complete re-building.

Network Rail has presented the costs of two re-doubling schemes, whose costs are almost identical (on the Estimate Review Sheet data) at £1.64m to £1.71m per km.

12.2 Comparisons with Other Re-Doubling Schemes

We have compared the above cost range with some recent re-doubling projects for which we could find cost data:

- Re-doubling of the Glasgow and South Western Route between Gretna and Annan. This is quoted in the technical press as being a £35m scheme of 8 miles in length. Clearly, the "8 miles" is a rounded figure, and £35m may be only the construction contract price, exclusive of scheme preparation and design costs. The rate is however about £3.0m per km;
- The Coventry to Gibbet Hill re-doubling resulted in a cost of about £3.4m per km. No stations were involved;
- The Chiltern Line "Project Evergreen" re-doublings were typically about £6.0m per km, although these construction contracts would have fully included risk elements and Optimism Bias in the Target Price. Stations were involved;
- Felixstowe Branch Re-doubling. This is quoted as being in the order of £45m for a 4.5 miles length, but there are additional sidings works at Ipswich. Deducting these might suggest a cost of £37m for 4.5 miles (7.2km), a rate of £5.1m per km;
- Restoration of track Bere Alston to Tavistock. This is quoted as £18.5m for a 5.5 mile route, but there is virtually no signalling involved, and the formation is intact. This is a rate of £2.1m per km.

A summary of the above is:

- Gretna to Annan: £3.0m per km;
- Coventry to Gibbet Hill: £3.4m per km;
- Chiltern Line "Project Evergreen": £6.0m per km (very high end of range);
- Felixstowe Branch: £5.1m per km;
- Bere Alston to Tavistock: £2.1m per km (no signalling);

Network Rail's figures of £1.64m to £1.71m per km (from the Estimate Review Sheets of April 3rd) look optimistic.

12.3 Cotswold Line Re-doubling Options

The OWW route from Oxford (Wolvercot Junction) to Worcester (Norton Junction) was constructed as a double-track railway. During the periods of route rationalisation, three long sections of the route were reduced to single track only. The single line sections significantly constrain overall route capacity and prevent the introduction of a regular, operationally robust hourly clock-face service. This is a current market expectation, and it is likely that the current service gaps suppress demand. We have seen a draft Business Case which shows a Benefit:Cost ratio of about 8:1. The scheme is provided as an optional scheme to produce a performance gain.

Network Rail provided, on April 14th 2008, a document entitled "Western Enhancements, Fast Track Project Development – Team Communication Brief" which sets out the main project parameters.

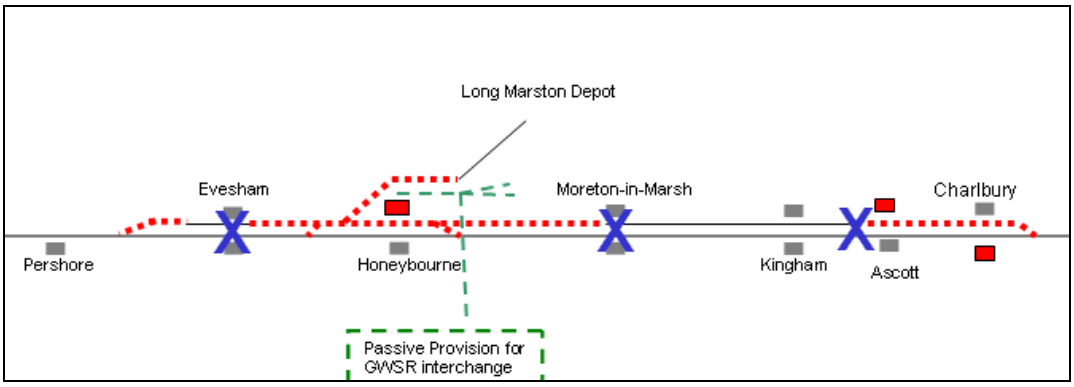
Network Rail has identified the constraints to achieving the required Public Performance Measure (PPM) by undertaking performance modelling using their internal Strategic Access Planning (SAP) Unit, who created a Timetable Services model. This model identified the performance constraints and recommended the optimum enhancement option which would deliver the aspirational 92%PPM.

The Scope of this optimum scheme is described as:

- Track:
    - Provide a two track railway from east of Charlbury Station to join the existing double track at Ascott-under-Wychwood;
    - Remove existing junction at Ascott-under-Wychwood;
    - Provide a two-track railway from Moreton-in-Marsh Station to join the existing double track at Evesham Station, including junction removals where they are no longer needed;
    - Provide a two track railway from Evesham Station to a point 1 mile west;
    - Provide for the existing Long Marston Depot connection west of Honeybourne;
    - Provide a new crossover east of Honeybourne;
- Signalling:
    - Provide signalling to enable 15 min headways with intermediate signals;
    - Provide a turn back facility in the London direction at Moreton-in-Marsh to allow trains to terminate and turn back to Oxford.
- Telecommunications:
    - Provide telecoms throughout to include all necessary systems;
- Civil Engineering:
    - Provide a new down platform and footbridge at Charlbury station to cater for 2 + 8 HST;
    - Provide a new up platform at Ascott-under-Wychwood for 3-car Class 165;
    - Modify the Ascott-under-Wychwood level crossing;
    - Provide a rebuilt up platform and footbridge at Honeybourne for 2 + 8 HST;
    - Repair or renew structures and earthworks as required;

- Modify level crossings and foot crossings as required.

These works are shown on the schematic below.



Network Rail is undertaking a fast track GRIP 1 to 3 development process within 30 working days, but the outcome is described as “GRIP 3 lite”. A consulting engineer has been appointed.

Network Rail’s Business Plan identifies a Point Estimate of £54.729m, of which £50.755m is in CP4. The total length of the re-doubling is about 20 miles (32km). The Point Estimate therefore equates to £1.71m per route-km. This scheme would allow the operation of 4 tph in each direction, according to the SBP update.

An interesting issue with these single-line sections, apparently quite remote from the London terminus, is the constraint they place on the main line terminal. If the 'Up' and 'Down' trains are timetabled around minimising the cost of providing double-track sections, this can lead to inefficient use of paths into the terminal and inefficient layovers at the route end as the trains cannot be moved round the clock relative to each other. Thus, effectively, the first trains one puts in the timetable at Paddington are the trains to and from the single line routes. Examples on other routes are at Waterloo (the first trains on the timetable are virtually those to and from Exeter because of the single west of Salisbury) and at Birmingham New Street (where trains to and from Aberystwyth and Chester are timetabled first). Hence double-tracking more than appears necessary is often actually needed to secure capacity enhancements as well as PPM improvements.

We then prepared an independent estimate based on the scope described above for:

- General Site Clearance;
- Fencing;
- Drainage;
- Earthworks;
- Platform Construction;
- Permanent Way;
- New 50mph Turnout;
- Structures;
- Highway Works;
- Signalling;
- Communications;
- Services / Utilities.

The following percentage "add-ons" were then added:

- Preliminaries: contractor's preliminaries about 25% of above items;
- Design costs: about 15% of above items;
- Testing & Commissioning: about 7% of above items;
- Ancillary Items: environmental mitigation measures at 2% of above totals;
- Possession costs: Assumed possessions;

Additional sums were added for Network Rail Project Management, Possession Management, RIMINI Costs, TOC Compensation/Schedule 4 Charges, and site supervision.

There was NO allowance for:

- Risk;
- Optimism Bias factor;
- Escalation Costs.

Our independent estimate was £105.567m, considerably in excess of the SBP Update estimate of £54.729m (of which £50.755m is in CP4).

However, since the Update, Network Rail has provided yet more cost information, and now advises that the cost is £73.875m. It may be noted that the NR cost estimates have risen from £35m in the SBP (October 2007), to £55m in the SBP Update (early April 2008) to £74m (late April 2008, post-dating the Update). This escalation supports our view that costs on this scheme are underestimated and that scope is ill-defined. While not as severe as before, we still have serious concerns.

We have re-profiled our £105.567m according to NR's programme.

12.4 Swindon - Kemble Redoubling

Network Rail describes the SWM1route from Swindon to Standish Junction as a twin track railway, except for a 12.675 mile (20.3 km) single line section between Swindon Loco Yard Junction (78m 20ch) and Kemble (90m 74ch), which significantly constrains the route capacity to a maximum of 2 trains per hour in each direction. Redoubling the single track between Swindon and Kemble is being evaluated. This includes passive provision for Swindon Borough Council's aspiration for a new station to the north of Swindon. The line is also a key diversionary route for South Wales, when the Severn Tunnel is closed. In this role, the single line section will severely restrict diversionary capacity.

The key outputs sought are:

- Capacity benefits, as journey times will be reduced due to simplification of the layout at Swindon, and the constraint of the current single line operation will be removed;
- performance benefit achieved through elimination of delays caused to trains awaiting clearance of the single line;
- the re-doubled route would provide greater flexibility when the line is used as a long-distance diversionary route, for example when the Severn Tunnel is closed;
- Opex costs will be reduced due to the section being entirely controlled from Swindon A signal control centre, which will enable the permanent closure of Minety crossing box; and
- may permit a new station to be built to the north of Swindon (Moredon).

Over most of the singled length, the tracks has adopted a varying position. Most bridges are intact, and capable (in terms of track position) of supporting the restoration of the second track. At Kemble Tunnel, it is possible that the track has been re-located to gain clearances;

possibly for the introduction of HST stock. Network Rail advised that few additional works are required to accommodate the second track.

Network Rail's Business Plan identifies a Point Estimate of £33.377m. Of this sum, £32.289m is the CP4 Point Estimate. The Point Estimate equates to a rate of £1.64m per km.

As for the Cotswold route, we prepared an independent estimate for this scheme, using the same cost rates, but the scheme-specific scope as defined by NR. Our estimate of cost was relatively close to Network Rail's £33.377m, which we effectively validated. We adopted their estimate and programme.

12.5 Track Re-doublings – Summary of Costings

The results of this analysis are shown in the table below.

Project Name	Network Rail Point Estimate	Arup Point Estimate	Comments
Cotswold Line Re-doubling	£54.729m (updated to £73.875m post-SBP Update)	£105.567m	Arup estimate 93% higher than SBP Update Arup 43% higher than post-update.
Swindon to Kemble Re-doubling	£33.377m	£39.050m	Arup estimate 80% higher.
Portfolio Total	**£88.106m (£107.162m)**	**£144.617m**	**Arup 64% (35%) higher**

For the portfolio, it can be seen that the Arup estimates are 64% higher. The estimates are substantially higher than Network Rail's, and, for the Cotswold line, well outside the ±30% at GRIP2, or the ±20% at GRIP3.

For the Cotswold line, it is perhaps not surprising that the estimates are so far apart, as the SBP highlights that the scope is not well defined, and that operational / performance studies are at an early stage. Also, Network Rail's continuous cost increases seem to be converging on the correct answer, but there still appears to be some way to go.

Finally, two issues emerge:

- Network Rail's rates (£2.3m per km for the Cotswold scheme, and £1.64m per km for the Swindon-Kemble scheme) reflect, to a degree, the fact that the Cotswold line appears to be more complex in terms of stations, level crossings, farm accesses and connections to Long Marston etc;
- Network Rail's costings appear to be lower than they are experiencing on other re-doubling projects.

We have serious concerns over the Cotswold Line scheme estimate.

13 Other Issues Not Covered by Previous Groupings

13.1 Access for All

No detailed work was carried out on this issue. Network Rail's figure of £206m was therefore replicated in the review of the "Orange and Green Charts".

13.2 Stafford/ Colwich Remodelling

The Enhancements Master Spreadsheet contains an allocation of £483.091m for major works in the Stafford area. The project objective is stated to be "The Stafford area has been identified as a bottleneck, limiting the opportunity to fully exploit the capacity offered by the modernised West Coast main line infrastructure and causing delay to existing and planned services. These capacity and performance constraints in the Stafford area are due to the number of conflicts that exist between the flows of traffic at Colwich Junction, Stafford and Norton Bridge. The project's remit is to resolve the capacity and performance constraints in the Stafford area, given the requirements of the 2015 traffic flow".

We understand that ORR is obtaining separate advice on WCML schemes and we have therefore not analysed this scheme further. We have included the £483.091m for the ORR's consideration.

13.3 Bletchley Milton Keynes

The SBP includes £221.828m (CP4 not modelled) for remodelling at Bletchley, which would be linked to replacement of life-expired signalling. The Enhancements Master Spreadsheet shows a figure of £114.4m in CP4 – it is not clear if these two figures are related.

We understand that ORR is obtaining separate advice on WCML-related projects and we have therefore done no work on this project for this report.

13.4 Thameslink

We were not required to comment on the Thameslink proposals. However the Thameslink scheme impinges on a significant number of routes and overlaps with a number of other schemes, most notably a number of platform extensions, power upgrade and station schemes in the London and South east area. ORR provided us with available scheme scope documentation, which we have used in reviewing scheme proposals where there appeared to be potential for overlaps or 'double counting' between schemes. Where overlaps in scheme scopes have been identified from the documentation provided, we have noted this in our reviews of individual schemes, and where appropriate adjusted the scheme scopes and costs accordingly. In a few instances the other schemes appear to be primarily driven by Thameslink requirements and it would seem more appropriate that they are undertaken as part of the overall Thameslink work rather than as separately funded work.

In some cases we have noted locations where work is proposed as part of Thameslink and separate works are proposed at the same location for other schemes. There would seem to be merit in combining the schemes together to maximise benefits and minimise disruption and overall costs.

For our independent estimate, we have used Network Rail's figure of £2,700.3m spread as their programme.

13.5 Intercity Express Programme

The Intercity Express Programme is a DfT sponsored project.

Network Rail are required to develop and implement works to facilitate the operation of the trains, including gauge clearance work, provision of longer platforms (or alternative means of accommodating the trains in station platforms – such as Selective door opening), and power supplies. Network Rail summaries the principal work areas as:

- Platform length extensions at a number of stations (with SDO operations at others);
- Gauging work on the proposed IRP main and diversionary routes.
- Power Upgrade Works on electrified routes;
- Works for two pantograph operations at 125 mph;
- Possible bridge and tunnel aerodynamics work;
- Track geometry works.

Our previous report used a point Estimate of £347.368m as the total project cost of which £260m was represented in CP4. This was spread over Network Rail's indicative programme produced the CP4 element. In discussion they acknowledge that these are generally at a very early stage in development and based on limited information.

We have again re-used the £260m spread equally over the 5 years of CP4.

