Network Rail

Initial Strategic Business Plan

Control Period 4

June 2006

Executive summary

This document is Network Rail's Initial Strategic Business Plan for Control Period 4 (CP4). It articulates Network Rail's emerging plans for operating, maintaining, renewing and developing the network. The document focuses on CP4 (2009/10 to 2013/14) but also includes high level projections over a longer period.

This document is the first submission for the Office of Rail Regulation's (ORR's) Periodic Review 2008 (PR2008). It therefore aims to inform our customers and funders of the issues and strategic choices the industry and funders face for CP4. In particular, it aims to inform the Department for Transport (DfT) and Transport Scotland in the development of their High Level Output Specification (HLOS) and Statement of Funds Available (SoFA) documents. Our plans will be updated in our Strategic Business Plan to be published in October 2007.

Following discussions with ORR, DfT and Transport Scotland, this plan has been put together based on two alternative strategies. Continued focus on improving safety is fundamental to both strategies. The strategies comprise:

- the **Baseline** which provides an understanding of the efficient minimum cost to maintain a non-degrading infrastructure but would not accommodate substantial growth;
- the **Base Case** which seeks to provide the capacity needed to accommodate a reasonable projection of growth in passenger and freight demand whilst delivering sustained good performance at or above the level we plan to achieve by the end of CP3.

Our plans aim to reflect the different priorities for each route. They include separate projections for Scotland, and England and Wales. As with the overall level of costs, however, further work is required over the coming months to improve the disaggregation of our costs.

The plan represents an important step forward in the development of robust plans for the railway. It therefore provides a basis to start the debate on the options and trade-offs that need to be considered. In particular, we have made significant improvements in some key areas which include:

- developing draft high level strategies for each of the 26 strategic routes which include an initial view of route enhancement options for discussion with our industry partners;
- updating our asset policies together with the first version of our asset policy justification documents; and
- developing a new infrastructure cost model to provide a consistent, transparent approach to our longer term projections, to provide more disaggregated information and to support the improved understanding of cost drivers including the impact of traffic.

But this is only the beginning of the process to determine our plans for the next control period. There remains a great deal to be done, working with other industry stakeholders, to improve the robustness of our plans and to assess alternative options for the railway. We will continue to challenge our initial projections and to build on the improvements described above. For example, in developing our asset policies and the infrastructure cost model, we will do further work to examine the trade off between maintenance and renewal activity levels and the impact on outputs.

Over the next 18 months we will also improve the robustness of our plans for CP4 in a number of areas, including:

- developing a much better understanding of how we can deliver further efficiency savings during CP4, including development of our world class transformation programme. This will enable us to develop a challenging but realistic efficiency profile for CP4;
- publication of further Route Utilisation Strategies which will help us to improve our enhancement projections together with specific further work to improve the robustness of our projections for individual schemes;
- reviewing the overall deliverability of our initial plans taking into account the availability of supplier resources and engineering access;
- integrating our plans for enhancements and renewals of the network to improve overall affordability;
- working with the industry to develop detailed safety metrics and specific plans to deliver safety improvements;
- further analysis of the costs and benefits of the European Rail Traffic Management System (ERTMS);
- development of possessions strategies for the network based on optimised whole industry costs and benefits; and
- sensitivity and scenario analysis to assess the impact of alternative assumptions and to explore the implications of alternative strategies. We will be providing further analysis to ORR by the end of September 2006.

In December last year, ORR provided its initial assessment of our expenditure requirements for CP4. Excluding non-controllable operating costs, our initial Baseline and Base Case projections of operating, maintenance and renewals expenditure are both slightly below the top end of the range identified by ORR. However, non-controllable operating costs are significantly higher than ORR assumed, largely due to the increase in electricity for traction costs.

Controllable operating costs are projected to be marginally lower than the top end of ORR's initial assessment. In addition, although we have slightly increased our maintenance projections to reflect the impact of increased traffic, this is broadly offset by increased variable charges paid by operators.

In the Base Case, our overall renewals expenditure is marginally lower than the top end of ORR's range. Since we last published long term projections in the 2005 Business Plan (BP2005), we have reduced the projected level of CP4 plain line track renewal by around three per cent. We have also reduced signalling expenditure by almost 40 per cent since BP2005 following a detailed review of the scope and timing of resignalling schemes and the development of a detailed workbank for minor works. Finally, we have significantly reduced our planned expenditure on IT in the light of progress achieved already and the development of better plans. However, we have increased the level of expenditure on operational property as we have for the first time started to develop detailed assessments of long term activity and expenditure requirements. We have also increased the Base Case projections for civils expenditure to reflect a detailed assessment for work required on our largest 26 major structures.

There has been significant investment in the network over the last few years. As a result the average age of some of our key assets is falling. However, the network has not yet reached steady state and our plan therefore continues the high levels of investment during CP4. Beyond CP4, however, we are forecasting that our annual renewals expenditure will reduce from over £2 billion to around £1.6 billion per year. For example, we expect to continue renewing around 2.8 per cent of plain line track during CP4 but that this will fall to around 2.3 per cent in subsequent control periods and we now have much more confidence that this rate is sufficient to sustain these assets.

Our work to form a view of the level of efficiencies that may be possible in CP4 is inevitably in its early stages. It is clearly not yet possible to make a robust projection of the levels of efficiency we will be achieving in up to eight years time. Therefore, for the purposes of producing this initial plan, we have developed reference assumptions which also take account of the fact that the potential for year-on-year improvement will tend to diminish over time. For most of our operating, maintenance and renewals expenditure we have assumed that the efficiency savings that can be achieved are initially around the middle of the ORR range (two to eight per cent per year) and that this will decline over time. We have assumed that lower efficiency savings are achievable for signallers and that there will be no real change in non-controllable costs, insurance and pensions.

As indicated in ORR's initial assessment, these efficiency savings may be offset by price rises in excess of general inflation for some of our inputs. We therefore commissioned an independent study to examine the impact of real price inflation on our input price trends. The study has provided a range of input price inflation forecasts and we have reflected the central estimates in this plan.

The figure opposite illustrates the projected level of expenditure in our Base Case projections for CP4 compared to CP3 and CP5. This shows that we are planning to reduce average annual expenditure on operating, maintaining and renewing the network from around £5 billion in the current control period to just over £4 billion per year in the next control period. We expect this to reduce to just over £3.5 billion per year in CP5. This reflects the progress we are making to address the backlog arising from past underinvestment, to understand the condition of our assets and their long term renewal requirements, and to improve the efficiency of our business.

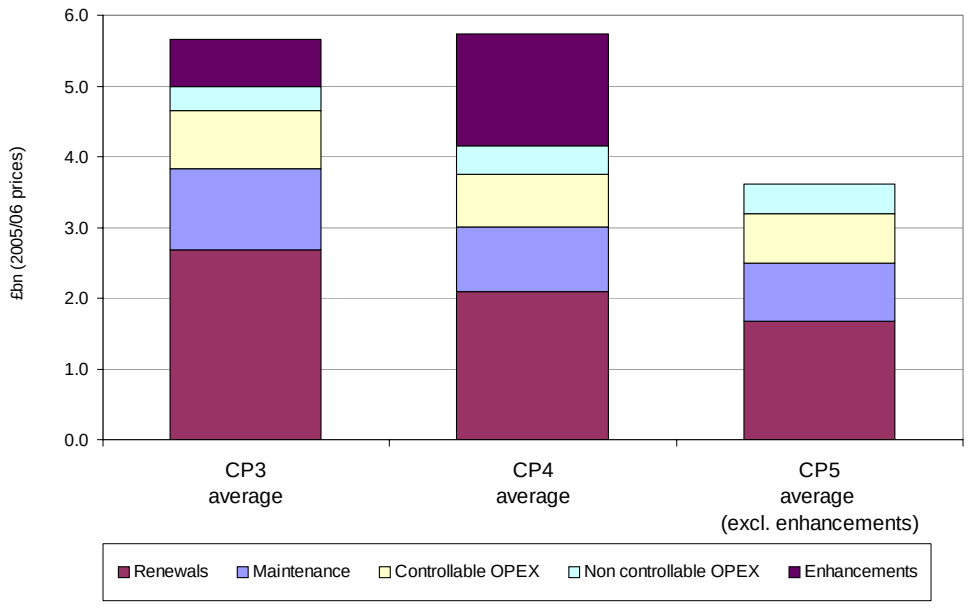
The plan includes our projections for the continuation of significant growth in passenger and freight demand over the next ten years. In our Base Case plan, we have set out a potential strategy to respond to this expected growth. This is based on our assessment of the implications for train services and the extent to which the infrastructure can accommodate this traffic. We have identified a range of enhancement schemes that might be required to respond to this growth. The analysis we have done so far indicates potential enhancements of around £8 billion over CP4 and the figure opposite shows that this would result in average annual CP4 expenditure which is broadly in line with that in CP3.

In developing these enhancement options we have produced draft strategies for each strategic route based on the emerging Route Utilisation Strategies and other available analysis. This includes schemes that address freight capacity constraints, such as the links to the south east ports. We have also included a number of large development projects including Thameslink, Waterloo and Birmingham New Street stations, and the Glasgow and Edinburgh airport rail links. Finally, we have included an allowance equivalent to the Network Rail Discretionary Fund to enable us to exploit the synergies with our renewal schemes in providing cost-effective enhancements.

There is, however, much work to be done to assess these options, to consider how they can be integrated more with renewals to improve overall affordability, and to consider how they might be funded. For example, some schemes may be funded by third parties outside the review process. Other schemes could be funded from surpluses which are generated from meeting or exceeding our efficiency targets in other areas.

Following this initial submission, Network Rail will work more closely with train operators and funders in the development of our longer term plans. In particular, we need to work together to build on the broad range of work that is being carried out to understand better the strategic choices faced by the industry and its funders. The challenge is to develop solutions for the railway as a whole which improve its overall affordability and enable us to provide services which meet the growing demand being placed upon it by passenger and freight users.

Figure 1 Average annual expenditure



1. The strategic context

Introduction

This document is Network Rail's Initial Strategic Business Plan for Control Period 4 (CP4). It articulates Network Rail's emerging plans for operating, maintaining, renewing and developing the network. The document focuses on CP4 (2009/10 to 2013/14) but also includes high level projections over a longer period.

This document aims to inform our customers and funders of the issues and strategic choices the industry and funders face in CP4 and, in particular, the Department for Transport (DfT) and Transport Scotland in the development of their High Level Output Specification (HLOS) and Statement of Funds Available (SoFA) documents.

There is a lot of work underway to understand better the strategic choices the industry and funders face. Following this submission, Network Rail wishes to engage further with train operators and funders in the development of longer term plans for the railway. This work will inform and shape the debate and our subsequent submissions in support of the Office of Rail Regulation's (ORR's) Periodic Review 2008 (PR2008) process.

The development of rail strategy

Since the 2005 Railways Act and the re-structuring of the industry, the development of rail strategy has been taken forward by the new DfT Rail and Transport Scotland organisations.

DfT has announced it will publish a long term strategy alongside the HLOS next year. The challenge recently outlined by the Prime Minister, in welcoming the new Secretary of State for Transport into office, was to develop a long-term strategy that supports economic growth and development, meets the public need for transport and is consistent with Government's environmental goals. In doing this, the development of the strategy will draw on Sir Rod Eddington's work on the priorities for investment in transport infrastructure and take account of wider Government policy in relation to the environment, energy and housing.

Transport Scotland is also developing its National Transport Strategy which will inform its HLOS, and will be informed by its Scottish Planning Assessment which will also be published later this year. It is important for Network Rail to understand and respond to the different priorities in Scotland and in different parts of England and Wales.

Work with our stakeholders to support the development of these strategies includes:

- the development of the Route Utilisation Strategies (RUSs) examining longer term demand and capacity options;
- the development of specific infrastructure projects;
- the development of the appropriate specification for the replacement of the High Speed Trains (HSTs);
- the cross-industry Rail Sustainable Development Group;
- work with our customers on improving the performance of the railway;
- work to improve the passenger experience including future proposals for stations; and
- the development of technical strategies for the railway that will enable the industry to meet its objectives.

The priorities for this plan

Following discussions with ORR, DfT and Transport Scotland, this plan has been put together based on two alternative strategies. Continued focus on improving safety is fundamental to both strategies.

The first strategy, referred to as the **Baseline**, is based upon maintaining a non-degrading infrastructure. Although this plan would not accommodate substantial growth, it provides an important benchmark in understanding the efficient minimum cost for delivery of committed outputs and holding overall asset condition broadly constant from the end of Control Period 3 (CP3) (2004/05 to 2008/09).

The second strategy, referred to as the **Base Case**, is seeking to accommodate a reasonable projection of growth in passenger and freight demand whilst delivering sustained good performance at or above the level we plan to achieve by the end of CP3. Under this strategy, the network would be developed and sustained to provide the capability and availability needed to respond to these demand forecasts.