13.6 Network Rail Discretionary Fund (NRDF)

The SBP Update contains an allocation of £233.708m under this heading. We have not undertaken any detailed analysis of NRDF proposals.

There are issues of whether small (sub-£5m) schemes should all be allocated to NRDF or those which contribute to capacity or performance metrics should be allocated within the main SBP categories. The SBP seems to contain a mixture of these approaches. The NRDF should give flexibility to develop and implement small schemes but there is a view that it does not give adequate certainty to stakeholders that the projects will be implemented in a timely manner or even at all. There may be an issue in a small number of cases of overlaps between NRDF schemes and other schemes in the SBP. Issues arising will need to be identified and resolved at an early date to avoid abortive or duplicated work.

We have used Network Rail's £233.708m estimate in our Orange and Green Charts, spread equally over the 5 years of CP4.

13.7 National Stations Improvement Programme (NSIP)

The HLOS and SBP identify a CP4 allocation of £155.815m for schemes within the National Station Improvement Programme (NSIP).

The SBP Update highlights that, following work since the SBP, the ORR confirmed in February 2008 that the NSIP programme are deliverable and efficient. The National Programme Board (NPB) agreed that the funding would be allocated in two tranches, with the allocation criteria based on geographical spread, passenger satisfaction and footfall. The NPB will allocate the second tranche of NSIP funding in April 2010.

We have not reviewed the NSIP proposal, but have simply repeated the £155.815m provision in our Orange and Green Charts.

13.8 Strategic Freight Network

The HLOS and SBP identify a CP4 allocation of £207.740m for the development of a Strategic Freight Network. The nature of such a network is not defined, and the SBP simply states that consultations are in progress.

By its nature, a freight network will overlay a number of routes, and a number of capacity constraints and development projects. This raises issues over potential project overlaps and competition for allocation of available capacity.

Work is required to show how funding and capacity will be shared between the freight route developments and other schemes.

The TIF funding already allocated for creation of the W10 gauge freight routes across London and from Peterborough and Southampton to the WCML, could be considered as

contributing some key sections to such a network. It is noted that NR publish a 'W10 National Freight Gauge Clearance Map (Existing and Proposed Routes) on their web site. Creation of a 'high cube' container gauge network will be an important element in the creation of an overall Strategic Freight Network.

We have not reviewed the SFN proposal.

13.9 NLL Capacity Enhancement

There are capacity issues on the North London, arising from the need to accommodate a mix of passenger and freight services and to provide for predicted increases in freight traffic. The driving need for capacity enhancements seems to be TfL aspirations to increase NLL service frequencies, broadly to achieve their aspirations for 'metro-type service intervals'. As such it may be more appropriate that the capacity works which are driven by the passenger aspirations and plans are funded directly by TfL rather than through the SBP.

The SBP includes £239.552m (CP4 not modelled) for capacity enhancements on the North London Line. The Master Enhancements spreadsheet contains a figure of £44.0m as the SBP contribution in CP4, the balance representing TfL contributions. Network Rail has subsequently stated that the CP4 contribution should be £28m.

We have included the £28m in our Orange and Green Chart.

13.10 Chadwell Heath Turnback

The project documentation notes that there has been significant demand growth in recent years on the Inner London services on the Great Eastern Corridor, and that the RUS showed that a number of peak services now in excess of PIXC limits. The proposal is to construct a turnback siding at Chadwell Heath, to allow services which currently terminate at Ilford to be extended to serve Seven Kings, Goodmayes and Chadwell Heath.

The Point Estimate for the scheme is £3.887m (of which £3.509m is in CP4). The Electric lines route on which the turnback would be located, and the services concerned, will become part of Crossrail. It may therefore be more appropriate that this turnback is funded and developed as part of the Crossrail scheme. This would also ensure that the train length provision, and project timing for the siding is fully compatible with developing Crossrail proposals.

The capacity requirement could be achieved by extending trains to Shenfield, saving capital cost but increasing operating costs.

For our Orange and Green charts, we have spread the £3.887m over the NR programme.

13.11 Stabling for "Northern" (West Yorkshire)

The Enhancements Master Spreadsheet includes an allowance of £14.800m for new stabling provision for the increases in Northern's fleet arising from the DfT's rolling stock strategy.

The project objective is stated to be: "The DfT's rolling stock strategy identifies that Northern will receive additional rolling stock. Northern has identified that if the additional roiling stock is cascaded then the existing depot facilities can cope with the additional maintenance required providing the likes of Newton Heath are cleared of stock that is not required to be there for maintenance reasons. Consequently an additional site will be required to handle the stock in terms of stabling, and day to day servicing. The objective of this project is to investigate Northern's stabling requirements and provide solutions for the necessary additional stabling and/or depot facilities in line with the projected increase of rolling stock. A strategy will be developed, based on the forecast rolling stock increases and planned service patterns, with a view to providing the most cost efficient location(s) taking account of any increases/decreases in empty stock moves".

The DfT's rolling stock strategy is being developed and initial proposals were only published in January. This and the above project description make it clear that the project development is at a very early stage. The SBP cost allocation can therefore only be regarded as a very tentative pre-estimate. Project scope and costs could change significantly as the rolling stock strategy develops, and depending on site issues.

Separate discussions with Network Rail indicated that they had not generally included depot provision for the DfT's proposed new rolling stock in their SBP and the only provisions seem to be for depots for Northern, in the North West and in west and South Yorkshire. There was some uncertainty over whether the packages for the new build stock would include the costs of providing the dedicated depot and maintenance facilities and therefore what Network Rail and the TOC's will finally be required to do.

This raises issues of consistency of the SBP proposals in that the only stabling proposals are for Northern. It would seem desirable that either the SBP includes "national" rolling stock strategy depot requirements or none at all, such that all depot requirements are funded in the same way.

13.12 Stabling for "Northern" (South Yorkshire)

The Enhancements Master Spreadsheet includes an allowance of £9.631m for new stabling provision for the increases in Northern's fleet arising from the DfT's rolling stock strategy. The comments in Section 13.11 above apply.

13.13 Cardiff Area Schemes

The following three schemes are considered together because of their geographical interaction:

- Barry to Cardiff Queen Street
- Cogan Junction Upgrade
- Ninian Park to Radyr (City Line) Line Speed Improvements.

Network Rail advised that the schemes support the 16tph service specification required by Welsh Assembly Government rather than the train lengthening initiative to satisfy the HLOS metric for Cardiff. However, the schemes have the opportunity to be delivered most efficiently by the (CP4) Cardiff Area Signalling Renewal and so should be considered accordingly within the optional schemes. Rather than just apply like-for-like renewal, consideration was given by Network Rail (in association with the Welsh Assembly Government and DfT) to opportunities for enhancements which could be incorporated into the renewals scheme to give capacity and performance improvements at incremental cost.

13.13.1 Barry to Cardiff Queen Street

The key railway corridor in the Cardiff area is the between Cardiff Central and Queen Street where basically all the Valley services funnel into a two track section between the stations. Capacity on this route section therefore determines the maximum possible service frequencies that can be offered on all the Valley routes.

The SBP contains the sum of £36.878m (CP4 not modelled) for this scheme.

We assume that, while current service levels meet the HLOS capacity metric, there are aspirations to increase service frequencies. Network Rail noted that there are notable operational issues associated with the operation of the Cardiff network, as it is the hub of a network of local, regional, inter-city and freight services. The aspirational train service of 4tph on each route would give a total 16tph south of Queen Street. The Cardiff Area Signalling Renewal Enhancements project therefore aims to incorporate this capability.

For our Orange and Green charts, we have spread the £36.878m over the NR programme.

13.13.2 Cogan Junction Upgrade

The SBP Update identifies that this scheme complements the Cardiff area signalling renewal enhancements (CASR). The CASR key enhancement requirements are to deliver greater capacity (16tph) between Cardiff Queen Street North Junction and Cogan Junction through the key nodal points of Cardiff Queen Street Station and Cardiff Central Station. The Enhancements Master Spreadsheet Estimate is £5m.

The scheme is noted in summary table 19 for Route Plan 15 SBP April 2008, p.15. It is quoted as being at GRIP Stage 3 and expected to be completed in 2011.

13.13.3 Ninian Park to Radyr (City Line) Line Speed Improvements

The scheme is noted in summary table 19 for Route Plan 15 SBP April 2008, p.15. The Enhancements Master Spreadsheet includes £5m. It is quoted as being at GRIP Stage 3 and expected to be completed in 2013.

13.14 Redditch Branch Enhancement

The Birmingham Cross-City line has been a significant success, and the core section of the route across the city centre offers a 10-minute frequency service throughout the day. The western arm of the route is single-track between Barnt Green and Redditch, limiting the maximum train frequency to 2 trains per hour (the other 4 services have to terminate at Longbridge). Passenger growth has been as high as 10% per year, and peak trains to Redditch now experience significant crowding. There are aspirations to run more trains to Redditch, while there is also a need to provide better services to Bromsgrove on the main line to Worcester and Cheltenham. Further “above trend” growth is predicted by the West Midlands Regional Spatial Strategy (RSS) which states that within the Redditch District Council area, there are plans to develop a further 6600 new dwellings within CP4 and 5.

This scheme (Section 13.14) and the following scheme (Section 13.15) have complex inter-linkages. For the Redditch Branch, the provision of capacity would facilitate 3tph to help manage CrossCity South route performance, where currently the overloaded 2tph Redditch starters import delay on the route and into New Street. Crucially, it would provide additional peak capacity for Redditch, Alvechurch and Barnt Green at 6-car 3tph, where the poorer financial option to expand to 9-car 2tph. The Bromsgrove extension would provide more peak Birmingham capacity to Bromsgrove (6-car 3tph as against 4-car 2tph), allowing back-projection of some released capacity from Longbridge. It would also allow some Worcester/Hereford and Cardiff services to omit the Bromsgrove call, back-projecting peak capacity on these longer-distance flows. In addition to the peak capacity delivery, there is a frequency benefit for Bromsgrove passengers and a journey time benefit for longer distance passengers west of Bromsgrove.

The project proposes the construction of a loop line on the Redditch Branch, thus dividing the single line section into two and allowing a 3tph service frequency.

Network Rail has included £17.150m (£16.416m in CP4) for this scheme.

The scheme is not required for the HLOS but is needed to meet local capacity issues. There may be opportunities for some limited funding contributions form stakeholders such as Local Authorities and Centro.

For our Orange and Green charts, we have spread the £17.150m over the NR programme.

13.15 Extension of Cross City Services to Bromsgrove

Bromsgrove has expanded rapidly in recent years and there is significant demand for rail passenger services, principally for commuting to Birmingham. Bromsgrove is located on the main line from Birmingham to Worcester, Cheltenham and Bristol and the current character and distribution of services on the routes makes it difficult to provide a satisfactory service to the town (impacts on longer distance journey times, crowding, etc). Service frequencies are currently generally hourly, with some additional peak period trains. A project is currently

under way to relocate the station to provide longer platforms, improved park and ride facilities, and reduce rail capacity impacts. We assume this to be separately funded.

Further growth is predicted by the West Midlands Regional Spatial Strategy (RSS) which states that within the Bromsgrove, Worcester City and Malvern District Council areas, there are plans to develop a further combined 17,500 new dwellings within CP4 and 5.

Proposals have therefore been developed to extend the Birmingham Cross-city electrification from Barnt Green to Bromsgrove with three of the services which currently terminate at Longbridge being extended to Bromsgrove (see also Section 13.14 above regarding complimentary improvement of services to Redditch). Operation of electric services over the Lickey incline should also give some performance benefits.

Network Rail has included £11.723m (£11.244m in CP4) for this scheme.

The scheme is not required for the HLOS but is needed to meet local capacity and passenger demand issues. There may be opportunities for some limited funding contributions from stakeholders such as Local Authorities and Centro.

The SBP allows for infrastructure work; the figure is intended to include for electrification, power supply upgrades, Bromsgrove station relocation, car parking and highway access arrangements, as well as the costs of promoting the scheme through industry and statutory processes.

The project involves electrifying (overhead 25kV) the line between Barnt Green and Bromsgrove, and requires approximately 4.5 double track miles (14.5 stkm) of overhead wire with supporting infrastructure and the possible installation of an additional feeder station.

The main work elements are;

- turnback facilities required at Bromsgrove station throat;
- gauge clearance for Class 323's;
- changes to maintenance methods of working;
- installation of overhead wire and associated infrastructure.

Network Change is required; the scheme is fully supported by West Midlands PTE and Worcestershire County Council.

The cost per stkm for small electrification schemes (such as this) is approximately 30% higher than would be the case if the electrification was a larger scheme. The cost of the proposed new electrification should be of the order of £12m. For this small electrification scheme, significant cost reductions may be achievable by NR by utilising in-house resources if they are available. The mark up of 30% may be high in view of the statement in the RSSB report that an 'optimism bias' was used which 'is considered cautious'.

No allowance has been made in the document titled 'Traction Power Supply Requirements for CP4' for a new 25kV supply point to feed the possible installation of the new feeder station referred to in the project remit; this would add further cost.

Our independent cost estimate incorporates the electrification proposal, a new feeder station, track work at Bromsgrove and a new station with car park. We estimate a cost of £26.898m. We estimate the cost without the station at £20.112m. Neither figure allows for any off-setting contributions from Worcestershire CC or others. Both are considerably higher than the SBP allocation of £11.723m.

We have used the figure of £26.898m in our "Orange and Green Charts".

13.16 Stabling for Northern (Route 20)

The Enhancements Master Spreadsheet includes an allowance of £14.450m for new stabling provision for the increases in Northern's fleet arising from the DfT's rolling stock strategy. The comments in Section 13.11 above apply.

13.17 Maidenhead and Twyford (Relief Lines)

Network Rail notes the objectives of this scheme as being to extend the Up and Down Relief Line platforms at Maidenhead and Twyford stations in order to accommodate 7-car suburban trains contributing to the delivery of the HLOS capacity metric for Paddington station.

The overall outputs of the W012 scheme aim to be the following:

- Increases to existing carrying capacity;
- Load factors will be maximised with values ranging between 87.2% (3hr peak) and 96.9% (high 1hr peak);
- Maintain or reduce current peak load factors i.e. 67% (3hr peak) and 76% (1hr high peak) in Paddington in CP4;
- No journey time reductions are anticipated with this scheme.

This project proposes to extend a total of 4 platforms. It is envisaged this work would involve S&C renewals, earthworks, retaining walls, minor electrification undertakings, plain line track installation, and bridge modifications at the 2 sites.