How we have prepared the plans

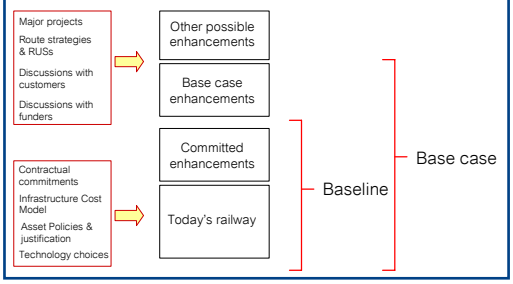
The Baseline plan provides a forecast of the long term activities and costs broadly to maintain the current infrastructure capability and capacity, taking into account committed changes. This plan has been developed based on our asset policies and the use of our Infrastructure Cost Model.

The Base Case plan has taken account of our route plans, emerging Route Utilisation Strategies (RUSs) and initial discussions with customers and funders to identify the key enhancements by strategic route that we believe are likely to be required to deliver the appropriate route strategies to respond to our growth forecasts. In considering

how best to accommodate the forecast demand in CP4 we have taken account of the longer term plans for each route. This approach is shown in the diagram below.

In developing these plans we have applied the

Figure 2 Preparation of the plan



principles set out in our Business Planning Criteria, including:

- the criteria we apply in making investment decisions on the network;
- how activities are prioritised and trade-offs made where constraints exist (e.g. the availability of funding, access to the network or resources to carry out the work);
- how we engage with our stakeholders on the development of these plans and ultimately improve the value delivered by the rail network; and
- the importance of route strategies and asset management policies in delivering our asset management responsibilities.

A key input into the development of the route strategies is the RUS programme. This programme is ongoing and will inform future business plans with increasing depth and justification for our route plans. The Base Case plan therefore had to anticipate the potential outcome from this further work in order to provide a starting point for discussion in the review process.

At this stage many of the projects included in the Base Case plan are in the developmental stage and are subject to further design and costing work and agreement to the funding of their implementation. The robustness of the project definitions and cost estimates will improve as projects progress through their project life cycle as defined by our Guide to Railway Investment Projects (GRIP).

The diagram above also illustrates the point that not all possible enhancements projects have been included in the plan. Possible projects will have been excluded for a number of reasons, including:

- the project does not meet the priorities adopted for the plan; and
- the projects require greater analysis of their potential impact, benefits or scope definition before a view can be taken.

Other projects have been included as sensitivities only at this stage. It is recognised that they will have a material impact on our plans but still require major industry and funding commitment to their implementation. For example, the implementation of the European Rail Traffic Management System (ERTMS) and Crossrail projects have been included as separate sensitivities to our core plans.

The key strategic issues

Network Rail, the rail industry and its funders face a number of important issues and strategic choices which will fundamentally impact on the railway, in terms of the outputs it delivers, its physical nature and its cost both within CP4 and beyond. These are explored in more detail in the rest of the document but the most significant issues requiring resolution are highlighted below. It is not for Network Rail to resolve these issues alone, but to work collaboratively with its industry partners and funders to take these forward.

Sustainable development

Environmental sustainability is becoming an increasingly important policy objective. The Prime Minister made clear that "the benefits transport can deliver must also be measured against its impact on the environment; in particular transport will be critical to our long-term goal of reducing carbon emissions". We aim to contribute to the goal of sustainable development, in particular by working with the rest of the industry to make additional capacity affordable so that the railway can meet the growing demand and help to integrate the railway with other modes of transport. We believe that a successful and profitable railway industry is key to this.

The Government has recently signalled its ambition to take forward the examination of road pricing as a key tool in tackling road congestion. The potential impact of the adoption of road pricing is not taken into account in this plan.

Providing capacity

The provision of capacity can potentially be delivered in a number of ways. These options are set out in this plan and explored in detail in our RUS programme. This plan identifies common interventions for markets and geography that share common issues. We have sought to set out strategies, route by route, that are incremental, affordable and consistent. Nevertheless, as the South West Main Line RUS demonstrated, increasingly on the network there will be key capacity constraints that, if not addressed, make investment in other parts of the route of limited value.

We believe that the most significant capacity investment required in England and Wales during CP4 is the Thameslink programme, which is a key project to address crowding and growth on London commuter and underground services. Substantial enhancements are also planned in Scotland. However, substantial further investment will be required if the railway is to accommodate demand growth elsewhere on the network.

The full industry costs and benefits

The plan identifies the funding required by Network Rail to operate, maintain, renew and develop the network. The cost estimates for enhancement options are often at a very early stage of development and we would hope to be able to reduce these in many cases. Also included in the plan is an estimate of the additional train kilometres operated that we believe would be appropriate under both strategies. Where appropriate, we have identified investment in rolling stock or other areas as the most efficient means of meeting overall capacity requirements. However, we have not yet quantified the additional cost or revenue impacts on train operators of the extra services that would potentially use the additional capacity provided.

Over the coming months, we will work with operators and funders to develop these proposals further. We will also work with DfT, Transport Scotland and ORR to assess the full industry financial and economic impacts of alternative proposals using the jointly developed Network Modelling Framework as part of the process of developing the HLOSs.

The need for flexibility

This plan presents Network Rail's current view of how the network might develop. The plan requires further development and refinement including greater understanding of the deliverability of the proposed programme of schemes. Further analysis through our RUS programme and the further development of individual projects will require flexibility in the framing of the outputs and the plans to deliver them in order to take account of changing priorities and plans as a consequence of this further analysis.

Exploiting project synergies

In developing our proposals, we will seek to maximise the synergies of integrating the planning and delivery of the proposed enhancements with our core renewals work. This will provide a more cost-effective delivery of the projects through reduced project management, design and implementation costs. To realise the benefits requires sufficient commitment, early enough in the project life-cycle, to exploit the synergies and to ensure that there is a single project team with an integrated specification and design and an appropriate funding and procurement structure.

Funding of the plan

There are a number of potential options for the funding and financing of the projects contained in the Base Case plan. A key part of the PR2008 review process will be to determine the appropriate funding mechanisms for these schemes and, more generally, the level and structure of access charges.

There are also other sources of funding outside of the PR2008 process. In particular, we would hope to secure third party funding for certain enhancements. In addition, we are supporting various applications to the Transport Innovation Fund (TIF). At this stage, the plan makes no allowance for funding from TIF.

The performance trade off

Network Rail and the industry face a choice in the utilisation of capacity. There is a clear trade off between the utilisation of the network and performance where the levels of utilisation begin to exceed a threshold. In developing our strategy for responding to demand, we have sought to develop a plan that does not worsen performance but where additional capacity is proposed it is primarily to accommodate growth rather than to deliver performance improvements.

Strategic choices for tomorrow's railway

The Base Case plan reflects a strategy in response to the Government's objective to increase the number of customers using rail. The plan is based upon development of the current infrastructure largely using existing or planned technology. There are a number of strategic developments which could change this plan. These proposals have not yet been reflected in this plan because the proposals are not yet sufficiently well developed for us to take a firm view on them.

We are working with operators and funders to create a consistent and more customer focused strategy for renewing our stations, addressing key requirements in terms of security, information provision, ease of access and the appropriate provision of services. In doing, this we want to implement design solutions that are operationally flexible, cost-effective and of an acceptable quality. Key to delivering this is the development of standardised and modular designs for different categories of stations. Improved interchange at stations with other modes of transport is also critical to the overall journey of many passengers. We aim to work with customers and funders to further develop initial proposals and implement pilot schemes in the current control period in order to test that the proposals meet the objectives identified. Once proven we would hope to gain wide support for the roll out of this approach as part of our renewals programme.

The development of the European Rail Traffic Management System (ERTMS) for use in Great

Britain represents one of the most significant decisions facing the industry. The strategy for its implementation would impact well beyond this control period and the next, and would materially affect rolling stock as well as infrastructure. There are key decisions to be made prior to the commencement of CP4 on how to take the project forward. In this plan, we have made provision for the future development of ERTMS during the next control period. In the development of our core plan, we have not assumed that the project will be implemented but have treated it as a sensitivity given the current uncertainty surrounding the project.

The DfT is leading a cross-industry group to develop the technical, commercial and financial case for the future replacement of the InterCity 125 high speed train (HST) fleet. The new generation of inter-urban trains will seek to deliver increased capacity and improved journey times and comfort as well as operational reliability and efficiency. Other investment in new rolling stock will be required and we are working with the rest of the industry to help ensure that it is specified in a way which minimises overall cost in particular by reducing the weight of trains.

We are working with Transport Scotland and other stakeholders on the Scotland RUS. This will inform the development of its transport strategy for Scotland and its HLOS and the key rail projects it wishes to progress. Transport Scotland has developed, and in some cases has implemented, a number of major projects. The key schemes in development are Airdrie to Bathgate, Glasgow Airport Rail Link, Edinburgh Airport Rail Link and Waverley Railway.

We are also working with Welsh Assembly Government (WAG), including through the Welsh RUS. Similarly, we are working with Transport for London (TfL) on a number of schemes which underpin their long term vision for transport in London. Several of these schemes are reflected in our plans and we will continue to develop these with TfL.

There are other proposals being examined, the implementation of which will be beyond CP4 but the potential impact of which needs to be considered during the lifetime of this plan. For example, there has been much public debate about the merits of a new high speed line and its impact on the rest of the network. This is likely to be a key consideration in the development of the governments' rail strategy and it could potentially have a major impact on our plans. We have not taken into account the potential of a new high speed line in our plans at this stage.

With the growth in traffic over the past few years, the importance of delivering a seven day railway is also growing, including the ability to run a near full service on Saturdays and Sundays. We will work with the industry to examine how this might be achieved. This will require the industry to work together effectively to deliver more effective management of the railway together with a sustainable investment programme.

The structure of this document

The rest of the document sets out the following:

- Chapter 2: The demand for rail – this sets out our view of the future demand for rail by key markets and the key drivers of this demand;
- Chapter 3: Managing our assets – this explains our asset management strategy and policies and the development and functionality of our Infrastructure Cost Model;
- Chapter 4: Delivering efficiencies – this explains the work we doing to develop our forecasts of potential efficiencies for the next control period and the reference assumptions used in this plan;
- Chapter 5: The Baseline plan – this sets out the long term forecasts of activity volumes, costs and the expected outputs consistent with maintaining a non-degrading network;
- Chapter 6: The Base Case plan – this sets out how we believe the network could develop in response to the priorities of accommodating growth and maintaining good levels of performance and the outputs it would deliver;
- Chapter 7: Expenditure and financing – this sets out the ranges of financial assumptions and potential revenue requirements to support the strategies contained in the plan;
- Chapter 8: Key sensitivities – this explains the impact of Crossrail and ERTMS implementation on our plans; and
- Chapter 9: Summary of future developments – this sets out the forward programme of activity within Network Rail to support and improve our understanding of the key issues set out in this document.

There are also two appendices to this document:

- Appendix 1 sets out the key assumptions underpinning the Baseline and Base Case plans; and
- Appendix 2 summarises the forecasts of total expenditure, income and outputs together with the disaggregation for England and Wales, and Scotland.

Supporting documents

As part of this submission we have provided ORR with supporting documentation that provides further detail on certain parts of this plan. We have identified the supporting documents at the end of each relevant chapter.

2. The demand for rail

The historic context

In aggregate, passenger kilometres travelled by rail have increased by nearly 40 per cent over the last 10 years, from 28 billion in 1994/05 to 42 billion passenger kilometres in 2004/05. All sectors of the passenger market have experienced growth in terms of the number and length of journeys travelled and the revenue generated. The strongest growth market over the last decade has been the London and South East commuter routes (57 per cent growth since 1994/95), followed by regional services (52 per cent) and long distance services (33 per cent).

There are a number of reasons for this growth in demand. In particular, healthy economic growth and increasing employment have been key over this period. These are reflected in strong growth of the London and South East commuter market and the dominance of rail for passenger travel into London, which accounts for 67 per cent of all passenger trips nationally. Rail's competitive position has also strengthened over the same period, as rising fuel prices and increasing road congestion have made car travel less attractive. The combined impact of economic growth and increased road congestion in major cities has also stimulated regional commuting markets, with strong growth seen in recent years into centres such as Birmingham and Manchester. However, increased competition from low fare airlines has had an impact on long distance rail travel.

Improvements in rail services have both helped to stimulate and accommodate growth. Most operators, as part of their franchise commitments over the last decade, have delivered improvements in the quality of service offered, with increases in the frequency and speed of trains, as well as significant investment in new trains.

In terms of growth in freight demand, there has been a 60 per cent increase in total net freight tonne kilometres between 1994/95 and 2004/05. Freight moved has grown faster than freight lifted since the average length of rail freight journeys has also increased over the same period. The main commodities responsible for this trend in recent years have been the transport of coal for electricity generation, and the movement of deep sea containers.

The increase in coal traffic has been driven by two factors First, there has been a modest increase in the total amount of coal burnt for electricity generation, as coal has become more competitively priced relative to gas as a source of power. Coal burn at power stations has increased from 49.5 million tonnes in 2001 to 51.1 million tonnes in 2005.

Second – and much more significantly in terms of mileage – there has been a shift toward more coal being burnt at power stations that are rail-served. This has been caused by a reduction in coal burn at power stations that are not rail-served (e.g. Tilbury power station plans to close as it cannot cost-effectively meet recent emissions requirements) and a requirement to burn more low sulphur coal (mostly imported) which is less energy efficient than British deep mined coal (i.e. more has to be burnt to produce a given output). There has also been a significant increase in the quantity of open-cast mined coal transported from Scotland.

These factors have driven an overall increase in coal moved for power generation (measured in tonne km) of 45 per cent between 2001 and 2005.

The importation of deep sea containers – driven primarily by domestic demand for imported goods from the Far East – has increased by an average of five per cent a year over the last ten years. Rail is a competitive mode of transport for the trunk haul inland from the ports towards the containers' final destinations. Since privatisation the rail mode share of this traffic has increased from around 16 per cent to 25 per cent.

Other key markets for rail freight are bulk commodities such as construction materials, metals, and oil and petroleum products. Rail haulage of construction materials has grown by 17 per cent over the last five years, with growth being focused on London and the South East. The key demand driver is large commercial construction and civil engineering projects (e.g. the building of Terminal 5 at Heathrow Airport). The volume of metals transported over the rail network has declined over the last five years, though the average distance hauled and the tonne miles have increased. Oil and petroleum haulage has been flat over the same term.

Demand and capacity today

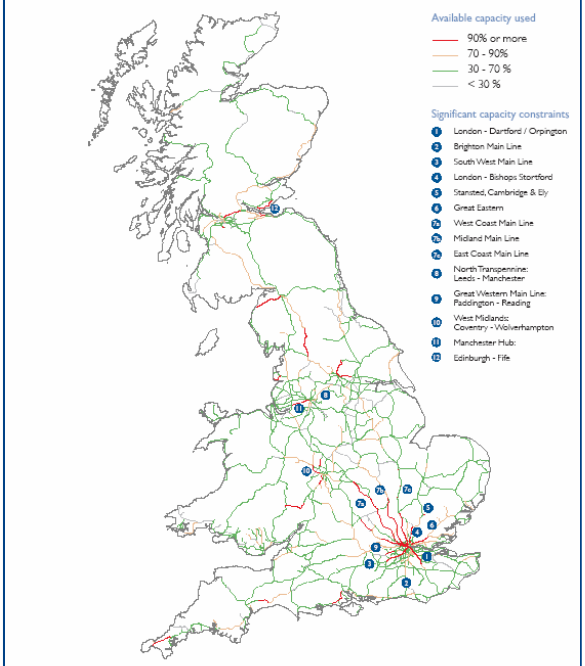
As a result of growth over the last 10 years, the rail network is approaching the limits of its capacity in an increasing number of places. This is apparent in the degree to which network capacity is increasingly fully utilised, in the levels of crowding on an increasing number of trains and in the increasing pressure on capacity at key stations.

Utilisation of the network

The Capacity Utilisation Index (CUI) map opposite identifies key parts of the network where there are currently significant capacity constraints. The most severe are centred around the approaches to London, followed by capacity constraints on the main north – south routes of the West Coast, East Coast and Midland Main Lines. Then there are a number of regional hotspots centred on Birmingham and Manchester, and on the North Transpennine corridor. In Scotland the key

constraints are in the central belt, particularly between Edinburgh and Fife, with restrictive throat layouts at Edinburgh Waverley station and the single line sections on the Bathgate and Newcraighall branches, long signalling headways across the Forth Bridge into Fife and a shortage of platforms at Waverley capable of accommodating six car trains.

Figure 3 CUI map & key capacity constraints



The map shows constraints from "plain-line" network utilisation in the peak hours. However, there are several other types of capacity constraint. Some key junctions constrain capacity due to the need to make conflicting movements. Similarly, the numbers of platforms and/or track layouts at key stations can constrain capacity. Although capacity utilisation is usually lower outside the peak hours, it is not always practicable to use all of this capacity – in particular, lower utilisation during the "inter-peak" hours is essential to ensure that the timetable for the day as a whole is sufficiently robust. Access is also required for maintenance and renewals.

These constraints limit the ability of the industry to respond to demand for growth. In the past it has often been possible to accommodate growth by running more trains, but the extent to which this is possible without enhancements to the network is becoming more limited and is highly route specific.

London and South East services

Levels of crowding vary enormously across the rail network and by time of day. Standing on some London and South East (L&SE) peak services is routine, with a significant proportion of passengers travelling on trains with loads at or above their capacity, even if standing capacity is taken into account.

Crowding standards for L&SE peak services are expressed in terms of "percentage of passengers in excess of capacity", or %PIXC for short. For services which run for less than 20 minutes non-stop into London, the capacity of the service includes a standing allowance which depends on the amount of space available but is typically around 35 per cent of the number of seats. The current standard, for each TOC, is that %PIXC should be no more than three per cent over the morning and evening peaks combined. There is also a limit of 4.5 per cent for either the morning or evening peak individually.

The annual train counts in autumn 2004 showed that two TOCs (Southern and SWT) were over the three per cent limit, with two others (Thameslink and WAGN) above 2.6 per cent. These TOCs account for 44 per cent of total peak passengers.

Crowding in the L&SE peak can also be measured in terms of the number of people standing. Based on the 2004 counts approximately 70,000 passengers travelling into London had to stand in the morning peak, or 15 per cent of the total; and approximately 30,000 had to stand in the evening peak, or eight per cent of the total.

The figure below shows the number of passengers in the AM Peak period (7:00 to 9:59) by TOC and the corresponding proportion of passenger standing.

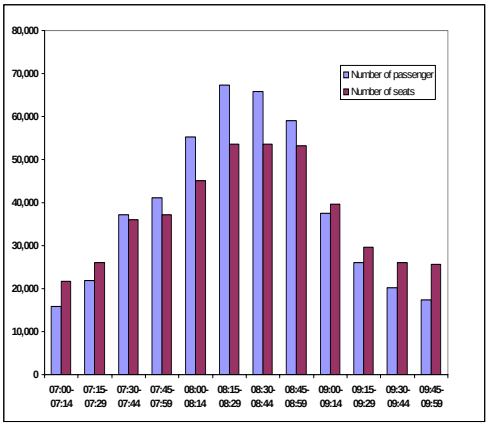
Figure 4 Morning peak period crowding

Train Operating Company	Number of passenger (000s)	Per cent of passenger standing
C2C	27	16%
Chiltern	10	2%
FGWL	11	8%
ONE	78	12%
Silverlink County	12	9%
South Eastern Train	120	14%
Southern	75	23%
SWT	82	17%
Thameslink	27	14%
WAGN	25	12%
Total	467	15%

The graph below shows how demand and crowding are spread across the peak hours. Demand is highest on services arriving in London between 08.00 and 09.00. Despite seating capacity being higher in this hour than in adjacent hours, there are approximately 50,000 (20 per cent of total) passengers standing in this hour. However, even in the shoulder peak hours of 07.00 to 08.00 and 09.00 to 10.00, approximately 20,000 people have to stand.

We plan to undertake with DfT and TfL joint research on the potential for demand management and peak spreading.

Figure 5 Morning peak period demand and capacity



Long distance services

Load factors on long distance services vary widely. Services that also serve commuter markets (e.g. from Reading and Peterborough to London) are particularly heavily loaded, with passengers standing for some distances. For example, the SRA's Great Western RUS showed an average load factor in excess of 100 per cent for long distance services arriving in London between 08.00 and 09.00. Even outside the commuter peak hours, however, load factors on an increasing number of trains are approaching 100 per cent.

Train operators are responding to this by using discounted fares to attract passengers to less busy services. However, there is a limit to the extent to which this can be effective, as many passengers (in particular commuters and business travellers) have limited scope to change their times of travel. In the absence of action to increase capacity during busier hours, growth will be increasingly constrained, either indirectly via increased crowding levels (standing is not a realistic option for most long distance passengers), or directly through increasing fares and/or ticket restrictions.

Regional services

Crowding on regional services is less widespread than on L&SE peak or long distance services. However, the growth of the last decade has led to crowding problems in some areas.

In particular, there has been significant growth in rail commuting into major cities. Rail has historically had a relatively low share of commuter traffic into most cities outside London, and this gives the potential for rail commuting to grow significantly faster than overall employment levels. For example, the SRA's West Midlands RUS identified that rail's share of commuting into Birmingham has increased from 12 per cent in 1991 to over 20 per cent in 2005.

The morning and evening peaks in regional cities tend to be more concentrated than in London. For example, the West Midlands RUS, found that well over half of all morning peak passengers arrive in Birmingham between 08.00 and 09.00, with consequential crowding on a limited number of trains. Likewise the SRA's Great Western RUS observed that overcrowding on services into Bristol, Bath and Cardiff is typically limited to one or two trains in the morning and evening peaks. Emerging analysis within the North West RUS shows a similar pattern of limited crowding on trains in Manchester.

Scotland

The needs of Scotland's rail passengers are particularly diverse and this is consistent with the different sectors discussed above. Passenger services range from those catering for millions of commuter journeys a year into Glasgow and Edinburgh to rural lifeline services which are characterised by considerable seasonal fluctuations in demand.

The populations of Scotland's two major cities, Glasgow and Edinburgh, have declined in recent years. The trend began in the 1960s and has continued as their economies have restructured from being manufacturing led to service based. Much of the population outflow has been to neighbouring regions and there has as a consequence been a steady increase in commuting by rail into the city centres. Rail passenger demand has increased significantly in the last few years reflecting increased employment, especially in Edinburgh and as a consequence of increasing road congestion.

Similar trends of urban depopulation and increasing numbers of commuter journeys have been in evidence in other regional centres in Scotland. Rail passenger journeys into regional centres have increased at lesser rates than into Glasgow and Edinburgh where rail offers services that compete more effectively with road. The population of Inverness has increased as businesses and government agencies have relocated there in recent years whilst the rural highland communities have depopulated.

Station capacity

On many of the busier routes, the capacity of terminal stations is also a constraint on the number of passengers that can be carried on the rail network. Most major London terminals are at or near passenger handling capacity at peak times. This relates to both the number of platforms available for trains and the ability of the station to cope with the high peak flows from the national rail network, predominantly on to the London Underground.

Of the major regional stations, Birmingham New Street has the most acute crowding problems. An estimated 120,000 passengers use the station each weekday compared with just 60,000 when the station was constructed in the 1960s, with the high volumes of interchanging passengers posing a particular challenge to the management of the station. Other stations that experience peak congestion problems include Liverpool Central and a number of the central Manchester stations including both Piccadilly and Victoria. In Scotland, the major stations in Edinburgh and Glasgow are becoming increasingly congested.

The pressure on pedestrian capacity at stations increases overall journey times for passengers, as concourses and other areas become more congested. At peak times of day, it can lead to temporary closures of certain areas, for example the entrances to the London Underground. The need to maintain adequate pedestrian space can also lead to the removal of retail outlets, a share of the profits from which are used to subsidise the operational railway.

Future passenger demand

We expect the same factors that have driven growth over the last 10 years to continue to drive growth in the future.

Economic / socio-demographic

Economic growth has been perhaps the single biggest driver of demand for transport in the past, and we expect this to continue. Increased employment drives growth in commuting; demand for business travel is dependent on economic prosperity; and leisure travel is linked to levels of disposable income.

In terms of rail demand, the distribution of economic activity and housing is also important. Public sector planning policy aims to ensure that, where reasonably practicable, new business, leisure and housing developments are well served by public transport, in recognition of the environmental, accessibility and other benefits that this brings.

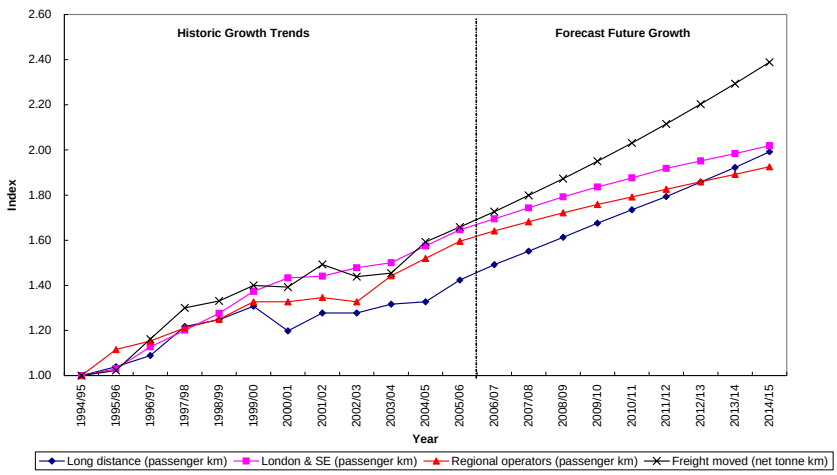
Competitive modes

Rail's main competitor for most journeys is the car. Between the 1950s and the 1980s, rail's competitive position against the car declined, as car ownership became more widespread and the costs of motoring (in real terms) fell.