This scheme has 4 interdependencies which are defined as being complimentary to this project and will provide additional capacity for peak periods. These include:

- Paddington Station reconfiguration;
- Padding Relief line speed enhancements;
- Reading Station redevelopment;
- Crossrail.

The exact relationship between the Twyford project and their related interdependencies is unclear, but Network Rail makes reference to Crossrail by stating that: "Crossrail project proposes key station platform extensions to accommodate 200m long trains. This includes Maidenhead under the current proposal. Should Crossrail be extended to Reading then Twyford platforms would then require extending. An opportunity arises to bring forward Crossrail spend to extend Maidenhead much earlier than currently planned to deliver both the HLOS and Crossrail requirements. Should this be achievable, then Twyford would need to be treated as an independent scheme".

Network Rail reported in April 2008 that this scheme was at GRIP Stage 0. This scheme has no specified end date, but it is expected to be completed during CP4. The Point Estimate is £3.118m of which £2.985m in CP4.

For our Orange and Green charts, we have spread the £3.118m over the NR programme.

13.18 Route 20 Capacity Enhancement Package

Network Rail states that the project objectives are to identify and implement tactical interventions that will improve the passenger environment at Victoria, and allow the cost effective deployment of Northern Rail's fleet.

The main element of work is capacity enhancements. This includes the provision of turnback facilities at Stalybridge, Rochdale and Buxton which includes: new platforms; electrification renewals and installation on the line to Stalybridge; linespeed increments at

various locations including the Hadfield route; interior modifications to Manchester Victoria and rolling stock deployment recasting.

The scheme has the following key outputs:

- Some of the interventions will lead to an increase in the level of electrification, and create additional capacity at specific locations in the NW area;
- One aspect to the efficient use of Northern's fleet will be to improve the cycle time of the diagrams – for example by allowing three to do the work, which currently require four. This will incidentally reduce journey times. The better passenger environment at Victoria will improve passenger generalised journey times;
- Some performance gain may accrue according to Network Rail, but the nature of this has not yet been established;
- Facilitates the operation of the increased fleet size necessary to reduce average load factors of units operating into and out of both Manchester and Liverpool Lime Street. The reduced journey time will lead to any crowding issues being kept to a shorter duration.
- Improves the environment at Victoria making more realistic any plans to redistribute passengers between Victoria and Piccadilly and get the best use of each train's capacity;
- Facilitates the planned increase in rolling stock in the NW, by allowing the units to be efficiently deployed, for example by avoiding the need to operate longer trains for greater distances than necessary.

This scheme has 7 interdependencies which are defined as being complementary or having a non-defined interface with the 'Capacity' project. These include:

- NW Platform extensions (complementary);
- NW Rolling stock increases (non-defined);
- Buxton Remodelling (non-defined);
- Stalybridge track and signalling renewals (non-defined);
- Salford Crescent remodelling (complementary);
- Manchester Victoria Fish Dock redevelopment (complementary);
- TPE LSI CP4 (non-defined).

Network Rail reported in March 2008 that this scheme was at GRIP Stage 0. However, within the same document it noted that this scheme was due to switch to GRIP Stage 1 in January 2008, 2 months before this datasheet was submitted. This scheme is expected to be completed by the autumn, 2013. The Point Estimate is £31.629m of which £29.182m in CP4.

At Buxton, a new crossover would allow moves into either platform, with diagramming efficiency, and saving a unit to be used elsewhere.

At Rochdale, the turnback platform would save about 6-8 minutes over the existing shunt move with the benefit of saving a 2 x 2-car peak-hour unit.

At Hadfield (plus the Stalybridge electrification and bay), the solution would allow 4 units to work a 15-minute service on the Hadfield line and 2 units to work a 30-minute service to Stalybridge. Journey times to Manchester from Guide Bridge and beyond would be improved, and there would be a total of 18 vehicle arrivals in each peak hour. The bay would allow a peak hour bounce-back that would otherwise have to work to Huddersfield, giving an additional 8 Manchester arrivals in each of the peak hours

We note this, and many other SBP projects in the Manchester area, and we feel it is vital that Network Rail determines an overall package of non-competing schemes, implementing each in turn in line with an overall objective, and ensuring no duplications or abortive expenditure.

For our Orange and Green charts, we have spread the £31.629m over the NR programme.

13.19 Huddersfield Platform 9

The scheme involves the construction of a new through platform to accommodate an 8-car train. Other works that will be required are new retaining walls, earthworks, drainage, and lighting, and a new subway spanning two tracks.

The scheme's objectives are as follows:

- to allow longer and extra services;
- Meet HLOS peak growth for the Manchester-Leeds route;
- Improve station capacity at Huddersfield;
- Improve train performance at Huddersfield;
- Meet Leeds-Manchester capacity improvements.

The scheme is at GRIP Stage 1. It is anticipated that it will be completed by December 2013. The Point Estimate is £9.353m of which £9.212m is in CP4.

This scheme has 4 interdependencies which are defined as being complementary. These include:

- West Yorkshire Stabling;
- East Leeds Parkway station;
- West Yorkshire platform extensions;
- Leeds new platforms (Bay).

The scheme would create an additional through platform which would provide additional opportunity for fast services to overtake slower (stopping) services and additional capacity for terminating long trains. This will contribute to Trans-Pennine capacity and performance benefits.

The cost estimate looks reasonable.

This is part of the Leeds area package of projects introduced in the SBP Update and discussed generically in Section 8.14. Huddersfield is on the Key Transpennine Corridor, which carried a wide range of services with different speeds and stopping patterns. Facilities for faster trains to overtake slower ones, recover lost paths and terminate trains clear of through routes therefore provide an important contribution to achieving journey time reductions and improving performance. The Scheme would create and additional through line and overtaking facility.

For our Orange and Green charts, we have spread the £9.353m over the NR programme.

13.20 Seven Sisters Improved Access

This is stated to be required due to the proposed turnback for the Cheshunt to Seven Sisters shuttles. Improved access is required for capacity reasons in connection with the additional proposed services and to meet predicted demand.

Network Rail advised that not investing in the station capacity at Seven Sisters will put at risk the achievement of the Route 5 HLOS into Liverpool Street, as the station will become increasingly overcrowded, resulting in frequent closures. This will effectively cause a

'crowding off' of passengers at station level rather than at an 'on train' level. The revenue growth is intrinsic to SOFA.

The only cost information we have received to date for this scheme is that on the Enhancements Master Spreadsheet supplied by the ORR in April 2008. The cost identified was £1m. The scheme is noted in summary table 18 for Route Plan 5 SBP April 2008, p.19. It is quoted as being at GRIP Stage unknown and expected to be completed in 2011.

For our Orange and Green charts, we have spread the £1.0m over the NR programme.

13.21 Seven Sisters Turnback

This is stated to be required to provide a turnback facility for the proposed Cheshunt to Seven Sisters shuttles. Improved access is required for capacity reasons in connection with the additional proposed services and to meet predicted demand, hence efficiently maintaining the load factors at the required level. Seven Sisters is also an important interchange with the LUL Victoria Line into London, which relieves the overcrowding (load factor) that would otherwise worsen into Liverpool Street.

The only cost information we have received to date for this scheme is that on the Enhancements Master Spreadsheet supplied by the ORR in April 2008. The cost identified was £1m. The scheme is noted in summary table 18 for Route Plan 5 SBP April 2008, p.19. It is quoted as being at GRIP Stage unknown and expected to be completed in 2010.

For our Orange and Green charts, we have spread the £1.0m over the NR programme.

13.22 Fenchurch Street and Chafford Hundred Passenger Circulation

This scheme is stated to be required to accommodate predicted demand at these stations.

Network Rail advised that Fenchurch Street and Chafford Hundred were identified by an SRA study in 2002 as being some of the most congested railway stations on the network. Additional demand will lead to worsening conditions, and not investing in station capacity would put at risk the Route 6 HLOS requirement into Fenchurch Street due to station closures. The revenue growth is intrinsic to the funding projections in SOFA.

The only cost information we have received to date for this scheme is that on the Enhancements Master Spreadsheet supplied by the ORR in April 2008. The cost identified was £2m. The scheme is noted in summary table 19 for Route Plan 6 SBP April 2008, p.19. It is quoted as being at GRIP Stage unknown and expected to be completed in 2010.

For our Orange and Green charts, we have spread the £2.0m over the NR programme.

13.23 Moorgate Branch Improvements

This scheme is newly-introduced in the SBP Update. It is recommended in the ECML RUS to help meet the HLOS high peak hour capacity metric for Moorgate by running additional trains. This requires reduced headways from 5 to 4 minutes, which in turn requires additional signals. The scheme aims to make passenger crowding conditions no worse than they are now. The additional rolling stock needed to deliver the capacity increase should be met from within the total rolling stock requirement identified in the October SBP.

This scheme is linked with the Alexandra Palace to Finsbury Park 3rd Up Line project. It is also linked to the newly-introduced scheme entitled “Finsbury Park to Alexandra Palace Capacity Studies” which relates to Down side improvements to complement the Up side proposals.

This scheme would re-introduce intermediate block signals to allow the train service frequency improvements which are an inherent part of the above schemes. Network Rail’s Point Estimate is £5.0m on the Master Enhancements spreadsheet.

Our independent view is that the re-introduction of additional signals is the only practical way of achieving capacity increases, as train lengthening would be hugely problematic and

disruptive in this tunnelled section of route. The scheme could possibly be aggregated with the Finsbury Park to Alexandra Park Area improvements to develop an integrated package of capacity enhancements for the Moorgate services to Welwyn Garden City and Hertford.

For our Orange and Green charts, we have spread the £5.0m over the NR programme.

13.24 Todmorden Turnback Facility

This scheme is designed to help meet the peak hour capacity metric into Manchester to avoid the need for strengthening Leeds – Bradford – Manchester Victoria services, thereby reducing additional vehicle miles and possibly reduce the number of vehicles required as some 'bounce back' may be possible.

The only information we have received to date for this scheme is that on the Enhancements Master Spreadsheet supplied by the ORR in April 2008. The cost identified was £5m. The scheme is noted in summary table 17 for Route Plan 10 SBP April 2008, p.19. It is quoted as being at GRIP Stage 3 and expected to be completed in 2012.

As with the new Leeds area schemes (Section 8.14) this scheme is new and has arisen though the discussions between Network Rail and Northern Rail, although the possibility of providing a bay platform at Todmorden has been under consideration for some time. Advantages and disadvantages of the proposal, and funding issues are similar to those summarised in Section 8.14. It is understood that the proposal currently does not have a good Business Case. An alternative option might be to extend the trains to Burney, which would probably have an even poorer Business Case, but could have regional economic benefits which could possibly attract some local funding.

As with Leeds the proposal seems to presuppose the availability of additional train paths into Manchester Victoria. The existing Calder Valley services through Todmorden, which terminate at Victoria are understood to cause capacity issues there, through conflicts at the station throat. Consideration has been given to extending these trains further west to terminate at Salford central or Crescent, thus removing the conflicts at Victoria.

Something similar would be likely to be required for any additional Todmorden trains but this issue is not mentioned. NR needs to show how the proposed services will be accommodated. A strategy and developed proposal is needed for dealing with these issues.

For our Orange and Green charts, we have spread the £5.0m over the NR programme.

13.25 Horsforth Turnback Facility

This scheme is designed to help meet the peak hour capacity metric into Leeds on Harrogate line – additional peak hour Horsforth – Leeds services to avoid the need for strengthening some York / Knaresborough/Harrogate - Leeds services. This thereby reduces additional vehicle miles and will reduce number of vehicles required as some 'bounce back' is possible. This scheme is subject to further analysis in the Yorkshire and Humber RUS.

The only information we have received to date for this scheme is that on the Enhancements Master Spreadsheet supplied by the ORR in April 2008. The cost identified was £5m. The scheme is noted in summary table 17 for Route Plan 10, SBP, April 2008, page.19. It is quoted as being at GRIP Stage 1 and expected to be completed in 2012.

This is one of the new Leeds area schemes referred to in Section 8.14, where the generic issues are discussed. The package of schemes also includes proposals for additional signals to increase capacity between Horsforth and Harrogate (See Section 13.26 below). The Local Authorities and PTE would like the Harrogate services improved, and there may be a risk that a Bay platform would see very limited use, with a preference for most or all trains to run through to Harrogate.

We have concerns that opportunities for additional train paths between Horsforth and Leeds might be limited, and the two proposals would seem to be an either/or option rather than both. In the absence of evidence, it would seem preferable for the signal section option to be developed.

For our Orange and Green charts, we have spread the £5.0m over the NR programme.

13.26 Harrogate to Horsforth Additional Signal Sections

This scheme will allow Horsforth shuttle services and is linked to the Horsforth turnback facility scheme.

The only information we have received to date for this scheme is that on the Enhancements Master Spreadsheet supplied by the ORR in April 2008. The cost identified was £4m. The scheme is noted in summary table 17 for Route Plan 10, SBP April 2008, and page 19. It is quoted as being at GRIP Stage 1 and expected to be completed in 2012.

This capacity enhancement is on the same route as the proposed Horsforth turnback discussed in Section 13.25 above. We have concerns over whether there would be route capacity for both schemes, and as discussed above, this option would seem preferable.

For our Orange and Green charts, we have spread the £4.0m over the NR programme.

13.27 Keighley Turnback Facility

This scheme will help meet the peak hour capacity metric into Leeds on the Skipton line by providing an additional peak hour Keighley to Leeds service to avoid the need for strengthening Skipton to Leeds services. This thereby reduces additional vehicle miles, reduces the number of vehicles required as some 'bounce back' is possible and avoids complex platform lengthening on the Shipley on Skipton line.

The only information we have received to date for this scheme is that on the Enhancements Master Spreadsheet supplied by the ORR in April 2008. The cost identified was £5m. The scheme is noted in summary table 17 for Route Plan 10, SBP April 2008, page.19. It is quoted as being at GRIP Stage 1 and expected to be completed in 2013.

This is one of the new Leeds area schemes referred to in Section 8.14, where the generic issues are discussed. The difficulty of train and platform lengthening on the Skipton line arises through the location of the station at Shipley on the triangular junction with the Bradford line. The lengths of the sides of the triangle limit the scope for platform extension. SDO could be a possibility, but this would entail part of the train stopping on one of the junctions, with adverse impacts on capacity.

The Bay platform would allow the service between Leeds and Keighley to be supplemented by turnbacks. An alternative option might be for long trains to omit the Shipley stop, which could be covered by other services. This would save the cost of the bay, and spread the train capacity benefits further west. However there would be increased operating costs and the need to lengthen platforms at stations between Leeds and Skipton, although it is noted that this is the approach proposed for the partner electric services to Ilkley (Section 13.28 below).

For our Orange and Green charts, we have spread the £5.0m over the NR programme.

13.28 Ilkley to Leeds Platform Lengthening

This scheme is not within the scope of the West Yorkshire platform lengthening scheme as it was originally expected that additional services would run to meet the peak capacity metric into Leeds on this route. However it is now proposed to allow train lengthening on the route.

The only information we have received to date for this scheme is that on the Enhancements Master Spreadsheet supplied by the ORR in April 2008. The cost identified was £5m. The

scheme is noted in summary table 17 for Route Plan 10, SBP April 2008, page 19. It is quoted as being at GRIP Stage 1 and expected to be completed in 2013.

This is another of the new Leeds area schemes referred to in Section 8.14, where the generic issues are discussed. However it will be noted that this one has adopted the opposite policy – longer trains, rather than more trains. The reason for the different approach is not stated, though it might have been recognised that increasing service frequency on all three of the Skipton, Ilkley and Harrogate lines, which all share track into Leeds might not be feasible.

For our Orange and Green charts, we have spread the £5.0m over the NR programme.

13.29 ECML OLE

The objective of this project is to reduce by 50% the number of delays on the East Coast Main Line due to overhead line failures. The scheme is of great importance in improving PPM performance given that in 2006/2007 72,000 delay minutes were attributed to OLE failures according to NR figures.

The scheme is at GRIP Stage 1, and the SBP contains a Point Estimate of £47.185m (of which £35.134m is in CP4) for these works.

The works focus on clearing vegetation including earthworks, reducing the 'defect' logbook of OLE, renewing neutral sections and improvements to locomotive pantographs. In addition, the scheme will devise more robust strategies for lineside protections and monitoring of OLE. It is assumed that 1290 wire runs are affected.

This scheme has parallels with the GE electrification scheme which was proposed in the SBP. This scheme was withdrawn from the SBP Update, as Network Rail acknowledged that "we have re-positioned the … replacement of the overhead line equipment … as renewals expenditure. In the SBP, this was included as a performance scheme in the enhancements section". It is not clear why this ECML project is different in character from the GE project. Again, it would appear that consideration should be given as to whether the project (or a substantial part of the cost) should be attributed to renewals, rather than as an enhancement.

For our Orange and Green charts, we have included Network Rail's estimate of £47.185m.

13.30 West Croydon Track Capacity

This is discussed in Section 8.7 together with the station enhancement scheme.

13.31 Didcot - Oxford Area Capacity Upgrade

Didcot – Oxford – Wolvercot Junction is a key route section on the London and Reading to West Midlands and Cotswolds passenger corridor and the Southampton to West Midlands and North West freight corridor. There is a SBP 'optional' scheme for doubling parts of the Cotswold line to improve performance and increase capacity, and TIF schemes for increasing capacity and gauge on the Southampton – West Midlands freight corridor. Outside the SBP studies are ongoing into a possible East- West rail link, initially from Oxford to Milton Keynes, which could be used as an alternative freight corridor to the West Midlands. All these schemes and opportunities place increased pressure on the Didcot-Oxford – Wolvercot Junction route section, which is predominantly double track and Oxford station which has only two through platforms, which also have to accommodate a significant number of terminating and starting services.

The SBP contains an allocation of £21.049m (of which £19.395m is in CP4) for capacity works between Didcot and Oxford. The project objective is to increase capacity and performance and to help deliver an estimated 50% increase in container traffic between Southampton and the WCML. The current proposals are for construction of additional

infrastructure (loops) and the remodelling of Didcot North Junction to improve speed and capacity.

As with Steer Davies Gleave, we are concerned that the current project objectives and scope do not appear to fully address the issues on this very congested route section and the possibilities of further increases in passenger traffic, and particularly on station capacity, which could arise from other schemes. Before proceeding with this scheme it would seem desirable for Network Rail to undertake a wider review of requirements on the corridor and to confirm that the scheme they intend to take forward will meet all reasonable future requirements for the route or facilitate provision for future developments.

Related projects include:

- Southampton to WCML W10 gauge enhancement;
- Reading remodelling – which would increase passenger and freight capacity on the corridor;
- Southampton to Basingstoke Capacity enhancement – a W10 diversionary route and additional freight capacity;
- Cotswold line redoubling – potentially giving capacity for an hourly passenger service;
- East-West Rail Link – potentially providing a regular Oxford – Milton Keynes passenger service and a new freight route.
- Oxford station enhancements – potentially including a south bay and conversion of current freight loops to passenger operation.

For our Orange and Green charts, we have spread the £21.049m over the NR programme.

13.32 Bolton Corridor Package

The SBP includes £7.590m (of which £7.319m is in CP4) for a 'Bolton Corridor Package'. The project objective is stated as 'To provide a valuable increase in capacity and improve journey times on the Bolton Corridor, especially between Salford and Bolton, but also from Bolton towards Euxton Junction and Wigan, and between Preston and Poulton. This intervention is recommended in the NW RUS'.

From this, the Bolton corridor can be defined as the route from Salford Crescent to Blackpool North via Bolton and Preston and the route from Bolton to Wigan. The particular issue on the corridor, as with other Transpennine Express routes, is the wide mix of passenger services, with different speeds and stopping patterns. The corridor is basically double track and there are limited opportunities for overtaking. This limits capacity and the opportunities for journey time improvements as differential speeds between services leads to capacity reductions.

The primary element of the proposals is to reinstate a former through platform at Bolton to provide opportunities for trains to overtake in the Down direction. Lostock station, north of Bolton is located at the junction between the Preston and Wigan lines, but only has platforms on the Preston line. It is proposed to construct platforms on the Wigan line to allow a better spread of stopping patterns. The station works will allow the implementation of line speed improvements which could deliver up to 7 minutes of journey time savings between Salford and Blackpool.

Although not required for the HLOS, the scheme will deliver useful capacity and performance benefits, particularly in combination with the proposed capacity enhancement scheme at Salford Crescent.

For our Orange and Green charts, we have spread the £7.590m over the NR programme.

13.33 Buxton Line Capacity and LSI

The SBP includes £16.836m (all in CP4) for works at Buxton. The scheme appears to cover the Buxton Freight Capacity and Buxton Remodelling elements of the October 2007 version of the SBP.

The former extensive layout at Buxton has been rationalised piecemeal over many years, leaving a somewhat rudimentary layout which has limited flexibility and capacity. Trains from the Dowlow area currently have to reverse in a run-round siding at Buxton, which limits train lengths. It is proposed remodel the Buxton Layout to allow trains direct access to the Hazel Grove line, thus removing the length constraint. This will allow the operation of up to 50% longer trains, reducing costs and releasing capacity on the congested Hope Valley route, and potentially for additional aggregates trains.

Some speed improvement work would also be required on the Buxton- Hazel Grove route to accommodate the freight trains between the existing passenger services, and this is included in the proposal.

The basic concept of the scheme was identified in the North West RUS, but as noted in the opening paragraph the scheme descriptions and scopes have changes somewhat since the publication of the SBP. It seems that the scheme is still evolving and will require further development before the full scope, benefits and costs can be defined with certainty. The project summary sets a target date of April 2009 for GRIP Stage 1 output definition.

The scheme is not required to meet the HLOS. It would seem to have significant benefits and it would be desirable to proceed with further scheme development.

For our Orange and Green charts, we have spread the £16.836m over the NR programme.

13.34 Hertford Loops (including Gordon Hill Loops)

This is listed in the SBP Update as an optional capacity and performance scheme. The project objective is stated to be “Enhance capacity on the Hertford Loop and provide additional routeing options onto the Hertford Loop south of Stevenage. Provide turnback facility at Stevenage to save empty sub-optimal running at Letchworth”. The output is to improve carrying capacity via the Hertford Loop as an ECML diversionary route during times of planned and unplanned disruption to accommodate planned growth on the ECML and suburban routes. The proposals for a turnback platform at Stevenage would be integrated with separate proposals for platform lengthening and provision of a new footbridge at Stevenage.

The work involves upgrading the signalling on the Hertford Loop to close the existing headway, and providing passenger loops at Gordon Hill.

The Hertford Loop is used during maintenance, renewals and perturbed situations as the ECML between Alexandra Palace and Stevenage. It is two track with no overtaking facility, long sections through Ponsbourne Tunnel and between Hertford North and Stevenage and as a result is only capable of operating a reduced ECML service which results in the local service either being withdrawn or severely reduced.

This proposal would significantly improve the routes capability in these circumstances.

The SBP estimate is £18.181m, of which £16.067m is in CP4.

The estimate and timescales for the signalling and loop works appear to be reasonable.

For our Orange and Green charts, we have spread the £18.181m over the NR programme.

13.35 Redhill Remodelling

The SBP indicates this scheme is needed to meet HLOS requirements.

Presently, the high-peak-hour has one 4-car through operation from Reigate to London Bridge and one 3-car through operation from Tonbridge to London Bridge. The SBP indicates that it is not possible to reliably split and join the Reigate and Tonbridge services in the high peak, given other requirements to run through and to terminate services on the North Downs Line in Platform 1. Without the scheme, there would be an 800-seat reduction in peak capacity below the HLOS metric. There would be no additional impact in 3-hour peak as there is only a high-peak issue.

The scheme would deliver an additional platform and an altered track layout to reduce conflicting train movements, increase platform capacity, and raise speeds through the station and junctions. The NR response to our questions indicated that the scheme would allow delivery of the +1tph Guildford/Reading to Gatwick service within FGW's Franchise Agreement that is presently undeliverable, given works at Gatwick Airport station in addition. It would be useful to ascertain if this proposed service is an aspiration or a commitment, and if there are any alternative sources of funding which could contribute towards delivery.

The track (S&C) in the Redhill area is expected to require replacement in the 2011 – 2017 period. Rather than replace like-for–like, a revised layout delivering capacity, performance and journey time benefits, at incremental extra cost is proposed. The SBP figure is stated to be the incremental cost after discounting the renewals elements of the work. There is some uncertainty over the proposed implementation period. The Route Plan 2 text states the implementation of Redhill Remodelling is in December 2015, while the SBP Enhancement Project Summaries forwards says the implementation date has been brought forward to 2011/12. The project summary quotes the S&C as requiring renewal sometime between 2011 and 2017 (to which the project needs directly linking to achieve value for money) and the project team stated that no condition assessments on the existing S&C had yet been carried out to establish remaining life.

Because of the incremental benefits of incorporating a remodelling scheme into the S&C renewals scheme it would seem desirable that development of a capacity enhancement scheme at Redhill is proceeded with. More work will be needed to establish optimum project timescales.

The Estimate Review Sheets give the project point estimate as £37.512m (CP4 not modelled). The Enhancement Mater Spreadsheet indicates a CP4 provision for this project of £25m.

For our Orange and Green charts, we have spread the £37.512m over the NR programme.

13.36 Round Oak to Walsall Reopening

Currently freight services in the West Midlands (many of which are inter-regional) have to share core route capacity with the intensive regional passenger services, most notably, the Bromsgrove to Barnt Green, Landor Street to Water Orton and Wolverhampton route sections. The Round Oak (Stourbridge) to Walsall line was closed some years ago, but the alignment was retained for possible use of sections for an extension of Midlands Metro. The route corridor does in principle offer the potential to create an alternative route for freight, bypassing the most congested sections of the West Midlands rail network. The proposal could:

- Release network capacity at key junctions, such as Kings Norton, Landor Street and Wolverhampton;
- Remove freight services from some congested route sections, with associated capacity and performance benefits;
- Provide some additional capacity for growth of passenger and freight services;
- Provide a strategic freight diversionary route.

The current proposals assume that the Midlands Metro extension will go ahead (it is not currently funded) and that the Network Rail scheme would consist of the incremental additions in terms of track, signalling and other facilities, needed to the Midlands Metro proposal to allow the creation of effectively a single track freight line, with a capacity of about 2 tph each way. The current proposal would involve inter-running of freight and Metro services, necessitating the use of tram-train type vehicles for Metro (there are currently no vehicles approved for such use in the UK, although proposals are being developed).

The SBP includes £33.849m (CP4 not modelled), but the SBP Update records a figure of £10m in CP4. It is described as an optional enhancement to renewal.

The project is not required for the HLOS, and in its current form appears to be dependent on the Midlands Metro scheme going ahead and agreements being reached for this project to be added to the Midlands Metro design and construction processes. This appears to pose significant uncertainties over timescales, costs and the risks of reaching satisfactory agreements. The original scheme text stated that the proposal does not have a strong enough Business Case as a stand-alone proposal.

In addition, it may be more appropriate for any scheme to be funded as a TIF scheme, or as part of the Strategic Freight Network.

We have not included any cost provision for this scheme.

13.37 Projects to Support Move towards Seven-Day Railway

The SBP Update contains a figure of £350m to support progress towards a seven-day railway (£320m in England and Wales, and £30m in Scotland).

In the SBP, Network Rail included provision as a response to the views expressed by Operators regarding the provision of an undisrupted service on seven days of the week. The TOCs/FOCs advised Network Rail there is demand for more services than is currently offered, particularly at the weekends and earlier and later trains in the week.

For our Orange and Green charts, we have spread the £320m for England and Wales equally over the CP4 period.

13.38 Development Fund for CP5 Schemes

Our recommendations on development funding for CP5 (and beyond) schemes start from the position that some funding organisation will have to make the necessary financial provision. That organisation does not necessarily have to be Network Rail, but someone has to assume responsibility for longer-term planning. Funding could be spread over a number of sources.

In very general terms, many of the "simple" schemes may have been done in CP4. For example, the platform extensions in the London and South-East area may be the maximum possible and there will be few “easy” extensions left. After the Stafford and Crewe schemes on WCML, any further significant change in capacity or journey times is likely to come from a much more substantial scheme or strategy. For most other main lines, the next generation of schemes is likely to be more complex, e.g. grade separations at places such as Woking on the SWML or a major scheme at Doncaster on ECML. Also, in terms of timescales, an increasing proportion of schemes may need TWA powers. Arguably, therefore, CP5 and beyond schemes could be increasingly complex, costly, and time-consuming.

We believe that development of CP5 schemes should start early in CP4, as there is a large amount of work to do in demand forecasting and identifying the capacity constraints. Once this work is complete, work can start on the development work. If development work is delayed, few schemes would be ready for delivery in the early years and many schemes would not be deliverable in CP5.

We understand that there may be a financial mechanism for release of development funding in a phased manner, releasing funds as and when Network Rail makes the case for a particular scheme(s).