Over the last 10 to 20 years, the decline in rail's competitive position has slowed and in some respects has been reversed. The increase in car ownership is inevitably slowing, as more and more people own cars already. The costs of motoring have stayed broadly constant, albeit with variations because of changes in fuel prices. And road congestion has become an increasingly significant factor contributing to growth in rail demand. We see these trends as likely to continue into the future.

In the longer term, the Government is looking at the possibility of road pricing. This could have significant effects on rail demand, although the effects would probably be mixed – higher rail demand in some areas but lower in others, depending on the net effect of road pricing on the cost of motoring in different areas and at different times of day.

Figure 6 Passenger and freight demand



Historic data source: ORR/SRA combination of National Rail Trends data

For longer distance journeys rail also competes with air. The expansion of low cost airlines over the last 10 years has clearly affected rail demand. For example, air currently takes approximately 85 per cent of the market for travel between the south east and central Scotland. However, the pressure on airport capacity in the south east will probably mean that until airport capacity increases, the scope for further growth in air traffic – at least at very cheap fares – is more limited than in the past.

In summary, although long term forecasts of specific demand drivers, such as fuel prices, are clearly subject to significant uncertainty, we believe that rail's competitive position is likely to improve in future. Rail has competitive strengths, such as energy efficiency and environmental impact, which society increasingly values, and we believe that in the long term these will put rail in a good position in relation to other modes of transport.

Unconstrained growth forecasts

We have used the framework in the Passenger Demand Forecasting Handbook (PDFH) to forecast unconstrained growth in passenger demand. The PDFH is produced by industry parties, managed by ATOC, and contains the industry's standard approach to demand forecasting. The PDFH framework uses growth in employment and in GDP as the key economic drivers of rail demand. It takes into account competitive factors such as car ownership, the cost of motoring and road congestion.

We have used HM Treasury forecasts of GDP, and forecasts of employment, car ownership and road congestion from the DfT TEMPRO 4.3 system. We have assumed that the costs of motoring remain broadly constant in real terms. We have assumed that there is no change in regulated fares policy (i.e. RPI plus one per cent). We have also included growth due to the projected improvements in rail punctuality.

The forecasts do not take account of any demand that may be generated by improvements to rail services. Neither do they take account of any step changes in demand that may be caused by changes in government policy, such as road pricing.

Our overall forecast is for growth in passenger-miles of around 30 per cent in 10 years.

On a sector basis we anticipate average growth as follows:

- for L&SE services, growth of around 25 to 30 per cent over 10 years. Within this overall figure, growth in peak travel will be around 20 per cent with off-peak travel growing by around 35 per cent;
- for long distance services, growth of close to 50 per cent; and
- for regional services, growth of 25 to 30 per cent, with strongest growth expected on inter-urban services.

The particularly strong growth in long distance services reflects the particularly high sensitivity to GDP growth, in the PDFH framework, of rail demand between London and the rest of the country outside the South East.

Forecasts of future demand are clearly subject to uncertainty. However, our forecasts appear to be broadly consistent with those from other sources, such as the 2004 Transport White Paper. There also appears to be a consensus that the demand for travel will continue to increase in the longer term, albeit possibly at a lower rate than in the next 10 years. We therefore do not believe that the uncertainty in demand forecasts undermines the strategies that the rail industry is developing, through processes such as the Route Utilisation Strategies. The problems, and their solutions, are likely to be similar whether growth is higher or lower than the central forecasts; what may be affected is how quickly the problems are encountered and the solutions are required.

Future freight demand

As part of the process of producing the Freight Route Utilisation Strategy (Freight RUS), predictions of unconstrained freight growth to 2014/15 were produced. This was done by the Rail Freight Operators Association (RFOA) and the Rail Freight Group (RFG) with the Freight Transport Association (FTA) in conjunction with Network Rail and other stakeholders. The RFOA used a bottom-up approach to forecasting, identifying changes to specific flows using market intelligence whereas the RFG/FTA predictions were generated by the GB Freight Model which forecasts changes to market size and rail share by commodity.

Despite the two very different approaches similar predictions of unconstrained demand for rail freight were generated. The table below sets out the core growth scenario adopted for the Freight RUS for each commodity compared to the base year (2004/05). The Freight RUS is also considering alternative growth scenarios for coal and intermodal traffic resulting in slightly different forecasts. We are also doing further work in this area in support of the business case for various enhancements to network capacity and capability.

Figure 7 Rail freight forecasts

Freight lifted (million tonnes)	2004/05	2014/15
Coal	46.0	52.9
Construction	19.7	23.6
Maritime containers	11.1	20.3
Metals	10.5	14.6
Chemicals & Petroleum	6.8	7.1
Channel Tunnel	2.0	6.0
Domestic intermodal / wagonload	0.9	2.5
Other	8.7	8.2
Total	**105.7**	**135.2**

Note: These forecasts may be subject to refinement during the course of the Freight RUS.

For all commodities, we anticipate that increasing congestion on roads and environmental issues will lead to rail being in an increasingly strong position to win market share from road hauliers.

Containerised imports to the UK and expansion of port facilities will continue to drive growth of containerised transport of maritime containers by rail. Domestic inter-modal traffic is anticipated to grow very strongly. This is partly due to planning policy which, we understand, encourages the development of rail linked warehousing.

A key assumption for forecasts of traffic volumes is that coal's place in the energy mix in the UK remains broadly similar to that today. Coal fired power station owners have invested heavily in flue gas de-sulphurisation equipment in order to reduce the emissions from their power stations. The level of this investment suggests to us that they anticipate supplying a considerable share of the UK's energy needs throughout CP4, and beyond.

We recognise that predicting future freight volumes is inherently difficult and subject to considerable uncertainty. However, we are content that these unconstrained industry predictions are reasonable given the underlying assumptions, which we also think are reasonable.

The Freight RUS is due for completion in 2007.

3. Managing our assets

Introduction

The effective and efficient implementation of our corporate strategy requires an asset infrastructure that meets our customers' and funders' requirements in terms of safety, capacity, capability, reliability and cost. Our asset management framework, and the investment planning process that underpins it, provides a structured approach to this challenge. This chapter:

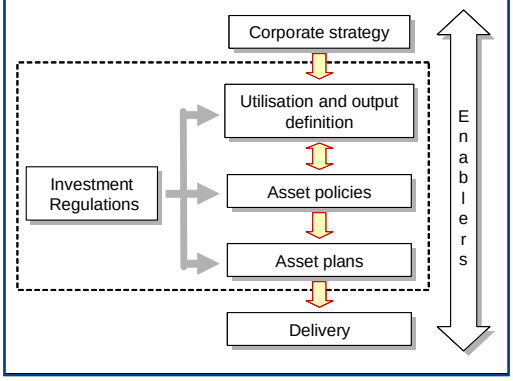
- sets out the key elements of our asset management framework;
- explains the application of this framework in the context of the development of asset policies which form the basis of our Initial Strategic Business Plan;
- details the extent to which we have rolled out a risk-based methodology for asset management;
- explains some technology and other issues that are generally applicable to all functional policies;
- provides a summary of the key elements of our functional policies and identifies those policy updates/enhancements that are planned and are likely to influence our October 2007 Strategic Business Plan; and
- explains the development and functionality of our Infrastructure Cost Model which is used to forecast activities and expenditure as a result of the application of our asset policies.

Detailed activity, expenditure and output forecasts as a result of the application of these policies can be found in Chapters 5 and 6.

Asset management framework

The diagram below identifies the key components of this framework. Our Initial Strategic Business Plan is based upon the application of this framework, as set out in our Business Planning Criteria.

Figure 8 Key elements of the asset management framework



Utilisation and output definition – this is the mechanism by which we establish our regulatory and contractual commitments at a route level. The route specification provides clarity on those aspects of the strategy for the route that are to be delivered and by when. Its purpose is to:

- provide a statement of the required outputs of the network at a route level in order to give clarity of required capability to those developing operating, maintenance and investment plans;
- provide clarity to customers, funders and other external stakeholders of the current and future capability expected on the network at a route level to allow them to plan their businesses; and
- provide clarity to customers and funders and other external stakeholders of what Network Rail is funded to deliver on the route.

Asset policies – describe the inspection, maintenance and renewal regimes necessary to deliver the defined route capacity and capability. An understanding of the feasibility and costs of delivering various output scenarios provides an important input into the development of the route specifications. In addition, major renewal plans arising as a consequence of the application of these policies often provide an opportunity to improve the route value by changes to existing capacity or capability. Consideration of such opportunities forms a major component of our asset management strategy.

Where changes to the existing capability of the network are required, we will need to have clarity on the availability of funding, recognising that our renewals plans are prepared on the basis of maintaining existing capability.

Asset plans – the results of the application of our asset policies are our forward expenditure and activity plans, covering operations, maintenance and renewal, and enhancement activities. These asset plans are summarised in our annual business plan, generally covering a 10-year planning horizon. A similar process is used to support the production of our periodic review submissions.

The Infrastructure Cost Model (ICM) is our strategic planning tool used in the production of long term forecasts. As we approach CP4 more specific work plans will be developed.

Investment regulations – effective investment decision-making, particularly where changes to capacity or capability are being considered, requires a robust, objective and transparent process for assessing the value delivered. Our investment regulations set out our appraisal methodology and identify the sources of data to support this analysis. These are described in our Business Planning Criteria.

Enablers – the successful operation of this framework requires access to information (on asset condition, unit cost of maintenance and renewal etc), decision support tools (including the ICM), training and competency assessment, and effective processes and procedures.

A series of initiatives is currently underway to improve the effectiveness of this framework, including updating our asset policies, further developments to the ICM and improving the availability of key asset information. In identifying areas for attention, we examined best practice within the company, in other businesses and the Institute of Asset Management's publicly available specification on good practice in asset management (BSI PAS 55).

Network Rail and ORR have appointed Asset Management Consulting Limited (AMCL) as the independent reporter for asset management. Key responsibilities for AMCL include an assessment of our plans and capabilities in the areas of asset management, decision support tools and asset information.

A high-level assessment of our asset management framework was completed by AMCL in March 2006. A more rigorous assessment is currently underway and is scheduled for completion by December 2006. This will include a detailed assessment of our asset policies and will provide:

- a clear view of our organisational strengths and weaknesses;
- the identification of internal areas of excellence;
- an identification of applicable external best practices; and
- guidance on activities to deliver improvements.

We will use the output of this work to refine our ongoing asset management improvement plans. Priority will be given to those actions that will improve the robustness of our October 2007 Strategic Business Plan.

In addition, we are discussing with LUL, Metronet and Tube Lines the development of a common assessment framework for asset management in the UK rail industry.

Asset policies

Asset policies provide the pivotal link between our strategy for meeting our stakeholder/statutory requirements and how we manage our asset base. These policies set out the inspection, maintenance and renewal regimes that will deliver the required network and route outputs for the funding available. Assets are designed, constructed, inspected, maintained and replaced in accordance with these policies and any subsequent guidance issued since the policies were last updated.

There are four key components to our asset policy framework:

- our asset management principles;
- functional asset policies;
- functional policy assumptions and justification; and
- standards and work instructions.

Asset management principles

Our Asset Management Policy statement sets out the framework and key principles against which our functional policies are developed and maintained. Issues addressed include:

- the overarching requirement for a safe, reliable and affordable railway;
- asset management costs – and the need for threes costs to be commensurate with the potential risks to business outputs;
- the requirement for clear economic and performance criteria for the major asset interventions that drive expenditure and deliver outputs;
- the delivery of capability and functional requirements as defined by the route or network specification;
- the application of whole railway, minimum whole life cost appraisal methodologies;
- the replacement of "find and fix" reactive maintenance with "predict and prevent" active management; and
- the requirement to maintain adequate asset related information for internal and external stakeholders.

Functional asset policies

For each asset group a functional asset policy is in place. These functional policies identify the individual asset types covered and set out how each of the policy statements identified in the asset management principles is being addressed. Route-specific modifications are made to our asset policies where this improves the alignment between asset management activities on the route and the delivery of the required outputs.

Policy assumptions and justifications

The policy justification documents provide the rationale for the inspection, maintenance and renewal regimes and how these regimes support effectively the implementation of the asset policies. They also indicate the longer term impact of the implementation of these polices (in terms of changes to route reliability, asset condition, future whole life costs etc).