We have not reached a financial conclusion as such, but have simply repeated Network Rail's "bid" for £180m for general funding.

13.39 North West Feasibility Study (Manchester Hub)

Network Rail has been asked by DfT to lead a feasibility study into 'the Manchester Hub', and this study will be completed in CP3. The SBP does not therefore contain a project(s) as such. The influence of Manchester embraces Leeds, Liverpool, Crewe, Stoke, Sheffield, Preston, Chester, Wigan and Blackburn, and in infrastructure terms, solutions will revolve around the problems at Piccadilly, Victoria, Oxford Road, Salford Central and Salford Crescent. A feasibility study will address these issues. Previous studies have identified schemes such as: additional platforms at Piccadilly, a flyover at Ardwick, and a chord and flyover at Ordsall Lane. It is likely that the capital cost requirement will be in the order of £300m - £600m. The capital investment is likely to be needed in CP5, but work will necessarily need to start in CP4. In advance of the study, the SBP requests funding of £60m during CP4 to develop the project and undertake enabling works.

Our assessment is in agreement that the projects likely to emerge are unknown, but, if a programme of £600m of work were needed, then £60m is a fair assessment of development needs. Elsewhere in the SBP are north-west schemes such as Salford Crescent, Salford Central and Bolton Corridor, which could be double-counted. It will also be necessary to ensure that designs developed in advance of the Hub studies are not compromised by, nor pre-judge, the outcome of the Manchester Hub work.

The SBP makes a funding bid for Manchester Hub £60m. For our Orange and Green charts, we have spread this £60m equally over CP4.

13.40 Policy Choices GSM-R Freight Only Branches, SISS, DC Regen Braking

The Enhancements Master Spreadsheet includes a figure of £166.930m. No detailed work was carried out on these issues.

For our Orange and Green charts, we have spread the £166.930m equally over CP4.

14 Arup's Financial Recommendations

14.1 Introduction

There are a number of considerations before we make our final recommendations on the CP4 financial requirements. These are set out below.

14.2 Forward Efficiencies on the Enhancement Programme

14.2.1 Introduction

Arup has very little evidence on which to base a judgement on the likely scale of efficiency savings going forward, certainly not within the scope of this study.

It was agreed with the ORR that the best way to identify the efficient unit rates going forwards was therefore to identify those enhancements and expenditure that were like renewals. ORR could then take a view of whether to apply the same efficiency trajectory to this spending as for renewals.

We therefore identified a set of criteria to define which enhancements were more like renewals, or where they were "unique" solutions. The issues affecting our comments are:

- the inclusion of repetitive elements (bespoke or repetitive solutions);
- risk levels;
- the potential for the inclusion of modular solutions;
- volume of activity;
- national or local application;
- undue safety issues, or lack of them;
- possession management: complex or well understood;
- suitability for a specialised contracting strategy;
- opportunities for improved procurement;
- improved possession management and utilisation;
- improved project management.

It must be remembered that all schemes will be subject to future Value Management (VM) exercises, which should also lead to cost savings and more effective and efficient use of resources.

We comment below on the individual areas of analysis, and offer a view on the extent to which forward efficiencies might be achievable.

14.2.2 Platform Lengthening Schemes

These schemes would appear to be capable of offering a high degree of efficiency gain. They include:

- repetitive elements, which can be made in a modular manner, often "off-site";
- off-the-shelf design techniques;
- modular construction;
- economies of scale on a large national rolling programme at a manageable rate of output;
- elimination of platform ramps;
- "constant" safety issues which could be dealt with generically.

In our estimates, we used a rounded rate of £8,000 per metre run. The un-rounded figure was actually £8,184 per metre run, assuming a 3.0m width of extension. This rate was an amalgam of several data sources and schemes, with understandably-different descriptions of measure, scope, item description etc. We repeated the calculations assuming a "best in class" rate for fencing, drainage, earthworks, track and platform works; the result was a rate of £6,765 per metre, about 17.3% better than average.

A related efficiency issue is that, as part of our day-to-day consultancy studies, we have seen little cross-fertilisation of ideas from one Territory to another. Teams seem to keep re-inventing the wheel, and do not build on the experience of others. There is an argument to be made for the establishment of a more national approach to achieving common design solutions to common problems, and then implementing these designs through a specialised contracting strategy; one could envisage a National Framework in which modular design solutions were introduced nationally, with less of the preferential engineering on a Territory basis. We can only speculate about potential procurement gains, but 5-10% over 5 years would seem to be achievable.

Overall, we believe that efficiency savings building up to a total of perhaps 25% could be achievable by the end of Year 5 of CP4, or an average of about 12.5% when averaged over the whole of CP4.

14.2.3 Stations

These schemes are often

- highly particular, "one-off" solutions;
- subject to the influences of a wide variety of stakeholders, many of whom will have competing and conflicting views of what is required;
- subject to planning permissions, introducing a "stop-start" risk.

We do not feel there is much that could be gained, apart from the usual inclusion of competitive tendering into the process, at a later rather than earlier stage. Network Rail needs to continue design development to define the solution, and then to seek competitive prices to build that chosen solution. Network Rail should be encouraged to share best practice by liaison between the various station teams, and achieve some efficiency gain. We suggest an average 5% improvement.

14.2.4 Power Supply Enhancements

Like platform extension schemes, these power upgrades could include modular equipment packages. Once the power modelling is complete, "standard" designs of track-side equipment delivering a selected range of power outputs could be developed. There is a reasonably large programme, but concentrated in London and the South-East. Again, there might be a case for wrapping these up into a highly-attractive package to be competitively tendered. We suggest an efficiency improvement of between 5% – 10% across CP4.

14.2.5 ECML Schemes

These schemes are almost unique, "one-off" schemes with particular site constraints and particular design solutions. Many are subject to statutory powers or planning permission. Even where there is a belief that a modular solution might be applicable for "a modular bridge for a grade-separated junction", this is rarely the case. There will always be unique spans, skews, widths, ground conditions, visual issues, electrification needs etc which make the solution special.

Again, we do not feel there is much that could be gained, apart from improvements in procurement and the maximisation of competitive tendering at an appropriate stage.

14.2.6 Line-speed Improvement (LSI) Schemes

Some degree of efficiency could be achieved in relation to track improvement works by the maximisation of work using modern track machinery and building on techniques and skills

learned from track renewals work. The ORR may wish to apply the same trajectory as assumed for Renewals expenditure.

14.2.7 Track Re-Doublings

Like the stations and ECML schemes, these are generally “one-off” schemes with particular site constraints and particular design solutions. Many are subject to statutory powers or planning permission, some include stations and level crossings; the mix is quite different. Some schemes may be sufficiently large to allow a more traditional site compound / site location approach, not strictly tied to railway possessions and access issues. There might be the opportunity for contractors to offer reduced preliminaries. Overall, we have estimated a maximum potential reduction of about 6%, achieved by the usual inclusion of fully competitive tendering into the process, at a later rather than earlier stage. Again, the ORR may wish to apply the same trajectory as assumed for Renewals expenditure.

14.2.8 Other Schemes

As before, most are “one-off” schemes with particular site constraints and particular design solutions. Many are subject to statutory powers or planning permission. Again, we do not feel there is much that could be gained, apart from the usual inclusion of competitive tendering into the process, at an appropriate stage.

14.3 Understanding of Cost

One issue which has been troublesome throughout this study is the response to the question: what does “cost” mean, and what do costs contain / exclude.

There is surprisingly little detailed “hard” knowledge of what things actually cost, primarily by virtue of the drive towards Alliancing contracts, or Design and Build contracts. In many of these newer contract forms, the individual costs and unit rates are not visible to Network Rail, only the tendered Target Cost or an inclusive price for the design issues. It is also often not clear how preliminaries in a contract are treated; are they a separate Bill of Quantity section, or subsumed into other rates.

The following suggestion is made as to a potential way forward. In order to aid efficiency, Network Rail could systematically award a number of contracts on a “Build Only” basis, with a traditional Bill of Quantity and a comprehensive definition of Item Coverage to correlate to the contractor’s quoted price. If such knowledge were accumulated over a number of different discipline contracts, Network Rail would be in a much stronger position to challenge costs presented to it.

14.4 Overall Financial Recommendations

In view of all the discussions and assumptions described in previous chapters, the expenditure profile (the Orange and Green Charts) were re-worked to give a revised scheme cost, and a revised scheme programme.

A spreadsheet was prepared, listing schemes vertically, while the columns represented years. The expenditure was re-profiled through time, allowing a summation by financial year, and by Control Period.

The table below sets out the basic summary of our recommendations, with explanatory notes showing the derivation of the figures, clearly stating what assumptions have been made.

The table’s financial data is based on the assumption that the entire SBP portfolio is to be taken forward; if the ORR wishes to delete certain schemes, the “Orange and Green Charts” can be re-worked to delete those schemes. The table presents ONLY the CP4 element. Where a scheme straddles the CP4 / CP5 boundary, this was calculated, but only the CP4 data is presented. It is also presumed that any scheme development expenditure of CP4 schemes being undertaken now in CP3 is already funded, and is not included in the CP4

total. The table follows the format of Figure 6.17 of the SBP Update, which contains the totality of the enhancements portfolio.

England and Wales Core Enhancement Projects							
			SBP Update Data			**Arup**	**Notes**
	DfT Baseline Projects			£1,251m		£1,251m	
	DfT Specified Projects			£4,141m		£4.110m	
	HLOS output Projects						
		Capacity Schemes	£1,292m			£1,115m	
		New Capacity Schemes	£92m			£78m	
		Small Scale Capacity Schemes (sub £5m projects)	£65m			£59m	
		Risk Adjustment	£237m			£0	
				£1,685m		£1,252m	
	DfT Performance Schemes			£250m		£250m	
	Total Core Enhancement Schemes				£7,328m	£6,864m	
England and Wales Optional Enhancement Projects							
	HLOS Performance schemes			£99m		£133m	
	Capacity and Performance schemes			£128m		£112m	
	Journey Time Improvements			£140m		£122m	
	Enhancement to Renewal			£159m		£128m	
	7-Day Railway			£320m		£320m	
	Longer Term Development			£240m		£240m	
	Policy Choices			£167m		£167m	
			Sub – total =		£1,253m	£1,222m	
			Total =		**£8,581m**	**£8,086m**	
		Efficiency Savings – Platform Extensions				- £42m	Deduct notional 12.5% of £336.022m

		Efficiency Savings – Power Supply				-£20m	Deduct notional 7.5% of £271.537m
		Efficiency Savings – Stations				-£27m	Deduct notional 5% of £547m
		Recommended (and Comparison) Totals =			**£8,581m**	**£7,997m**	

Notes:

All costs are expressed in Q4,2006 Prices.

Even where Out-turn costs are expressed, they are STILL in Q4, 2006 prices, NOT inflated to the year of occurrence.

In overall summary, Arup believes that the CP4 Total should be £7.997bn, compared with Network Rail's estimate of £8.581bn.

In summary, our assessments indicate:

- Platform Extension Schemes: within the bounds of the ±30% associated with GRIP stage 2 or ±20% at GRIP3.
- Stations: Savings mainly at Reading;
- Power Supply: significant reduction by the elimination of risk and Optimism Bias elements;
- ECML: well within the bounds of the ±30% associated with GRIP stage 2 or ±20% at GRIP3;
- Journey Time Improvements (LSI Schemes): well within the bounds of the ±30% associated with GRIP stage 2 or ±20% at GRIP3.
- Re-doublings: major concerns over Network Rail's low estimate for the Cotswold Line.

15 Transport Scotland Schemes

15.1 Airdrie – Bathgate

15.1.1 Purpose of Scheme

This project is of strategic importance to the overall rail network in Scotland and has had a high involvement of Network Rail in the development and delivery of the scheme. The project is a major investment in Scotland's public transport network and is a key priority for Transport Scotland, the project funder.

The A2B project will provide a rail link largely along the former rail formation between Bathgate and Drumgelloch / Airdrie. This in effect will connect two existing passenger rail routes to create a fourth direct rail link between Edinburgh and Glasgow. The work comprises:

- re-opening of the railway line between Drumgelloch and Bathgate;
- upgrading the existing railway line between Bathgate and Edinburgh and between Airdrie and Drumgelloch;
- construction of new stations at Caldercruix and Armadale;
- relocation of the current stations at Bathgate and Drumgelloch;
- upgrading of the existing stations at Airdrie, Livingstone North and Uphall;
- relocation of the present cycle track between Airdrie and Bathgate.

The key benefits from the scheme are:

- Improved direct access to Glasgow and Edinburgh for people living in the Airdrie to Uphall corridor;
- Enhanced public transport opportunities to those without access to private cars;
- Contribution towards increasing the number of people using public transport in Central Scotland;
- Offers a public transport alternative to the M8; and
- Allows existing services between west of Glasgow to Drumgelloch, and Bathgate to Edinburgh to operate as through services to Edinburgh and Glasgow.

Network Rail is the promoter of the scheme and has been granted powers for the construction of the scheme by a Scottish Parliamentary Act which was given Royal Assent in May 2007.

The key scheme objective is to provide a 4tph passenger service between Edinburgh and Glasgow. The service will be operated by electric trains.

The Airdrie to Bathgate project was originally developed by West Lothian Council but quickly transferred to Transport Scotland and then to Network Rail. At present all elements of the scheme are being undertaken by Network Rail. This includes the development of the new, relocated and upgraded stations, the construction of the new lines, and the electrification of parts of the existing network.

The first phase of the investment project has now begun. Advance Works will include doubling the track on the existing Edinburgh to Bathgate branch line and upgrading Livingston North and Uphall Stations. Once complete, passengers using existing Bathgate to Edinburgh services will benefit from enhanced performance and reliability as early as the end of 2008.

The new A2B rail link is programmed to be completed in December 2010.

Transport Scotland has committed funding for the project to a maximum of £299.7 million.

15.1.2 Project Definition

The output requirements for the project appear to be clear. The service frequency and journey time aspirations are now well documented.

Operational modelling of the project was undertaken ahead of the granting of the Act. Work is currently under way to refine the timetable planning of the new services to deliver a seventy-four minute end to end journey. This involves fortnightly meetings between Network Rail, Transport Scotland and First ScotRail. They have produced a series of timetables each of which has some flaws however there is general consensus that the timetable is achievable and that there are no risks to the infrastructure scheme likely from the operational perspective.

The infrastructure enhancement elements of the Airdrie to Bathgate scheme have been identified and are in the course of development. At the time of writing this review the project is at GRIP Stage 3. At this point the scheme has considered a number of options which have now been refined. There was no evidence that the work done to date had not identified all the required works to deliver the scheme.