Standards and work instructions

The asset policies provide the mechanism to determine the default position with regard to the actions that should be carried out, based on asset age, condition or performance etc. It is the application of the asset policies that drives the

development of the forward maintenance and renewal programmes (known as workbanks). As a consequence, we supplement our asset policy documents where appropriate with standards, specifications and work instructions. These provide more specific information for determining the appropriate action on individual assets following routine inspection or asset failure.

Development of asset policies

A risk-based methodology

The objectives of our asset policies are to deliver a safe and reliable railway through the proactive management of our assets and, where financial and other constraints allow, achieve this on a minimum whole railway whole life cost basis.

Previously, our asset policies have been concerned primarily with managing the safety risk and the overall condition of our assets, both at an individual asset and network level. With the exception of track, and to a lesser extent civils, a broader consideration of the consequence of asset degradation on the delivery of business outputs at a strategic route level has not figured heavily in our asset inspection, maintenance and renewal regimes.

Consistent with good practice in other organisations with a large asset base, our asset management regime is increasingly centred on a risk-based methodology. This methodology is used to identify those factors that may impede the delivery of our corporate objectives, and manage the associated risks by:

- an initial fit-for-purpose asset or system design;
- an inspection regime to monitor asset condition and identify actual or potential asset defects (primarily aimed at defects that occur at random intervals or asset degradation rates that are not readily predictable);
- reactive maintenance to address issues resulting from the inspection regime;
- planned maintenance to address predictable asset degradation and prevent premature asset failure; and
- renewal criteria that identify when the current asset or system should be replaced as the likelihood and consequence of failure is considered unacceptable or ongoing maintenance is considered to be uneconomic.

All whole life evaluations for maintenance and renewal work will include consideration of both the cost of the work and the possessions required to enable its implementation. This will help make sure that work is carried out efficiently while encouraging innovation in reducing possession times.

Where appropriate these design, inspection, maintenance and renewal regimes will be differentiated by route, reflecting the volume and nature of the traffic carried and the consequential risks to business outputs of service disruption as a result of asset degradation. The effective management of these risks will be achieved by the allocation of resources and the setting of priorities, and documented in our asset policies.

As a consequence of this we have developed a revised justification framework. This has been structured to ensure that risks are addressed consistently between asset groups and is based on:

- an understanding the required business outputs from the assets, where appropriate on a route specific basis;
- an understanding of asset degradation characteristics and failure modes and the consequential risk to these business outputs as a result of degradation/failure;
- an identification of an acceptable level of business output risk;
- the determination of the inspection and maintenance regime necessary to manage the asset to this level of risk;
- the identification of the criteria that should be applied when considering the renewal of an asset; and
- details of how we develop long-term activity and expenditure forecasts based upon the application of these policies, including how we model the asset in the ICM.

Route categories

To assist in the identification of appropriate asset management regimes we differentiate the network by route type, reflecting the volume and general nature of the traffic carried. This approach provides an effective means of identifying the differing reliability and performance requirements of, for example, high intensive routes carrying inter-city traffic from those with a more infrequent service. This allows for asset policies to be differentiated, where appropriate, by the type and nature of traffic carried and make certain that decisions on routes with similar usage characteristics are managed in a consistent manner across the network.

The length of track in each route category is shown in the table below.

Figure 9 Track km by route category

Route category	Track km
Primary	10294
London and South East commuter routes	4152
Secondary	10719
Rural	3848
Freight only	2092

Achieving optimum asset condition

As stated above, our inspection, maintenance and renewal regimes are targeted at achieving a balance between asset expenditure and the risks to business outputs as a result of asset failure. For most assets there is an optimum asset condition in terms of risk and asset management costs. Assets whose condition is below this level generally require higher costs to achieve the same level of risk management than an asset at the optimum condition level.

The UK rail network has not yet reached the point where the majority of the assets on the network are at this optimum condition, although maintenance and renewal activity levels in recent years have considerably improved the situation. Our current policies are aimed at achieving this optimum condition level for the rail network. Towards the end of CP4 and during CP5 the gradual improvements in network condition as a result of these policies will allow asset management activity levels (and hence expenditure) to reduce as the risks to business outputs reduce.

Progress to date

Considerable progress has been made in developing our suite of asset management documents, with functional asset policies in place for track, signalling, civils, telecoms and E&P assets. We have also produced the first version of our asset policy justification documents in the format described above. This has confirmed the current focus on the management of safety and asset portfolio risk within existing policies and the opportunities provided by this templated approach to:

- improve the alignment between business risk as a result of asset degradation and our asset inspection, maintenance and renewal regimes;
- identify further opportunities to improve the differentiation of asset policies by route type;
- provide more quantitative evidence to support our asset management activities where this is currently based on primarily qualitative evidence; and
- to improve our ability to assess the consistency of the approach to risk management across the asset groups, a necessary prerequisite to ensuring the appropriate allocation of financial and other resources to each asset group.

As a consequence of this work we are developing a programme of improvement initiatives for each asset group aimed at embedding this risk-based methodology. This work will be prioritised on the basis of asset expenditure and the potential impact on business outputs, with key actions scheduled for completion in time for the October 2007 Strategic Business Plan.

In August 2005 we published an update of our Asset Information Strategy and our plans for the delivery of a robust asset register by September 2007. A key deliverable of this programme is the provision by September 2006 of key asset information to support our October 2007 Strategic Business Plan. This programme remains on target and the ICM and associated support tools will be updated as asset information becomes available. This additional information will improve the robustness of this plan and may change activity and cost forecasts.

Standards

As discussed above, standards form an important part of our asset management framework, providing clarity on those actions necessary to deliver our asset policies. In our 2006 Business Plan we set out our plans to implement a new Company Standards programme that will enable standardised processes and specifications to be used managing projects. We intend to increase the business benefits realised from standardisation by moving to a more consensus based approach. The first stage of this will be a “proof of concept” exercise carried out over summer 2006 to test the feasibility of the proposed consultative group processes within Network Rail. If this exercise is successful we will adopt the consensus based approach for the development of future standards, and would aim to have the necessary processes in place by early 2007.

In addition, working with stakeholders throughout the industry we will be reviewing the way standards drive costs on community rail lines and whether there are any opportunities to reduce the subsequent costs. A number of options are being considered including:

- a risk-based review of existing standards to identify potential opportunities to change current inspection and maintenance frequencies; and
- use of lighter vehicles. As this will mean mixing heavy and light vehicles on the network, we will be undertaking work to understand how this approach can be managed and to understand the changed risk profile.

Technology and other issues

Our asset policies specify the design and future inspection and maintenance regimes for assets that will be installed during CP4. These assets will have a life expectancy varying from 10 to 15 years for most electronic components to in excess of 100 years for some structures. Although it can be relatively straightforward to amend a policy to take advantage of a change in technology or to reflect a change in legislation, such changes are very difficult to implement retrospectively and it can be many years before these changes are realised on a significant proportion of the infrastructure.

As a consequence, wherever possible we are seeking to ensure that we are informed about

future risks and opportunities and engaged in appropriate actions to "future proof" our assets and polices wherever feasible.

In general, we are dealing with the opportunities and threats that technological development offers by being involved with those who are experts in it. We are also liaising with world railways and are looking to collaborate with other European infrastructure managers, who face all of the same issues as us. In addition, we are developing a future vision for the railway which provides us with a better context against which these issues can be considered.

A number of issues we are addressing are outlined below.

Legislation

A detailed understanding of the implications of new legislation and, where appropriate, active participation in its development is important in the development of robust plans. We achieve this by a number of means, including:

- engagement with DEFRA in implementing the Environmental Noise Directive, monitoring of new legislation and areas of growing societal concern; and
- active participation in drafting Technical Specifications for Interoperability (TSIs), CEN/CENELEC/ETSI drafting and participation in management committees.

Obsolescence

Rapid technological change in the IT and communications fields creates a significant risk of system and component obsolescence. As a consequence of this risk Network Rail and the National Audit Office jointly commissioned Qinetiq to:

- assess our processes to identify their suitability for managing obsolescence at key points in design, procurement and maintenance;
- identify the extent to which obsolescence was considered at these critical points;
- examine and make a technical assessment of system elements to assess risks of future obsolescence of the elements analysed and the related costs of maintenance; and
- identify obsolescence risks to the systems, to the West Coast Mainline project as a whole and to Network Rail's renewals and maintenance budgets.

Qinetiq made a number of recommendations relating to their findings and we are developing plans to address the issues raised, including:

- the development an overarching obsolescence policy and strategy;
- the development of detailed obsolescence plans for projects and equipment; and
- the introduction of obsolescence requirements into supply and support contracts currently under review.

We are developing plans to address the issues raised.

In addition we are collaborating with other infrastructure managers to create a market for replacement parts at a European level, which should be sufficiently large to attract continued investment by suppliers.

New technology

In addition to important work within our business, our strategy includes participation with:

- Rail Research UK and other universities including representation on the directing body;
- UIC Forum on Research and Technology, UIC Infrastructure Forum, UIC Safety platform.
- EU funded projects with consortia of other infrastructure managers, suppliers, academia etc;
- European Rail Research Advisory Council (ERRAC) which is setting the rail research agenda for the EU.
- UIC International Rail Research Board sharing research knowledge with world railways including Japan, AAR, SNCF, DB

Rolling stock

We are members of all the System Interface Committees and are developing a growing understanding of the interaction between trains and Network Rail's infrastructure. We are considering developing an enabling policy relating to our involvement with the specification of rolling stock. This is intended to consider both Network Rail owned rolling stock and that operated by train operators. The latter is particularly important as for a number of years the lack of integration between rolling stock specification and acceptance and network management has led to a situation that has inflated both rolling stock and network management costs. In part this has resulted from an inadequate consideration of train and network interfaces, poorly understood acceptance processes and late changes being required to the infrastructure or retrofitting of trains.

Two key issues that will drive rolling stock design in the future are the expectation of reduced journey times and a requirement to become more energy efficient. On the surface these are conflicting requirements, but they are actually achievable if we can make trains lighter. Lighter trains can deliver improved acceleration and breaking, reducing journey times between stations and using less energy. There are four main ways of making trains lighter per seat:

- improved design, including a greater use of new materials (for example carbon fibre);

- extending the electrified system to remove the need for trains to carry around their own engines;
- removing tonnes of crash resistance from the train and transferring this to the infrastructure – modern train protection technology can control the train-train collision risk. In addition, the use of low cost modular bridges is likely to allow the cost effective removal of many level crossings; and
- reduce bogie and axle weight by improving track quality.

Skilled manpower resources

With the likelihood that there will be fewer, more expensive, skilled workers available to industry in the future, we have to design every part of our system for low maintenance while improving reliability and safety integrity. A central strategy for the last three years has been to move from "find and fix faults" maintenance to "predict and prevent" management. For this to happen, regular objective measurement of asset condition is essential which can only be achieved through automated systems. We cannot afford to use scarce, skilled people for these repetitive tasks. Hence the move into train-based technology and remote condition monitoring to measure the infrastructure, supported by centralised systems to diagnose trends and patterns. Gathering performance data intelligently from remote condition monitoring of our assets will provide early visibility of equipment degradation and performance issues to facilitate a more proactive approach to maintenance and fault rectification. We are continuing with the development of these plans. One example of this is our plan to equip our bridges and earthworks with automatic condition monitoring systems using a new generation of technology – our "intelligent infrastructure" initiative.

Climate change

The full impact of climate change and its possible effect on rail infrastructure is as yet uncertain, but without mitigation measures is likely to include;

- the adverse affect of higher wind speeds on OLE infrastructure;
- increased number of heat related TSRs (due to track or OLE issues);
- increased outage of electrical equipment due to more frequent lightning strikes;
- periods of intense rainfall interspersed with extended periods of drought causing drainage problems and potential major deterioration of embankment and cuttings; and
- higher sea levels and increased frequency and severity of storms causing damage to sea defences.

Our current asset policies do not allow for any major effects of climate change. We are in debate with government and other bodies to understand the potential scale of the problem and possible actions.

Track

The purpose of the track system is to convey the planned range and tonnage of traffic at the range of authorised speeds safely and reliably across the network.

The asset portfolio comprises the rail, sleepers, ballast and switches and crossings and the associated formation and drainage. Also featured are lineside and other track assets including the cesses, vegetation management and boundary measures.

Asset degradation

Track assets comprise a complex system and the deterioration of individual components has an adverse effect on the others. Degradation of the key track components is mainly due to the speed, volume and type of traffic that runs over it through two basic mechanisms: wear and fatigue. Additionally, environmental factors can dominate degradation, for example timber sleepers on low density routes may require renewal due to rot rather than as a result of mechanical wear.

The other major influence on degradation of track components is the quality and quantity of maintenance over the life of the asset. If the maintenance regime is inadequate (which could be as a result of inadequate traffic access, skills or resources) then the degradation rate will increase significantly and the serviceable life of the asset will be reduced accordingly.

The potential impact on business outputs of failed or degraded track assets includes:

- failure to maintain route capability, and consequently train service contractual commitments;
- failure to meet regulatory targets for asset condition (including the number of broken rails) and rail geometry;
- train service delays;
- increased risk of train derailment;
- increase cost of remedial work; and
- possible route closure.

Asset policy objectives

We manage these asset degradation risks by a comprehensive inspection, maintenance and renewal regime.

To ensure that the cost of implementing this policy is commensurate with the risks to business outputs of asset failure/degradation, our inspection, maintenance and renewal regimes for track assets are differentiated by the type and nature of traffic carried, with separate regimes in place for the following route categories (although these categories are clearly subject to further discussion with funders):

- primary and key L&SE (London approaches and other key corridors) routes;
- other L&SE and all secondary routes; and
- rural and freight-only routes.

Primary and key L&SE routes

Our policy for these routes is targeted at achieving the following outputs. This reflects the levels of safety required for high-speed operation and the reliability required to meet our business objectives. Targeted outputs are:

- no broken rails from detectable defects;
- no train delays as a result of track condition;
- no severe level 2 exceedences;
- level 2 exceedences will be less than 50 per cent of the network average;
- the frequency of track circuit and point failures caused by the track system will be less than 50 per cent of the network average;
- no flooding caused by defective track drainage;
- sight lines and cesses will not be obstructed by vegetation; and
- no trespass or livestock incursions through defective boundaries.

Other L&SE and all secondary routes

These routes are characterised by lower line speeds, a broader range of passenger revenue and train delay penalties than primary routes and generally a more limited demand for route capability enhancements. As the impact of asset failure on business outputs is less than for primary and key L&SE routes our inspection, maintenance and renewal regime for these routes allows a marginal decrease in asset performance, targeted at achieving:

- the incidence of broken rails will be less than the network target;
- the incidence of level 2 exceedences will be less than the network target;
- the frequency of track circuit and point failures caused by the track system will be less than the national target;
- no flooding caused by defective track drainage;
- sight lines and cesses will not be obstructed by vegetation; all signals and places of safety will be kept clear of woody vegetation; and
- no trespass and limited livestock incursions through defective boundaries. Lineside boundaries will be managed in line with the risk at each location.

Rural and freight only routes

These are typically lower speed routes (below 60 mph), lightly used, with low train service revenues and low train delay penalties, although freight services on some routes may have high axle weights. As asset degradation/failure on these routes generally does not have a significant impact on business outputs a less onerous inspection, maintenance and renewal regime is in place. This is reflected in the output targets for these routes:

- limited preventable broken rails;
- level 2 exceedences at one and a half times the network average;
- limited trespass and livestock incursions;
- limited short term obstruction of sight lines;
- limited train delays;
- track geometry 90 per cent at good or satisfactory;
- limited point failures; and
- limited flooding.

In addition, by a combination of renewals and targeted maintenance, we aim to limit the number of track condition related TSRs on other L&SE, secondary, rural and freight only routes to no more than 100 per annum.

Improving route value

Track renewals (often developed in conjunction with signalling renewals) can provide opportunities to improve the capacity and capability of a route for a relatively low incremental cost or to rationalise the network (where aspects of existing functionality are no longer required). Value improvement opportunities considered as part of asset renewal schemes include:

- plain lining track where there is no longer a requirement for a switches and crossings (S&C) unit;
- replacing an existing S&C unit with one with a higher turnout speed;
- revisions to track layout to improve operational flexibility or reduce maintenance costs;
- provision of diversionary routes to improve operational flexibility;
- improved lineside access to improve safety and reduce maintenance costs; and
- provision of track infrastructure capable of supporting additional tonnage or higher linespeeds.

Longer term impacts of policy

For primary and key L&SE routes our asset design and subsequent inspection and maintenance regime will deliver a more reliable railway, with fewer train delays as a result of asset degradation, and lower maintenance costs. In addition, as CEN60E2 grade 260 rail has a longer life than the existing rail in use on these routes, there will be less disruption as a consequence of future asset renewal. It should be noted, however, that it will be a number of years before this policy brings about a material change in outputs.

For other L&SE and secondary routes, reliability will gradually improve, primarily by a combination of our inspection and maintenance regimes. For rural and freight-only routes the use of CWR and fully-welded S&C as a replacement for existing jointed track and crossings will improve route reliability.

Policy development

There are a number of initiatives that are currently underway that target improving the management of our track asset portfolio. Our October 2007 Strategic Business Plan will provide an update on these initiatives with the activity and cost implications clearly defined.

Justification for existing inspection, maintenance and renewal regimes

Although track has the most developed business risk-based approach of all asset groups, much of the supporting evidence is of a qualitative rather than quantitative nature. This is based primarily on asset management experience over many years. However, as our knowledge of track degradation and its underlying causes improves, we believe there will be opportunities to refine the current inspection, maintenance and renewal regimes. We are examining the implications of varying inspection frequencies and intervention criteria, particularly for those track assets whose construction and condition meet the route norm.

Cyclical renewals

At present, we optimise the renewal of rail, sleeper and ballast in a semi-autonomous manner, renewing combinations of the assets only where renewal ages coincide (within an agreed tolerance). There are clear economies of scale that could be realised if all assets could be replaced at the same time and on a fixed cycle. These economies would be enhanced if this cyclical renewal programme could operate on a rolling programme on adjacent sites, renewing a route from end-to-end.

A key obstacle to the implementation of such a policy is the initial need to renew some assets prior to their end of their serviceable life, particularly where an end-to end approach is being considered. This may be more expensive in the short-term but could offer substantial whole life cost savings. The case for such a change will also improve as we become more efficient. Work is currently underway to assess the impact on the implementation of a cyclical policy on primary and key L&SE routes.

Other policy initiatives

Other initiatives under consideration include:

- the installation of absolute track geometry on primary routes;
- the handback to traffic at linespeed after track renewal on primary routes;
- optimising the balance between high output and conventional methods for the delivery of track renewals across the network; and
- increased recovery of serviceable rail and concrete sleepers from renewals to cascade for use in lower category lines.

Modular S&C

The existing practice of assembling an S&C unit in a depot, dismantling, shipping to site as parts and then re-assembling at site is relatively labour intensive and consumes additional preparatory track possessions. We are seeking to achieve a step change in the design, manufacture, installation and maintenance of S&C units and are exploring the potential benefits of developing modular units. Initial indications are that the use of modular S&C could reduce design and manufacturing costs and installation possession times.

Signalling

Signalling systems provide the main control and protection function for the railway. Within the railway system, the signalling system is primarily provided to ensure safe separation between trains and prevent conflicts. Signalling systems also facilitate control of the railway, enabling operators to implement the railway timetable and make regulation and routing decisions. Signalling systems also provide the fundamental interface to the driver in the form of signals, indicators and in-cab information.

The signalling system comprises several key elements to provide the functions required:

- control;
- interlocking;
- train detection;
- train protection;
- signals and indicators; and
- points operating equipment.

Asset degradation

Although there are a multitude of mechanisms which may affect the signalling system there are essentially two types of degradation associated with signalling assts:

- ageing due to chemical and electro-chemical effects e.g. degradation of interlocking and external wires and cables, silver migration affecting relays, rust affecting signal structures, location cases; and
- mechanical wear is associated with mechanical signalling systems and components, such as interlocking frame wear, point machine wear, relay usage wear.

In the worst cases, these mechanisms can lead to failures which can compromise the safety of the signalling system and therefore require careful management. Most failures however are detected and result in the signalling system reverting to a safe state. This results in delays to trains as alternative, degraded modes of operation have to be implemented.

Asset policy objectives

We manage these asset degradation risks by applying to each asset an appropriate inspection and maintenance regimes with the aim of providing the required level of service at minimum whole life cost. The regimes applied vary between the different types of asset.

Inspection and maintenance

Maintenance frequencies are specified in our standards, with the intervals intended to maintain the designed safety and reliability of the asset by detecting and correcting deficiencies to signalling infrastructure before there is deterioration or failure. The intervals have been derived from best practice over a wide range of operating uses and environment and are suitable for network-wide application. However, there are circumstances on the network where the specified intervals are not optimal, and where specific operating uses and environments can be identified a case may be made to propose a change to the intervals shown.

We have a comprehensive suite of maintenance standards for signalling (the Signalling Maintenance Specifications, or SMSs). These standards specify the tasks to be carried out in order to keep the equipment operable in a safe manner. The suite of SMSs is updated as new equipment comes into use on the network and maintenance processes are revised.

Renewal

All signalling assets have their condition assessed using our SICA (Signalling Infrastructure Condition Assessment) tool. SICA is used to give an indicative asset condition from which engineers can prioritise site visits, peer reviews, further assessments and prepare detailed work-banks. We have been implementing actions to ensure SICA remains a robust tool and to this end work has been done to ensure SICA users are able to produce consistent results and that training and guidance is adequate to make the tool fit for purpose. Although SICA gives an overall indicative life of an interlocking area, it is necessary to review individual SICA elements to determine if a particular part of the signalling system is driving the renewal date and whether life extension activities can provide a cost effective solution within the constraints of the delivery programme.

Improving route value

Signalling renewals (often developed in conjunction with track renewals) can provide opportunities to improve the capacity and capability of a route for a relatively low incremental cost or to rationalise the network (where aspects of existing functionality are no longer required). Value improvement opportunities considered as part of asset renewal schemes include:

- repositioning signals to reduce headways, resulting in an increase capacity;
- increasing capacity by replacing 2 and 3 aspect signalling with 3 or 4 aspect signalling;
- increasing operational flexibility by the introduction of bi-directional signalling
- plain lining reducing renewal and ongoing maintenance costs; and
- signal box rationalisation, reducing operating costs.

Longer term impacts of policy

These policies will maintain signalling outputs generally at current levels, particularly in terms of asset condition. There will be some improvements in safety and reliability, for example due to the gradual elimination of legacy wiring degradation issues and the use of LEDs in signals.

Policy development

We are continually looking at ways to improve our delivery of signalling capability. There are a number of particular initiatives in addition to our normal improvement processes that target improving the management of our signalling asset portfolio and some of these are highlighted below. Our October 2007 Strategic Business Plan will provide an update on these initiatives with the activity and cost implications clearly defined.

Justification for existing inspection, maintenance and renewal regimes

There are various initiatives and pilots (under the generic programme name ROSE – Reliability Centred Maintenance for Signalling Equipment) to make changes to both the frequency and specification of maintenance activities. The aim is to realise efficiency benefits from tailoring the inspection and maintenance of assets to the reliability and risks associated with the asset. Such efficiency measures have the additional benefit of ensuring that limited maintenance resources are utilised in the most efficient manner to optimise the safety and reliability of the railway.

We are also completing extensive pieces of work to examine the business case for whole system re-signalling as opposed to partial renewals and life extension options. This is being done in conjunction with production of a long term signalling renewals plan and overall strategy taking us in to CP4 and beyond.

ERTMS

A definitive policy on ERTMS is not available at this stage. The trial fitment on Cambrian lines is, however, continuing and it is expected that in the future a cab based signalling system will form a central core of our plans for economic signalling.

This policy will be informed by the business case analysis and technical investigations being carried out by the National ERTMS Project Team. The current business case analysis (as at December 2005) suggests that, while long-term benefits exist,

ERTMS based on current technology is unaffordable.

For the High Speed TENS routes, the default position is to retain the existing train protection arrangements. Individual route-based analysis for these lines is being carried out by the national ERTMS Project Team to determine if the current default position remains appropriate.

LED signals

The use of LED signals and indicators has significant financial and operational benefits and the policy of renewing life-expired signals with LEDs variants will be extended to cover all types of indication. We aim to extend the fitment of LEDs as a substitute to filament lamps to all signalling asset types including platform indicators, level crossing indicators and further fitment of main running signals. We are also looking at the business case for the replacement of oil lamps in semaphore areas by an LED replacement.

Bi-directional signalling

Bi-directional signalling allows train movements to be signalled in both directions over a single railway line. In a traditional implementation there are significant installation costs, which generally outweigh the likely benefits, although a case-by-case examination is usually required.

However, the cab signal implementation of bi-directional signalling utilising ERTMS offers the possibility of realising the benefits for a lower cost and further examination of this implementation is being considered.

Proceed on sight signals

A proceed on sight signal (PoSA) is a subsidiary signal that authorises a driver to pass a main signal held at danger, proceeding "on sight". The installation of PoSAs in selected locations around the country could offer a number of safety and performance benefits. We are considering their use as an addition to main signals for critical parts of the network.

Train detection

Having gained considerable experience in the implementation of axle counters on the network, we are currently appraising lessons learnt in order to inform the technical policy for train detection.

Level crossings

We are currently appraising various level crossing technologies with the aim of improving the safe operation of level crossings.