On the basis of the foregoing we consider that the scheme is well defined given the current state of development.

15.1.3 Timescales

The planned commissioning of the final scheme is planned for December 2010. Network Rail has developed a programme for the works which it believes to be robust and from a review for this report appears to satisfy the desired timescales. Network Rail believes the programme to be 'tight' but is confident of its delivery despite having slipped on the base line time scale. Other elements of the project will however now be delivered in such a way as to allow the scheme to return to the planned timescales.

At this time it would appear that the programme to the delivery of the A2B scheme is satisfactory.

15.1.4 Spend Cost Profiles

The figures in the Network Rail SBP have been produced from a detailed build up of the quantum and rates based on the emerging design. The figures that have been produced are Level 3 Estimates at 1Q 2006 price levels. Table 7 shows the build up of the cost estimate.

Element	**Q1 / 2006 Prices**
Base Construction Cost	£176.1m
Preliminaries Costs (15%)	£22.3m
Management Costs	£55.2m
Total	**£253.6m**
Opportunities Provision (P50)	-£16.3m
Spot Cost	**£237.3m**
Contingency at P80	£28.9m
Optimism Bias (excl Advance Works) 4%	£33.5m
Total	**£299.7m**

Table 7: A2B Cost Build Up

From the foregoing tabulation it is clear that consideration has been given to the generation of figures to provide an estimate at P80 including optimism bias.

The spread of the above project cost is projected as shown in Table 8:

Date	**Estimate**
Prior	£9.2m
2007 / 2008	£57.6m
2008 / 2009	£93.1m

CP 3 Total	**£159.9**
2009 / 2010	£117.6m
2010 / 2011	£21.7m
2011 / 2012	£0.5m
CP 4 Total	**£139.9m**
Input Price Inflation on CP4 Total	£5.0m
CP4 SBP Entry	**£144.5m**

Table 8: Annual Spread of A2B Costs

The above figures have the following assumptions attached:

- The cost plan for the estimate is based on the GRIP level 3, at P80 emerging costs estimate, at Q1 2006 price levels;
- While the split includes the land purchase estimated costs of circa £26m (currently in the CP3 figure, and is made up of £19.8m plus contingency and optimism bias to total £26m) Network Rail believe that it is likely that agreement will be reached with Transport Scotland that these costs will remain as an emerging cost arrangement grant funded by Transport Scotland and not part of CP4;
- All spend in CP3 is anticipated to be grant funded by Transport Scotland; and
- Network Rail note that Transport Scotland has expressed the view that they may wish to RAB the main works in CP4 although some of the spend may be incurred in CP3 – this may therefore increase the spend in CP4.

Following the submission of figures to the Business Plan Network Rail has continued to refine the estimates for the project in conjunction with Transport Scotland. As part of this review £5.7m of costs have been taken out of the scheme. These savings have been achieved as shown in Table 9 below.

Element	**Q1 / 2006 Prices**
Base Construction Cost	-£4.1m
Preliminaries Costs (15%)	+ £6.4m
Management Costs	+£18.1m
Opportunities Provision (P50)	+£10.3m
Contingency at P80	-£9.5m
Optimism Bias (excl Advance Works) 4%	-£27.1m
Total	**-£5.9m**

Table 9: Cost Revision Build Up

This revises the total project cost to £294m and this remains Network Rail's view of the project cost.

Network Rail has met with Transport Scotland and the costs of the scheme have been reviewed. There is general agreement over the quantum of work required however there is some disagreement over the rates and contingency elements. Table 10 below highlights the areas of difference.

Element	**Network Rail View**	**Transport Scotland View**	**Difference**
Elemental Works			
Overhead Line – green field siteworks TS consider that there should be a larger percentage reduction in this area of works. However, NR consider that they have reduced identifiable green field site activities by 15% which is generally in line with ORR proposals	£22.9m	£22.35m	£0.55m
Structure Works / Preliminary Costs TS consider that there is an element of double	£18.07m	£15.66m	£2.41m

counting of preliminaries in the structure estimate. This is disputed by NR.			
Power Supplies TS believe that there may be scope to reduce this figure	£8.25m	tba	
Environmental Impact TS believe that there may be scope to reduce this figure	£3.56m	tba	
Base Cost			
Network Rail Property Management	£0.87m	£0.44m	£0.43m
Property Management Costs - Consultants	£2.88m	£2.09m	£0.79m
Implementation Consultancy	£0.95m	£0.65m	£0.30m
NR Management Costs	£15.62m	£10.88m	£4.74m
Waverley Design Costs	£0.40m	0	£0.40m
Optimism Bias	£6.39m	£6.27m	£0.12m
Total			**£9.75m**

Table 10: TS / NR Estimate Differences

The figures in the tables above show a cost range of between £294m and £284m at baselined Q1 2006 price levels, including land and property purchase. Note that the Network Rail figures include a quantified project risk of £19.4m and optimism bias of £6.4m.

As part of the Transport Scotland and Network Rail review the Risk Register has been updated and an agreed figure of the £19.4m has been included as risk at P80. This represents 11% of construction costs and 6.5% of total project costs.

The figure for Optimism Bias has not been reviewed during the course of the analysis and remains at 4% of construction costs. This figure has been calculated in the normal way by reviewing the risk and mitigation factors.

It is noted that Network Rail consider the level of optimism bias, at 4%, is low considering the present level of project risk associated with the current state of development of the scheme.

From the foregoing it is clear that there has been considerable work done to develop estimates for the scheme and they appear to be in line with the stated level of GRIP Stage 3 development. The figures in the SBP have now been revised in line with the general development of the project however there is still a gap between the views of project costs from Transport Scotland and Network Rail.

It is clear that further dialogue needs to take place between Transport Scotland and Network Rail with a view to closing the gap and reaching agreement on the project costs. There has not been the opportunity to undertake a separate review of the costs for this interim report to validate either position.

15.1.5 Route Fit

The A2B project is being driven by the political wish to provide better connectivity across the central belt to give access to Glasgow from West Lothian and from North Lanarkshire to Edinburgh and to encourage economic development along the corridor of the re-opened route. The service is also designed to relieve capacity issues on the Edinburgh to Glasgow via Falkirk High shuttle services.

In terms of route fit the scheme will enhance the capacity of the current routes through the doubling of current single line sections in both the east and the west and the remodelling of the single lead junction at Newbridge. Thus, in overall terms the network, as it is today, will benefit from the scheme. In particular train service constraints on the current Bathgate Branch will be eased.

The electrification of the route to provide a further infill between the currently electrified routes in the west and east is seen as providing the springboard on which to develop the electrification of the central Scotland rail network.

In summary, the project will improve current capacity constraints and in that sense it provides good route fit.

15.1.6 Project Fit

The delivery of the Airdrie to Bathgate project is not so dependent or heavily associated with other schemes as is the case with GARL. It is our understanding that the project does have some linkage to a renewal scheme however this will be delivered as part of CP3 and is therefore not included in that part of the scheme currently under review. In this context the project can be considered cleanly without the complexity of associated renewals.

As mentioned above there is currently some interest in the electrification of the central Scotland rail network and from that perspective the A2B scheme may be considered as a precursor, and indeed an enabler, to such an ambition.

In the main, the project is not reliant upon and does not impact on other projects.

15.1.7 Conclusion

For the purposes of this review of the A2B scheme we have accessed certain documentation and held a brief meeting with the key Network Rail staff associated with the project. The additional documentation provided for this latest view has updated only the variance between the Network Rail and Transport Scotland estimates.

The development of the project is at GRIP Stage 3. From the documentation reviewed the outputs appear to be entirely in line with this stage of development.

Programme timescales appear to be achievable for the scheme.

The estimates for the scheme have been worked up from the quantum derived from the scheme development and using appropriate rates. Network Rail has applied a series of uplift factors to the base costs to derive the £294m total scheme cost. There is currently agreement between Transport Scotland and Network Rail over the quantum of work but some gap in understanding regarding some specific areas. This has led to roundly a £10m gap between the Network Rail and Transport Scotland estimates. Based on available information we have been unable at this stage to review how the separate figures have been derived.

The project has little synergy with other schemes adjacent to A2B and therefore little impact.

In conclusion, it is our view that the scheme would appear to be progressing reasonably from this preliminary review. There is however an issue with the estimates for the project which need to be resolution.

15.1.8 Estimate Review

Following all the above discussions on estimates, documentation provided by ORR on June 2nd 2008 pulled together the estimate position described below.

The ORR and Network Rail have agreed the cost of the scheme, based on a resolution of the difference between the December 2007 cost estimate of £284m and Network Rail's estimate of £294m. The overall outcome is a base price of £290m. The premium for agreeing a fixed price is now also settled, and combining the revised cost estimate and the fixed-price premium results in a total fixed price estimate of £312 million. The ORR notes that there may be some exclusions to this fixed price, primarily resulting from issues outside either party's control, which Network Rail needs to set out clearly.

15.2 Glasgow Airport Rail Link

15.2.1 Introduction

The GARL project will provide a direct rail link from Glasgow Central to a new station constructed within Glasgow Airport's boundary. The work comprises:

- The lengthening of platform 11a at Glasgow Central station;
- The provision of a third, bi-directional line (7.2km long) between Shields Junction and Arkleston Junction on the outskirts of Paisley;
- The remodelling of junctions at Wallneuk and Arkleston;
- The four-tracking on the line between Wallneuk and Arkleston Junctions;
- The lengthening of the existing Up loop at Elderslie (to replace a loop which will be lost as a result of the scheme at Arkleston);
- Enhanced crossover and running functionality between Paisley Gilmour Street and St James;
- The creation of a new 1.9km long double track branch line from the Inverclyde lines to the airport; and
- The construction of a new double platform station at Glasgow Airport.

The scheme promotion has just been transferred from Strathclyde Partnership for Transport (SPT) to Transport Scotland; powers for the construction of the new branch line were granted by a Scottish Parliamentary Act which was given Royal Assent in January 2007.

The key scheme objective is to provide a frequent and direct heavy rail passenger service linking Glasgow Airport to the city centre. The plan is to operate a fifteen minute frequency service between Glasgow Central and the Airport with a journey time of sixteen minutes, including a call at Paisley Gilmour Street station, whilst preserving the integrity of the current and predicted future service patterns on the route.

Control of the delivery and the funding for the project rests with Transport Scotland. Responsibility for the delivery of the scheme is shared between a number of bodies. SPT will deliver the civil engineering works associated with the new branch line and the new station including the acquisition of all land. BAA, the Glasgow Airport operator, will relocate a fuel farm at the airport (advance works) and will provide the linkage between the new station and the airport terminal building. Network Rail will undertake the enhancements to Glasgow Central station, construct the new third line between Glasgow and Paisley, remodel junctions as necessary, extend an adjacent freight loop, and provide the rail system infrastructure on the branch line as required (in effect it will fit out the new branch).

Work has already started on some of the advance works and the service is due to be operational during early 2012.

15.2.2 Project Definition

The timetable service requirements from the project are clear. Airport services will operate on a fifteen minute frequency for over eighteen hours a day, seven days a week.

The elements of the GARL scheme, to deliver the infrastructure as described above, has been associated with a renewal project. The Paisley Corridor Resignalling scheme (PCR) is a programmed renewal of the signalling equipment in the area of the GARL project. This work was programmed to be complete before 2014 but has been re-programmed by Network Rail to avoid disruption to the new airport services and to facilitate some synergy benefits between the two schemes. For the purposes of the planning and development of the project at present both of these elements are considered to be part of the GARL project.

The development of the GARL project has been led by SPT in association with input from Network Rail. The project has completed GRIP Stage 2 and is currently in the early part of Stage 3.

The work to get the project to this stage has not been without a degree of pain. There have been issues associated with the early development of the scheme including concern over the track layout design and the operational functionality delivered by the proposals. As a result of a greater involvement by Network Rail a number of these issues now appear to be resolved.

Based on the documentation reviewed to date and the preliminary discussions held with Network Rail it is clear that the overall objectives of the scheme are well defined. The scope of works to deliver the required functionality is also known and is consistent with GRIP Stage 2 development of the project.

15.2.3 Timescales

As stated above, the timescales for the delivery of the scheme are such that the new service will be included in the 2012 timetable. It is assumed that the services will be varied into the ScotRail franchise at that time.

An overall programme for the scheme has been prepared for the elements of the project taking account of the programme dates of other interested parties. The programme would appear to be deliverable given the current commencement of GRIP Stage 3 development work.

Network Rail are satisfied with the integrity of the programme but made the point that certain elements are outwith their control, for example the civil engineering work on the new branch line. Should delays occur to work packages outwith Network Rail's remit it will not prejudice the delivery of Network Rail's elements of the scheme but may delay the commissioning of the new train service. As a result the programme for the delivery of the Network Rail portion of the work is considered robust.

From the perspective of the Network Rail Strategic Business Plan the programme for the delivery of the scheme is considered to be entirely reasonable.

15.2.4 Spend Profile Costs

The figures in the Network Rail SBP have been built up from a review of the project estimates following their engagement by SPT to review the work done to date. In the summer of 2007, dialogue took place between the parties with a view to resolving any design issues associated with the scheme. This highlighted variances in the quantum of work in some areas and demonstrated differences in the rates used. In November 2007 there was agreement between the parties over the estimates produced for the project. Table 1 shows the agreed figures which represent the best view of the scheme costs at that time.

Element	**Q4 / 2004 Prices**
Branch Line Works	£84.54m
Railway Works – Advance Package	£9.81m
Railway Works – Main Package	£118.82m
Total	**£213.17m**

Table 1: GARL / PCR Base Costs

Having established the base costs for the scheme a number of scenarios were then applied to understand the risk, opportunity and optimism bias impacts on the estimates.

The scenario selected by Transport Scotland and accepted by Network Rail to be applied to the base figures included a Mean Risk Value plus Optimism Bias, these figures are shown in Table 2.

Element		Q4 / 2004 Prices	
Risk			
Branch Line Civil Works		£4.99m	
Railway Works		£13.36m	£18.35m
Optimism Bias			
Branch Line Civil Works	14.9%	£12.63m	
Railway Works	13.8%	£17.70m	£30.33m
Total			**£48.68m**

Table 2: Risk and Optimism Bias Breakdown

As a result of the foregoing, the base cost estimate was increased to £261.85m.