Civils

Civils assets consist of structures and operational property. The structures asset portfolio covers:

- bridges;
- earthworks;
- tunnels;
- sea defences;
- culverts; and
- retaining walls.

These are naturally long-life assets and generally date from the original construction, although intermittent maintenance may have improved or strengthened individual assets.

The operational property assets comprise a diverse range of building types, sizes and age profiles, many of which are subject to heritage constraints. Together these properties form five portfolios:

- lineside buildings;
- light maintenance depots (for rolling stock);
- franchised stations;
- managed stations; and
- maintenance depots

All operational properties are categorised according to their size, capacity and relative importance. The overall portfolio encompasses a wide variety of building fabric, building engineering services, plant, equipment, external works assets and mains utilities supplies. It includes active, redundant and mothballed property. Plant and equipment includes, for example, lifts, escalators and travellators, and train and building fuelling equipment.

Asset degradation

Environmental and other external factors have a significant impact on asset degradation.

For structures, degradation results from the impact of:

- traffic;
- rainfall;
- the freeze/thaw cycle;
- flooding, storm damage, scour and surface water run-off;
- corrosion of metallic structures and components; and
- perishing of mortar, loose brickwork, exfoliation of brickwork, masonry, concrete.

Each of these defects may lead to a loss of strength or integrity which requires action for restoration or prevention of further loss. Eventually action has to be taken to restore the safety factors of the structure, and this is done by either repairing the defect or:

- imposing speed restrictions;
- imposing weight restrictions; and
- in extreme cases, closing the line.

For operational property rain, vegetation and vandalism are key drivers for the degradation of

operational property. Additional drivers include user wear and tear and increased throughput.

Asset policy objectives

We manage these asset degradation risks by a comprehensive inspection, maintenance and renewal regime.

Inspection

All assets, with some minor exceptions in operational property, are subject to inspection and examination regimes, which produce reports that are used to determine what maintenance and renewal work is needed. The inspection and examination regimes vary (in frequency and content) by assets types to reflect the different degradation characteristics and failure implications. So, for example tunnels are inspected and examined in a different way to coastal and estuarine defences.

Maintenance

We manage the risk of asset degradation by applying to each asset one of three alternative policies, as follows:

- Policy A – return and maintain the asset to steady state by the use of maintenance activities that will improve performance levels and the remaining life of existing assets;
- Policy B – allow assets to deteriorate until repairs or renewal is essential to maintain operational requirements. At the time of intervention, carry out interventions that achieve lowest long-term costs; and
- Policy C – allow assets to deteriorate until intervention is essential to maintain safety standards or raise performance levels to an acceptable level.

We have applied these policies to achieve a balance between delivering current route capability and train performance, lowest whole life cost and the level of funding available. Policies have been applied to the different categories of route as shown in the table below.

Figure 10 Policy by route category

Route category	Policy
Primary	A
London and South East	B
Secondary	B
Rural	C
Freight only	C

In practice, policies are refined for individual structures using minimum whole life principles to ensure that work is carried out only where there is a measurable benefit in doing so.

For operational property the policies are selected according to the class of operational property not the route category as shown in the table below.

Figure 11 Policy by property type

Property type	Policy
Managed station	A
Franchised station	A
Light maintenance depot	A
Lineside building	C
Maintenance delivery unit / NDS depot building	A

Renewal

Assets are replaced where the policy applicable to the asset required it and it is cheaper, in whole life cost terms, than the maintenance needed to continue to meet the requirements of the route. The complete renewal of structures is considered as a last resort in most instances, with maintenance generally being the most cost-effective approach.

Improving route value

Major refurbishment (and the very infrequent replacement) of civils' assets can provide opportunities to improve the capacity and capability of a route for a relatively low incremental cost or to rationalise the network (where aspects of existing functionality are no longer required). Value improvement opportunities considered as part of asset renewal schemes include:

- strengthening of underbridges to increase axle loading capability and linespeed;
- lengthening platforms to accommodate longer trains or addressing stepping distance issues as part of a platform renewal programme; and
- the removal of redundant lineside or station buildings.

Longer term impacts of policy

The intention of this policy is to provide an overall asset condition across the network that remains constant over time. This continues our strategy of addressing the gradual degradation in the condition of civils' assets that has existed for many years, partly as a result of natural deterioration and partly due to under-investment. Improved prioritisation techniques have enabled us to make significant reductions in civils related TSRs. As remedial work is completed on the high priority structures we will be able to address issues on a line of route basis. This should deliver construction efficiencies and enable capability issues to be addressed along a whole route section.

However, as funding assumptions constrains our ability to operate policy A across the whole of the civils assets portfolio, the volume of work carried out will not maintain this condition level at lowest whole life cost. The operation of policies B and C

also limits our ability to address any visual degradation of bridges and other structures.

Our ability to deliver this policy may also be impeded by the availability of materials and labour, particularly during the construction period for London 2012.

Policy development

There are a number of initiatives that are currently underway that target improving the management of our civils asset portfolio. Our October 2007 Strategic Business Plan will provide an update on these initiatives with the activity and cost implications clearly defined.

Justification for existing inspection, maintenance and renewal regimes

At present the focus of our policies for civils assets is on managing safety risk and the overall condition of the asset portfolio. We believe there are opportunities to develop further our current differentiated approach, along similar lines to that adopted by track. As a consequence we are developing a policy planning tool which will allow the policies applied to individual assets to take into account the category of route they are on (e.g. primary, L&SE). This tool will also enable us to understand the actions required, and cost implications, of achieving additional reductions in TSRs. This tool is scheduled for completion in early 2007.

As part of this initiative we will be examining the costs and benefits of applying policy A to lineside buildings that are considered critical to the operation of the network (e.g. IECC buildings).

Introduction of risk-based examination frequencies

Our current fixed-frequency examination regime does not take full cognisance of the varying degradation characteristics of the assets within our portfolio. For example, metallic structures are more prone to deterioration than others and may need the shortest examination interval, whereas brick and masonry structures deteriorate more slowly and would not need the same frequency. In addition, for many structures, particularly brick and masonry, the six-yearly detailed inspection provides little additional value to that gained during the annual visual examination.

The introduction of more risk-based examination regimes will enable us to implement an asset specific regime based on the individual asset's deterioration characteristics.

Developing a station strategy

We are developing our strategy for maintaining, renewing and developing our stations. The objectives of the strategy reflect our role as landlord for all stations and manager for the managed stations. In taking this forward we will need to work closely with all our industry partners, particularly train operators who operate the majority of these stations. Our objectives are:

- to lead the industry as it seeks to develop its stations, in terms of what they do and what they look like;
- to create a standardised design specification for stations which is passenger focussed, addressing capacity issues and the key requirements of security, information provision, ease of access and the appropriate provision of services, from retail to parking;
- to implement station design solutions which are operationally flexible, delivering efficiencies whilst meeting a quality standard that can excite stakeholders;
- to grasp commercial opportunities where they exist, optimising the commercial value of our stations footprint while also minimising operational and maintenance costs. These proposals must meet value for money and affordability constraints; and
- to be aware of our wider role in the community, delivering solutions which are sustainable, environmentally friendly and community-based.

Modular station design

A cornerstone of the strategy to deliver these objectives is the development of a modular approach to station design. In developing our proposals we are working with train operators, ATOC, Passenger Focus, DfT and Transport Scotland. We have developed a new categorisation of stations into four types based on the nature of the traffic as well as the demand at each station. We believe this provides more relevant specifications that are more easily applied. The four categories are:

- Type 1 (30 stations): industry flagship stations providing a world class passenger experience. Bespoke designs to meet local requirements but utilising a standard template for facilities, customer information, ticket issue, signage and way finding;
- Type 2 (75 stations): high quality, energy efficient design with efficient passenger management. Bespoke design following a standard pattern of spatial relationships, utilising corporate signage and way finding, customer information systems, standard furniture and fittings. Standard canopy, car park and footbridge designs;
- Type 3 (around 1,200 stations): programme of station rationalisation around a standard pattern of proven station building layouts and modular design of elements including a standard range of building finishes, standardisation of canopies and footbridges, corporate way finding and standard customer information systems, furniture and fittings, and platform construction and finishes; and
- Type 4 (around 1200 stations): transformation of all small stations to a standard modular format with modular components, a pattern book

catalogue of elements providing a safe, maintainable and cost effective design for the small station.

It is expected that the above approach will deliver cost savings from:

- co-ordination of work banks at stations, addressing all the issues at the same time;
- high quality station design procured at efficient prices through standardisation of components which will reduce design costs and project complexity and timescales; and
- removal of old, maintenance-intensive buildings.

The next steps in taking these proposals forward involves gaining industry acceptance and agreement to the proposals, finalisation of the modular design proposals and development of pilot schemes. Once proven, we will discuss how best to implement these proposals with customers and funders and we will need to address issues around the station code, funding and resources and co-ordination with the re-franchising process.

Technology issues

Technology change associated with civils' assets is characterised by relatively small, incremental, advancements (for example the use of soil nailing and reinforced earth structures), with step changes in technology only occurring infrequently. Advanced composites (also known as fibre reinforced polymer - FRP) provide the potential for such a change and we will continue to investigate their use, to reduce the cost of strengthening bridges and to provide replacement bridges at lower cost. Examples exist of both strengthening and renewal in highway (overbridges) and footbridges, and the technology will be exploited where appropriate. Opportunities to exploit these materials in underbridges will be sought, particularly where they may bring whole life cost benefits by reducing future maintenance costs.

Telecoms

There are four major components to our telecoms network:

- bearer network;
- radio networks;
- fixed lineside systems; and
- retail systems.

The bearer network comprises transmission systems, optical fibre cables, main copper cables and cable route. It provides circuits and services for signalling and electrification control systems, train radio systems, lineside communications, level crossing CCTV and customer information systems.

We operate four radio networks (three analogue and one digital) comprising base stations, antenna systems and control equipment. A new digital radio network based on GSM mobile telephony technology (GSM-R) is currently being rolled out and during CP4 the three analogue systems will be decommissioned.

Fixed lineside systems include:

- telephone concentrator systems and telephones located on the lineside and at signal posts to allow train drivers to contact signallers;
- telephone links from level crossings;
- CCTV systems for Driver Only Operation trains; and
- voice recordings for recording safety critical communications.

Retail systems consist of customer information systems, public address systems and clocks provided on station platforms and concourse areas as well as CCTV systems provided to monitor public safety and capture video images for security purposes.

Asset degradation

Telecoms assets are generally very reliable. However, they do degrade as a result of:

- mechanical damage;
- ageing and routine use;
- the result of third party intervention, including vandalism;
- exposure to dust and dirt and other environmental factors; and
- corrosion and oxidation.

The degradation or failure of Telecom assets has the following potential impacts on safety and performance:

- failure of cable and transmission systems carrying signalling circuits could lead to signalling problems over a wide area and potentially severe train delays;
- failure of level crossing telephone systems increase the risk to the public and can cause train delays;
- failure of Driver Only Operation (DOO) CCTV systems could increase the risk to passenger safety and cause operational difficulties for train operating companies;
- failure of voice recorders in signal boxes and electrical control rooms would prevent the recovery of communications, crucial to incident or accident inquiries;
- failure of customer information systems will be disruptive to the public and could incur penalty payments; and
- failure of radio systems may lead to speed restrictions.

Asset policy objectives

We manage the risk of failure and subsequent loss of system functionality by both designing our telecoms networks to reduce the impact of isolated

failures (e.g. diverse routing) and by having inspection and maintenance regimes that are designed to keep the assets in working order at lowest whole life cost. Depending on the asset being maintained we monitor its condition by carrying out physical on-site inspections, monitoring its performance remotely or a mixture of both. Some assets are subject to regular maintenance, while for others there are degradation modes that cannot be prevented by maintenance and a more reactive regime applies.

In addition, most assets are allocated a nominal life. A more thorough inspection and reliability review is carried out two years before this age is reached to establish actual asset condition and identify an asset specific renewal date.

Assets are replaced when one or more of the following criteria are reached:

- unacceptable safety/operational risk associated with the continued operation of the asset;
- systems become obsolete or are deemed unsupportable by the manufacturer;
- maintenance costs have become excessive compared to life cycle costs of renewal; and
- third-party support costs increase above an acceptable level.

Commercial, off-the-shelf-equipment is installed wherever possible. However, due to certain functional and ergonomic requirements there remains a limited requirement for bespoke equipment.

Improving route value

The renewal of Telecom assets provides a more limited opportunity to improve overall route value than, say, the renewal of track or signalling assets. However, where retail systems are life-expired and require replacing, enhancements to the facilities currently provided are considered (in terms of improved customer information or surveillance CCTV systems) as they can often be delivered for a relatively small incremental cost. The introduction of GSM-R may provide the opportunity to work DOO (P).

Longer term impacts of policy

These policies will maintain telecom outputs at current levels, in terms of safety and overall asset condition. The introduction of the GSM-R should provide a more robust platform that is less prone to failure.