It could be considered that the figure may be lower particularly given the current stage of project development (GRIP 2) which is likely to already include contingency which could in effect be double counted by the applied Optimism Bias outlined above. At that time, Network Rail had no visibility of the percentage uplifts applied to the Optimism Bias figures which were again developed by Transport Scotland. We have no further clarification of this presently.

For the SBP, the foregoing figures were developed further as shown in Table 3.

Element	Cost
Q4 2004 uplifted estimate	£262m
Q2 2006 uplifted estimate	£281m
Network Rail Element of above	£171m
Planned NR CP3 Spend	£8.5m
Resulting NR CP4 Spend	£162.5m
Plus Input Price Inflation	£7.5m
SBP CP4 Spend	**£170m**
SBP CP4 Spend on Renewals	£46m
SBP CP4 Spend on Enhancement	£124m

Table 3: Development of the SBP Figures

Based on a revised tabulation of costs received the Network Rail element of the project at Q2 2006 prices has now increased to £173.5m. It is not possible to track this back to understand the source of this variance. We are however able to provide a revised spread of expenditure as shown in Table 4. These figures exclude IPI. The CP3 spend is put at £9.7m.

2009	2010	2011	Total
£27.4m	£20.0m	£116.4m	£163.8m

Table 4: Spend Profile

There has been considerable work done to develop estimates for the scheme and it would appear that there is now some degree of agreement over the quantum and rates to be employed in generating the base costs.

Transport Scotland appears to have guided Network Rail over the application of the risk and Optimism Bias inputs. The completion to GRIP Stage 2 means that there is likely to be a degree of contingency already built into the costs. This may lead to double counting when Optimism Bias is applied unless this is taken into account in the percentage uplifts applied. Network Rail previously claimed no visibility of the percentages developed in the OB calculation and we have no evidence now to make us believe that this has changed. In view of this we still have some concern over the figures which will require to be further explained since they may overstate the likely costs.

There are a number of cost risks to the project in part due to the interdependencies with other schemes such as the branch line works that are being delivered by SPT and other projects being delivered by Network Rail such as Glasgow Central interlocking project, Shields Junction renewals and Ayrshire and Inverclyde renewals.

15.2.5 Route Fit

Amongst the most significant capacity constraints in Network Rail's Route Plans for Route 26, Strathclyde and the South West are:

- The approaches to Glasgow Central;
- Paisley Gilmour Street to Glasgow Central; and
- Glasgow Central Platforms.

It has been known for some time that the line between Paisley and Glasgow is approaching capacity. The current level of passenger service is as shown in Table 5:

Service	Peak	Off-Peak
Glasgow – Wemyss Bay	2	1
Glasgow – Gourock	4	3
Glasgow – Largs	3	2
Glasgow – Ayr	2	1

Table 5: Passenger Train Service Pattern

These service levels may change to alleviate current overcrowding on Ayrshire services (currently 84% peak load factor) which are predicted to grow by 3% per annum. In addition, there is a healthy pattern of freight services on the line which may increase given recent investment at power stations in FGD equipment and plans to create a container terminal at Hunterston. The current service patterns for both passenger and freight services mean that the line carries greater than 20mt per annum.

The planned works to upgrade the route for GARL services will provide a third bi-directional line between Arkleston and Shields Junctions. The GRIP 2 design work that has been undertaken has shown that this will provide the necessary additional capacity to cope with the four extra trains per hour in each direction to and from the Airport. Two freight paths per hour are also provided for in the scheme. Network Rail believes that the scheme will also deliver an additional two paths per hour in each direction.

Whilst Network Rail previously had concerns regarding the operational performance of the scheme these have largely been resolved however the situation was previously believed to be clarified once a Railsys simulation exercise of the proposed layout was completed in January 2008. We have had no feedback on whether or not this was the case.

As well as high utilisation on the core route to Paisley there are capacity constraint issues at Glasgow Central. The proposed extension of the current platform 11a at the station will provide another usable platform at the station albeit significantly remote from the main concourse. It is notable that it is planned that this platform will not be used exclusively by the new GARL services. However, the planned works are designed to alleviate any worsening of the current limitations at the station caused by the scheme.

Finally, the works will provide the opportunity to improve the reliability and capacity of the existing signalling equipment to reduce the maintenance requirement and remove obsolete and non-preferred equipment.

In summary, it is understood that the planned works should not worsen the current capacity issues on the routes affected and indeed provide two additional paths per hour – this to be validated in the Railsys output.

15.2.6 Project Fit

Network Rail has a significant programme of work on the route affected by GARL and it has planned some of this work around the requirements of the scheme such that there is a measurable efficiency saving to be gained. The following table shows the linkage between the schemes.

Scheme	Relationship
Glasgow Central Interlocking Project	This is required for GARL and must be completed ahead of it
Shields Junction Renewal	To be completed ahead of GARL and will provide higher line speeds
Ayrshire and Inverclyde Renewals	These will be undertaken before and during the GARL project, these have an impact of service reliability
Paisley Corridor Re-Signalling (PCR)	Being undertaken at the same time as GARL
Glasgow Crossrail	This will follow GARL and could provide an opportunity to divert services or may lead to risk if new services run through Paisley

Table 6: Associated Projects

From the above it is clear that there is a suite of projects associated with GARL which are complementary and contributory to it. This makes it important that issues surrounding the scope and timescales for the main scheme are resolved in early course in order to avoid impacts and potentially increased costs and delays on these synergious projects.

15.2.7 Conclusion

During the course of this high level review of the GARL scheme we have accessed certain documentation and held a meeting with the key Network Rail staff associated with the project.

The development of the project is approaching the end of GRIP Stage 2. Whilst there appear to have been some developmental issues with the project from a technical and operational perspective these now appear to have been largely resolved. The greater participation of Network Rail in the development of the project, it is leading the GRIP Stage 3 development of the rail elements, should drive a more technically acceptable solution.

Programme timescales appear to be achievable. It is noted that whilst Network Rail is confident about the timescales for elements of the scheme under its control there are other parts for which it has no jurisdiction which could delay the overall commissioning of the scheme.

From the early estimates for the scheme produced by SPT there appears to have been considerable work done to enhance the quality of the costs whilst recognising that we are in the early stages of the project. There does however seem to potentially be an issue regarding the application of risk and optimism bias. As a result the figures probably represent a more pessimistic view of the costs than might otherwise be the case.

The project demonstrates good synergy with adjacent schemes and it is manifest that there are benefits to be had from programming the work on GARL sympathetically with these adjacent renewals. This appears to be taking place.

Most elements now appear to be under control however, there is some doubt about the SBP cost estimates which need some further clarification. The latest position appears to be that the cost is £173.5m including Optimism Bias and risk, with potential double-counting. A fixed

price premium is not part of these figures. There remain a number of cost risks to the project in part due to the interdependencies with other schemes.

15.3 Borders Rail

No detailed work was carried out on this project. Network Rail's figures were therefore replicated in the review of the "Orange and Green Charts".

15.4 Glasgow to Kilmarnock

This project enhances the route from Glasgow to Kilmarnock and in particular reinstates double-track formation over some 7 miles to create a dynamic loop facilitating the enhancement of the route capacity such that a 30-minute frequency service can be operated in both directions.

A detailed review of the Glasgow to Kilmarnock scheme was not undertaken for this review. It is however understood that there are on-going discussions between Network Rail and Transport Scotland with regard to the estimate for the project. Estimates for the scheme are at an advanced stage of development given that the figures quoted in the SBP reflect the outcome of the GRIP Stage 4 development of the project. This puts the scheme cost at some £25m. This estimate reflects the belief by Network Rail that the scheme will be funded on an emerging cost basis through the RAB funding. We have been unable to test the validity or otherwise of this supposition. The project is currently out to tender for the GRIP Stage 5 development under a design and build contract.

With regard to the scope of the project, a decision has recently been taken to exclude the upgrading of car parks at two of the stations affected by the doubling from the main project. These works will be funded by Strathclyde Partnership for Transport (SPT) and it is not yet clear if they will be delivered as part of the main works or under a separate contract. Discussions on this point are currently on-going between Network Rail and SPT.

With regard to the project timescales the original aspiration of Transport Scotland was to introduce the service enhancement at the May 2009 timetable. Network Rail has advised that this is unachievable and have indicated that a revise timetable date of December 2009 is now the best that can be delivered.

15.5 Tier 3 Project Development

In the development of the High Level Output Statement (HLOS) a number of aspirational schemes were identified by Transport Scotland. These projects are all at early stages of development with GRIP Stage 1 outputs planned for delivery between now and 2013. The Tier 3 schemes are broken down into three levels of priority. The HLOS requires that all of these schemes are progressed to GRIP Stage 1 within Network Rail's CP4 funding. It is noted that the schemes currently forming the Tier 3 list may be increased during the currency of CP4.

The following table lists the schemes.

Tier 3 Schemes	
Priority 1	**GRIP Stage 1 Delivery**
Edinburgh to Glasgow Improvement Programme	2008
Rolling Stock Strategy	Complete
Highland Main Line	Complete
Inverness to Aberdeen Hourly Service	2009
Priority 2	**GRIP Stage 1 Delivery**
Journey Time Improvements, Central Belt to Aberdeen	2011

Electrification – Paisley Canal	2010
Electrification – Whifflet	2008
Electrification – East Kilbride	2010
Electrification – Kilmarnock	2011
Freight Gauging – ECML to Mossend	2010
Priority 3	**GRIP Stage 1 Delivery**
Kilmarnock Long Lyes	Complete
Mauchline / Annbank	Complete
Laurencekirk Loop	Complete
Portobello Junction	Complete
Tail Light Cameras	On-going
Cross Glasgow Connections	2013

The foregoing schemes are at such an early stage of development that comment on their costs and fit is considered premature at this time.

15.6 Small Projects Fund

No detailed review has been undertaken of this initiative as part of this study.

15.7 Seven Day Railway – Scotland

No detailed review has been undertaken of this initiative as part of this study.

15.8 Policy Choices Scotland

No detailed review has been undertaken of this initiative as part of this study.

Appendix A

"Orange and Green Charts" (Estimate of CP4 Expenditure Needs)

A1 Orange and Green Charts

The following sheets are the output from the processes described in Chapter 6, which generated Arup's version of Network Rail's funding needs in CP4.

Appendix A - "Orange and Green Charts" (Estimate of CP4 expenditure needs)

	NR REF	TERRITORY	SR	Project point estimate £000s	2007/2008 Q1	2007/2008 Q2	2007/2008 Q3	2007/2008 Q4	2008/2009 Q1	2008/2009 Q2	2008/2009 Q3	2008/2009 Q4	2009/2010 Q1	2009/2010 Q2	2009/2010 Q3	2009/2010 Q4	2010/2011 Q1	2010/2011 Q2	2010/2011 Q3	2010/2011 Q4	2011/2012 Q1	2011/2012 Q2	2011/2012 Q3	2011/2012 Q4	2012/2013 Q1	2012/2013 Q2	2012/2013 Q3	2012/2013 Q4	2013/2014 Q1	2013/2014 Q2	2013/2014 Q3	2013/2014 Q4	2014/2015 Q1	2014/2015 Q2	2014/2015 Q3	2014/2015 Q4	2015/2016 Q1	2015/2016 Q2	2015/2016 Q3	2015/2016 Q4	CP4 total
England & Wales - Core enhancement projects																																							
DfT Baseline projects																																							
(Access for All)	MULTI	MULTI	MULTI																																				
				206000.00									*41200*				*41200*				*41200*				*41200*				*41200*											*206000*
King's Cross	LNE001	LNE	8																																				
				175198.20									*64169*				*53025*				*38213*				*7994*				*11798*											*175198*
Stafford/ Colwich Remodelling	LNW009	LNW	18																																				
				483091.00									*29629*				*39287*				*97843*				*159744*				*156588*											*483091*
Bletchley Milton Keynes	LNW010	LNW	18																																				
				114397.00									*83696*				*30701*																							*114397*
Power supply upgrade (AT)	LNW012	LNW	18																																				
				272414.00									*49213*				*24950*				*30346*				*101806*				*66099*											*272414*
Total DfT Baseline projects																																							**1251100**
DfT Specified projects																																							
Thameslink	MULTI2	MULTI	MULTI																																				
				2700246.39									*671318*				*743926*				*386626*				*441167*				*457210*											*2700246*
Intercity Express Programme	MULTI3	MULTI	MULTI																																				
				260000.00									*40000*				*50000*				*50000*				*60000*				*60000*											*260000*
Network Rail Discretionary Fund (NRDF)	NA	NA	NA																																				
				233707.50									*46742*				*46742*				*46742*				*46742*				*46742*											*233708*
National Stations Improvement Programme (NSIP)	NA	NA	NA																																				
				155805.00									*31161*				*31161*				*31161*				*31161*				*31161*											*155805*
Stategic Freight Network (SFN)	NA	NA	NA																																				
				207740.00													*51935*				*51935*				*51935*				*51935*											*207740*
Reading Area Redevelopment	W001	W	13																																				
				425000.00									*77010*				*130144*				*100436*				*50567*				*66844*											*425000*
Birmingham New Street Gateway Project	LNW003	LNW	17																																				
				128000.00									*101000*				*22000*				*5000*																			*128000*
Total DfT specified projects																																							**4110499**
DfT HLOS Output projects																																							
(Capacity schemes)																																							
~~**12 car operations Sidcup and Bexleyheath routes**~~																																							
Power supply enhancements (route 1)	SE005	SE	1																																				
				18310.00									*1297*				*5917*				*7958*				*3138*															*17013*
12-car operations: Dartford to Rochester Inc. Gravesend	SE004	SE	1																																				
				15666.00									*609*				*1076*				*13544*				*437*															*15057*
12-car operations: Greenwich and Woolwich route	SE003	SE	1																																				
				3305.00									*252*				*434*				*1642*				*977*															*3053*
12-car operations: Hayes and Sevenoaks (stopping) services	SE002	SE	1																																				
				35.00									*3*				*31*				*0*				*0*															*32*
New Cross Enhancement to Power Supply	SE006	SE	1																																				
				16093.00									*2428*				*4887*				*4887*				*3890*															*13665*
Power supply enhancements (route 2)	SE010	SE	2																																				
				17416.00									*1179*				*3176*				*7784*				*5277*															*16237*
Route 2 Suburban area 10-car operations to Victoria and London Bridge	SE008	SE	2																																				
				82405.00									*7637*				*17518*				*33856*				*23393*															*74768*
Gatwick Airport Remodelling and Passenger Capacity	SE007	SE	2																																				
				30000.00													*10000*				*10000*				*10000*															*30000*
East Croydon passenger capacity scheme	SE011	SE	2																																				
				12000.00													*5000*				*5000*				*2000*															*12000*
West Croydon Stn Development	SE012	SE	2																																				
				5000.00																	*3000*				*2000*															*5000*

Appendix A - "Orange and Green Charts" (Estimate of CP4 expenditure needs)

	NR REF	TERRITORY	SR	Project point estimate £000s	2007/2008 Q1 Q2 Q3 Q4	2008/2009 Q1 Q2 Q3 Q4	2009/2010 Q1 Q2 Q3 Q4	2010/2011 Q1 Q2 Q3 Q4	2011/2012 Q1 Q2 Q3 Q4	2012/2013 Q1 Q2 Q3 Q4	2013/2014 Q1 Q2 Q3 Q4	2014/2015 Q1 Q2 Q3 Q4	2015/2016 Q1 Q2 Q3 Q4	CP4 total
Power supply enhancements (route 3)	SE017	SE	3											
				33493.00		*1587*	*1562*	*7167*	*13790*	*9387*				*31906*
WIT conversion medium term	SE015	SE	3											
				57236.00		*4622*	*7588*	*13606*	*13643*	*13606*	*4171*			*52614*
Clapham Junction station capacity and platform lengthening	SE018	SE	3											
				61237.00		*4764*	*5410*	*2879*	*48184*					*56473*
10 Car SW Suburban Railway (Route 3)	SE016	SE	3											
				93075.00		*5689*	*18938*	*27882*	*27958*	*12608*				*87386*
Reading Southern Platforms	NONE	SE	3											
				21000.00					*5000*	*15000*	*1000*			*21000*
WA Outer 12 Coach Trains	SE020	SE	5											
				27820.00		*3660*	*8053*	*8053*	*8054*					*24160*
Power supply enhancements (route 5)	SE019	SE	5											
				1590.00		*73*	*50*	*545*	*683*	*239*				*1517*
WA Inner 9 Coach Trains	SE021	SE	5											
				11245.00		*270*	*966*	*3913*	*5883*	*214*				*10975*
Power supply enhancements (route 6)	SE025	SE	6											
				349.00		*17*	*113*	*219*						*332*
Tilbury Loop platform extensions	SE023	SE	6											
				20670.00		*1876*	*2543*	*5820*	*5836*	*4594*				*18794*
NLL capacity enhancement	SE024	SE	6											
				28000.00			*14000*	*14000*						*28000*
Power supply enhancements (route 7)	SE028	SE	7											
				2046.00		*93*	*61*	*341*	*676*	*674*	*202*			*1953*
Chadwell Heath Turnback	SE027	SE	7											
				3887.00		*378*	*2462*	*1047*						*3509*
COMBINED SCHEMES: Alexandra Palace to Finsbury Park 3rd Up Line project and Finsbury Park to Alexandra Palace Downside Capacity Enhancements	LNE010 &	LNE	8											
				62239.00		*1915*	*1915*	*1915*	*19150*	*24896*	*12448*			*60324*
Hitchin Grade Separation	LNE002	LNE	8											
				51629.00		*1106*	*1475*	*1475*	*6915*	*23233*	*17425*			*50523*
ECML level crossing closure programme	LNE008	LNE	8											
				21376.00		*1302*	*3043*	*4781*	*4794*	*4781*	*2675*			*20074*
York Holgate Junction 4th line	LNE006	LNE	8											
				13174.00		*1168*	*11006*	*1000*						*12006*
Peterborough Station re-development and additional island platform	LNE004	LNE	8											
				27554.00		*848*	*848*	*848*	*15091*	*9919*				*26706*
Shaftholme Junction re-modelling	LNE003	LNE	8											
				51891.00		*1297*	*1297*	*1297*	*1297*	*23351*	*23351*			*50594*
FCC Platform Lengthening	LNE011	LNE	8											
				13120.00		*1920*	*5040*	*5040*	*1120*					*11200*
Enhanced Capacity between Peterborough and Doncaster ("Capacity relief to the ECML")	LNE009	LNE	8											
				191000.00		*10835*	*23197*	*51837*	*51981*	*50105*	*3045*			*180165*
West Yorkshire - Platform lengthening (route 10)	LNE014	LNE	10											
				5376.00		*1466*	*1606*	*1606*	*699*					*3910*
Stabling for northern (West Yorkshire)	LNE013	LNE	10											
				14800.00			*2532*	*11914*	*354*					*14800*
South Yorkshire - Platform lengthening (route 11)	LNE016	LNE	11											
				1721.00		*182*	*617*	*636*	*286*					*1539*
Stabling for northern (South Yorkshire)	LNE015	LNE	11											
				9631.00			*1688*	*7943*						*9631*
Barry - Cardiff Queen St corridor (Part of Cardiff area signal renewal)	W011	W	15											
				36878.00				*8000*	*12000*					*20000*

Appendix A - "Orange and Green Charts" (Estimate of CP4 expenditure needs)

	NR REF	TERRITORY	SR	Project point estimate £000s	2007/2008 Q1	Q2	Q3	Q4	2008/2009 Q1	Q2	Q3	Q4	2009/2010 Q1	Q2	Q3	Q4	2010/2011 Q1	Q2	Q3	Q4	2011/2012 Q1	Q2	Q3	Q4	2012/2013 Q1	Q2	Q3	Q4	2013/2014 Q1	Q2	Q3	Q4	2014/2015 Q1	Q2	Q3	Q4	2015/2016 Q1	Q2	Q3	Q4	CP4 total
Chiltern Platform Lengthening	LNW002	LNW	16																																						
				7824.00								*426*			*433*			*1580*			*2151*				*2145*				*1089*												*7398*
Redditch Branch Enhancement	LNW005	LNW	17																																						
				17150.00								*734*			*1257.00*			*7215.00*			*7877.00*				*67.00*																*16416*
Extension of cross city services to Bromsgrove	LNW006	LNW	17																																						
				26898.00								*1097*			*1875*			*11378*			*12443*				*106*																*25801*
West Midlands Platform lengthening (route 17)	LNW004	LNW	17																																						
				23352.00								*1253*			*2827*			*11722*			*7551*																				*22099*
North West Platform Lengthening Routes 20 and 23	LNW015	LNW	20																																						
				9712.00								*517*			*565*			*2202*			*3115*				*3094*				*219*												*9195*
Stabling for northern (route 20)	LNW021	LNW	20																																						
				14446.00											*2532*			*11914*																							*14446*
Salford Crescent New Station	LNW019	LNW	20																																						
				22645.00								*810*			*1604*			*1254*			*18977*																				*21835*
~~**Liverpool James Street**~~	LNW022	LNW	21																																						
Salford Central New Platforms	LNW020	LNW	20																																						
				11279.00											*1220*			*4451*			*5374*				*182*				*53*												*11280*
~~**Liverpool Central Passenger Capacity**~~	LNW023	LNW	21																																						
(Total capacity schemes)																																								*1115385*
(New capacity schemes)																																								
Leeds Southern Entrance	LNE026	LNE																																						
				9862.00								*684*			*873*			*7785*			*520*																				*9178*
East Leeds Parkway	LNE025	LNE																																						
				11378.00								*498*			*444*			*481*			*6074*				*3881*																*10880*
Leeds new Bay Platforms	LNE024	LNE																																						
				16782.00														*645*			*510*				*7184*				*8443*												*16782*
Maidenhead and Twyford (relief lines)	W012	W																																						
				3118.00								*133*			*315*			*2597*			*73*																				*2985*
Route 20 capacity enhancement package	LNW024	LNW	20																																						
				31629.00								*2448*			*1440*			*13758*			*13570*				*413*																*29181*
Huddersfield Platform 9	LNE028	LNE																																						
				9353.00														*124*			*253*				*4001*				*4709*												*9087*
(Total new capacity schemes)																																								*78093*
(Small scale capacity schemes)																																								
Cogan Junction upgrade		W	15																																					
				5000.00											*1000*			*1000*			*1000*				*1000*				*1000*												*5000*
Ninian Park to Radyr (City Line) linespeed improvements		W	15																																					
				5000.00											*1000*			*1000*			*1000*				*1000*				*1000*												*5000*
Route 2: 8-Car Operations, Victoria Eastern to Bellingham		SE	2																																					
				4320.00											*864*			*864*			*864*				*864*				*864*												*4320*
Route 1: 8-Car Operations, Swanley to Ramsgate (via Maidstone East and Ashford)		SE	1																																					
				5480.00											*1370*			*1370*			*1370*				*1370*																*5480*
Route 1: 12-Car Operations, Swanley to Rochester		SE	1																																					
				2616.00											*523*			*523*			*523*				*523*				*523*												*2616*
~~**Birmingham New Street new bay platform**~~	LNW	LNW	17																																					
				0.00																																						*0*
Seven Sisters improved access	SE																																						
				1000.00											*1000*																										*1000*
Seven Sisters Turnback	SE																																							
				1000.00											*1000*																										*1000*

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	NR REF	TERRITORY	SR	Project point estimate £000s	2007/2008 Q1 Q2 Q3 Q4	2008/2009 Q1 Q2 Q3 Q4	2009/2010 Q1 Q2 Q3 Q4	2010/2011 Q1 Q2 Q3 Q4	2011/2012 Q1 Q2 Q3 Q4	2012/2013 Q1 Q2 Q3 Q4	2013/2014 Q1 Q2 Q3 Q4	2014/2015 Q1 Q2 Q3 Q4	2015/2016 Q1 Q2 Q3 Q4	CP4 total
Fenchurch Street and Chafford Hundred passenger circulation	SE													
				2000.00			*1000*	*1000*						*2000*
Moorgate branch improvements	LNE													
				5000.00			*1000*	*1000*	*1000*	*1000*	*1000*			*5000*
Todmordon turnback facility	LNE													
				5000.00			*1000*	*1000*	*1000*	*1000*	*1000*			*5000*
Horsforth turnback facility	LNE													
				5000.00			*1000*	*1000*	*1000*	*1000*	*1000*			*5000*
Harrogate to Horsforth additional signal sections	LNE													
				4000.00			*1000*	*1000*	*1000*	*1000*				*4000*
Keighley turnback facility	LNE													
				5000.00			*1000*	*1000*	*1000*	*1000*	*1000*			*5000*
Ilkley to Leeds platform lengthening	LNE	LNE	LNE											
				2608.00			*522*	*522*	*522*	*522*	*522*			*2608*
East Midlands platform extensions														
				5672.00			*1134*	*1134*	*1134*	*1134*	*1134*			*5672*
(Total small scale capacity schemes)														*58696*
Total DfT HLOS output projects														**1252174**
DfT performance														
Projects required to deliver 92.6 PPM	MULTI	MULTI	MULTI											
				250000.00			*50000*	*50000*	*50000*	*50000*	*50000*			250000
Total Core projects (DfT Baseline, specified, output and performance projects)														**6863773**
England & Wales - Optional enhancement projects														
HLOS performance schemes														
ECML OLE		LNE												
				47185.00			*12051*	*19399*	*15735*					*35134*
Cotswold Line re-doubling options	W003	W	13											
				105567.00			*7667*	*39757*	*57707*	*436*				*97900*
Total HLOS performance schemes														**133034**
Capacity and performance schemes														
West Croydon Track Capacity	SE014	SE	2											
				16065.00			*932*	*792*	*5896*	*6873*	*1572*			*15133.000*
Didcot - Oxford area capacity upgrade	W004	W	13											
				21049.00			*1654*	*4029*	*5846*	*5862*	*3658*			*19395*
Bolton Corridor Package	LNW018	LNW	20											
				7590.00			*270*	*714*	*5513*	*1093*				*7320*
Buxton Line Capacity and LSI	LNW017	LNW	20											
				15279.00				*798*	*500*	*5000*	*8981*			*15279*
Doncaster Loversall Carr junction revised operational layout	LNE007	LNE	8											
				6600.00			*273*	*611*	*5716*					*6327*
Hertford Loops (inc. Gordon Hill Loops)	LNE005	LNE	8											
				18181.00			*2114*	*3721*	*6658*	*5481*	*207*			*16067*
Swindon - Kemble redoubling	W005	W	13											
				33377.00			*1088*	*7764*	*20590*	*3935*				*32289*
Total capacity and performance schemes														**111810**
Journey time improvements														
Westerleigh - Barnt Green linespeed upgrade	W002	W	13											
				33220.00			*1641*	*6236*	*10686*	*10715*	*3942*			*31579*

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Wrexham to London Marylebone JTI (formerly "LSI Chilterns")	LNW001	LNW	16																																					
				5857.00					*516*				*960*				*2609*				*1772*																				*5341*
MML St Pancras - Sheffield LSI	LNE018	LNE	19																																					
				64000.00					*5099*				*10774*				*13463*				*13500*				*13463*				*7701*												*58901*
TPE Route Enhancements – Linespeed Improvements	LNW014	LNW	20																																					
				28208.00					*1871*				*9350*				*16987*																								*26337*
Total Journey time improvements schemes																																								**122158**
Enhancement to renewal																																								
Redhill remodelling	SE009	SE	2																																					
				37512.00					*12512*								*10000*				*15000*																				*25000*
Crewe remodelling / resignalling	LNW011	LNW	18																																					
				428600.00									*3000*				*5000*				*8000*				*17000*				*25000*												*58000*
Reading Station Area Redevelopment Programme - Plat 1-8 Renewals	W008	W	13																																					
				26200.00													*13100*				*13100*																				*26200*
East Midlands resignalling: Nottingham station area	LNE020	LNE	19																																					
				19209.00					*439*				*639*				*952*				*2531*				*14648*																*18770*
~~**Route 17 Round Oak to Walsall reopening**~~																																								
Total Enhancement to renewal schemes																																								**127970**
7 day railway																																								
Projects to support move towards a seven day railway	MULTI	MULTI		320000.00									64000				64000				64000				64000				64000												320000
Total 7 day railway schemes																																								**320000**
Longer term development																																								
Development for CP5 projects	MULTI	MULTI																																						
				180000.00									*36000*				*36000*				*36000*				*36000*				*36000*												*180000*
North West feasibility study (Manchester Hub)	LNW016	LNW	20																																					
				60000.00									*12000*				*12000*				*12000*				*12000*				*12000*												*60000*
Total Longer term development schemes																																								**240000**
Policy choices																																								
Policy choices (GSM-R freight only branches, SISS, DC regen braking)																																								
				166930.00									*33386*				*33386*				*33386*				*33386*				*33386*												*166930*
Total Policy choices schemes																																								**166930**
Total optional enhancement schemes																																								**1221902**
Total DfT enhancements in CP4																																								**8085675**