However, the speed of development of new equipment, in particular, PC based equipment is likely to lead to shorter renewal cycles in the future. This is not factored into this Initial Strategic Business Plan; planned renewal dates are based on current asset lives.

The demand for skilled telecoms labour for the British Telecom 21st Century Network programme and telecoms work associated with enhancement schemes such as London 2012 and Crossrail may reduce the number of skilled telecoms workers available for our work and lead to an increase in costs. This may impact on our ability to implement fully all aspects of Telecom asset management policy.

Policy development

There are a number of initiatives that are currently underway that target improving the management of our Telecom asset portfolio. Our October 2007 Strategic Business Plan will provide an update on these initiatives with the activity and cost implications clearly defined.

Justification for existing inspection, maintenance and renewal regimes

As our current renewal assessment methodology is based primarily on engineering judgment it does not provide us with a consistent approach to asset renewal decisions between asset types, schemes or routes. A Decision Support Tool (DST) for Telecom assets has been developed to provide a consistent approach to rectify this position.

The DST will use a series of asset specific assessment questions e.g. business risks associated with asset degradation, asset and environmental conditions, and maintainability. This information will then be used to support the renewals planning process thus enabling consistent decisions to be made on asset renewals across the network. The functionality of the DST is currently being validated and will be completed by mid 2006.

Retail assets

We are currently responsible for the renewal of the majority of retail assets (customer information systems, clocks and long line public address systems) at franchised stations. Maintenance responsibility rests, primarily, with the station facility owners. Under the proposed changes to the Station Access Conditions, the renewal responsibility would transfer to the station facility owners. However, another option currently under consideration is for Network Rail to take on the responsibility for renewal and maintenance of these and TOC owned retail assets. Further discussions are due to take place with operators on a bilateral basis to determine the appropriate solution.

Convergence

At present there is considerable consolidation and realignment taking place amongst both telecoms equipment suppliers and operators. The dominant global trend within telecommunications is for the migration of traditional separate data and voice telecommunications networks towards a single converged platform.

Convergence is an end-to-end service environment where all networking applications e.g. voice, data, video and rich media are managed on a single internet protocol (IP) based infrastructure. As a major owner and user of telecommunications infrastructure, we have the opportunity to realise significant operational, business and financial gains by deploying our own IP based network, including:

- the use of commercially available equipment, more powerful and less expensive than that in use today and that allows economies of scale;
- improved access to real time data, facilitating the development of initiatives such as intelligent infrastructure, remote condition monitoring and the national SCADA project;
- deployment of voice over IP (VoIP), providing a more flexible system; and
- allowing for a reduction in payments to third party suppliers of communications networks.

Our service providers are moving to full convergence using IP based service provision during the next control period – BT is well underway with its initiative in this area. Existing Time Division Multiplex (TDM) based equipment which we currently deploy will therefore become obsolete.

Deployment of a national IP based network will require the new FTN infrastructure to be enhanced as a key enabler for this initiative. Work has just commenced to engage with stakeholders to understand the potential benefits of convergence to the business. A convergence strategy and business case is being developed.

Remote Condition Monitoring

We will define standards and maintenance policies associated with gathering equipment for integration into our IP based network in support of our strategy for intelligent infrastructure monitoring (the next stage of remote condition monitoring). The requirements have not yet been defined and timescales have not yet been determined.

Line side Communication

GSM-R will provide secure voice and data communications over the whole infrastructure. On high speed Trans European Network Services routes, GSM-R will also be necessary to support ERTMS should the proposal be adopted. The second element of the programme is the installation of a new national Fixed Telecom Network (FTN) to replace the existing life-expired cable and transmission network to support GSM-R and our operational and business telecoms needs.

GSM-R will prove the technology and provide replacements for existing operational hand portable telephones. This initiative may negate the need for SPTs and some other telephones provided at the line side, although the project itself will not provide replacement portable telephones for all track workers. A study is underway to review the requirements for line side communications with the advent of GSM-R. On completion of this study in 2007 we will have produced an assessment of the feasibility of GSM-R as a realistic alternative to line side phones, have firmed up on a single option and developed an implementation plan. If the decision is taken to reduce the number of line side phones, this will require considerable stakeholder review within the railway community.

Electrification and plant

The mechanical and electrical assets within the E&P portfolio include:

- OLE equipment including structures, wiring and registration;
- conductor rail;
- distribution equipment including HV switchgear, HV cables, transformers, rectifiers and DC switchgear;
- Grid Supply Points: connections to dedicated Public Electricity Supplier (PES) and National Grid Company (NGC) supply points;
- Supervisory Control and Data Acquisition (SCADA) systems: to control and monitor the status of the electrification equipment;
- signalling power supplies;
- point heaters;
- non-traction high voltage distribution systems; and
- major plant installations (e.g. moving bridges or pumping installations).

Asset degradation

The failure modes of electrification and plant assets vary according to the type of asset. However, there are some failure modes that are common to most electrification and plant assets:

- mechanical failure as a result of wear of moving components;
- mechanical failure as a result of corrosion;
- failure of the electrical insulation caused as a result of degradation;
- damage due to severe weather conditions such as wind and gales, ice accretion etc; and
- failures as a result of poor quality of design and construction.

Failures of electrification and plant assets can result in:

- loss of control of signalling and points systems, leading to delay and cancellation of all types of trains;
- loss of points heating, leading to delay and cancellation of trains; and
- loss of ancillary systems such as customer information systems and surveillance CCTV.

Asset policy objectives

We manage these asset degradation risks by applying an appropriate inspection and maintenance regime to each asset with the aim of providing the required level of service at minimum whole life cost. The regimes applied vary between the different types of asset, but they generally include:

- inspection activities;
  - non-intrusive inspection/test;
  - high level intrusive inspection;
  - dynamic recording using on train instrumentation;
- scheduled maintenance tasks on discrete items; and
- prioritisation and removal of defects.

Where it is cost effective to do so, these risks are mitigated by providing a degree of redundancy in the system design, which allows services to be maintained even with the failure of one component. However, if this situation is allowed to exist for an extended period it can put a greater load on adjacent units accelerating their degradation.

Where renewal of any asset is necessary this is selected on the basis of the least whole life cost solution that will meet the performance requirements for the relevant route.

Improving route value

The renewal of E&P assets can also provide opportunities to improve the reliability, capacity and capability of a route or to rationalise the network (where aspects of existing functionality are no longer required) for a relatively low incremental cost. Value improvement opportunities considered as part of asset renewal schemes include:

- rationalisation/reconfiguration of OLE layouts (tension lengths, sectioning and switching) to improve reliability and maintainability. OLE system renewal also provides opportunities to support additional train services, changes in rolling stock, or higher linespeeds;
- reconfiguration of signalling power supplies to provide increased performance and reliability as part of a route based signalling scheme (alternative in-feeds, auto changeover, increased rating of supplies etc); and
- the installation of remote monitoring of performance-critical assets (transformers, cables and power systems) to improve knowledge of asset condition, serviceability and degradation for key routes.

Longer term impacts of policy

These policies will maintain E&P outputs at current levels, in terms of safety and overall asset condition. Some system reliability improvements will be delivered by the introduction of newer more reliable technologies, for example in transformer design.

Policy development

There are a number of initiatives that are currently underway that target improving the management of our E&P asset portfolio. Our October 2007 Strategic Business Plan will provide an update on these initiatives with the activity and cost implications clearly defined.

Justification for existing inspection, maintenance and renewal regimes

With the exception of the OLE system, the E&P asset management policy is not currently differentiated by the type of traffic carried on the route. We will be examining opportunities to do so.

In addition we have commenced an initiative to review the asset condition (or other) criteria that trigger renewal decisions for a significant proportion of the E&P asset portfolio.

Regenerative braking

Our Initial Strategic Business Plan includes OM&R provision in CP4 to make the AC electrification infrastructure “regeneration” capable (as part of the national oil-filled switchgear replacement project and other stand alone relay replacement projects). We are also working on some shorter term initiatives.

We are assessing the cost and benefits of making the DC system “regeneration” capable. The output of this analysis will be documented in our October 2007 Strategic Business Plan.

Traction power supply

At present a lack of clarity on the capability and capacity of the traction power supply system on a route by route basis limits our understanding of the strategic opportunities or constraints and our ability to respond to customer requests. We have recently launched an initiative aimed at providing a capability statement for the network, disaggregated by strategic route. This is intended to provide a list of possible traction supply enhancement schemes, identifying capacity and capability delivered.

Central master station

Due to equipment obsolescence we are planning to replace our electrification control system. At present the system is operated from 14 control rooms, each having different control capabilities, utilising different technology and subject to different operating instructions. Our strategy is to migrate to a common system architecture, with standard control capability and operating instructions. Potential benefits include:

- more rapid isolation (and subsequent return to operation) of the network;
- reduced switching errors; and
- improved asset information.

We are currently assessing any additional operational flexibility that this strategy may support.

The infrastructure cost model

Scope and functionality

Our development of a new Infrastructure Cost Model (ICM) is a key enabler in supporting our asset management framework and improving our strategic planning capability. The model serves a number of purposes in improving the efficiency of our asset management:

- to provide a focus and an impetus for improved understanding of cost drivers, and to act as a vehicle where cost relationships can be quantified;
- to provide a single definitive source of information that supports more effective asset management decision-making and long term forecasting;
- to support the development of effective route planning capability and associated route specifications;
- to promote more informed decision making around the timing and prioritisation of activity between routes; and
- to provide challenge to and context for the territory led short term work banks included in the business plan.

In addition to informing our business planning processes, the model will be used to assist Government and other funders in making efficient decisions on the level of funding and rail outputs by demonstrating the cost implications of decisions on service levels. It will also play a key role in enabling ORR to examine the cost and funding implications of alternative rail output scenarios for the Government and other funders at periodic reviews.

The ICM is designed to estimate the costs of operating, maintaining and renewing the network for different specifications of usage and capability. It produces forecasts of activities, expenditure and network output measures over the long-term (up to 40 years), and can disaggregate these forecasts to segments of the network.

Key inputs to the model include detailed asset information (location, type, age etc mapped to a common definition of the network) current and forecast levels of traffic, unit costs of key activities and assumptions about trends in input prices and efficiency. The model predicts the level of maintenance and renewal activity associated with applying our asset policies, using inputs including estimated asset service lives, activity frequencies and expected failure rates.

Version 1 of the ICM is now complete and has been used to produce and/or consolidate the activity and expenditure forecasts contained in this plan. The completion of the model has delivered a step change in our business planning process through:

- the integration of existing forecasting models into a single system, ensuring consistency of assumptions and increasing the speed and flexibility of scenario testing;
- the increase in transparency of costs and the underlying assumptions, and the flexibility to change critical inputs such as unit rates and asset lives; and
- the much more detailed geographic disaggregation of the network, using the segmentation of our 26 strategic routes into around 300 strategic route segments.

An independent review of the model is currently being carried out by AMCL. The objectives of this review are to identify any errors or inconsistencies in the current working of the model, and to make recommendations for improvements to the modelling process in future, drawing on best practice from other asset management organisations.

The development of the ICM is a long-term activity and the completion of version 1 is only the first step. We are developing a plan for further refinement of the model, with the production of version 2 targeted for the end of 2006 and further developments to be completed to support our October 2007 Strategic Business Plan. This plan will take account of our experience in developing and using version 1 of the model, improvements in asset information, feedback from the AMCL review and the views of stakeholders.

While the ICM has been reviewed and calibrated at network level, we have not yet completed a detailed review of results at lower levels of disaggregation, e.g. by route classification, area or for specific route segments. We anticipate that this more detailed analysis of the outputs, together with extensive testing of alternative scenarios and sensitivities, will highlight aspects of the model that could be refined.

We will be working closely with ORR to develop the functionality to support the development of the structure of access charges, ensuring alignment with the principles of the charging regime. For example, this could involve the application of avoidable costs principles and/or cost allocation rules to underpin the allocation of fixed track charges, refinement of the capability to estimate usage costs and the translation of forecast costs into charges in line with agreed principles.

The precise scope and timing of improvements to the ICM will be influenced by the business priorities and the industry priorities for PR2008 but is likely to include:

- development of functionality to support the calculation and allocation of access charges;
- more accurate modelling of the interaction between maintenance and renewal activities;
- improvements in the modelling of relationships between activity and network outputs;
- incorporation of developments in the understanding of cost causation and improvements in availability of asset condition data;
- more detailed modelling of activity costs, e.g. addressing resource input requirements and regional variations in cost rates; and
- capability to incorporate enhancement cost estimates in a more integrated way.

Unit costs

Where possible the ICM estimates costs "bottom-up" by identifying activity volumes and multiplying by defined unit costs using the best available unit cost data. At present the availability of robust unit cost data is limited.

For renewals, the establishment of a uniform Cost Analysis Framework (CAF) will lead to progressive improvements in the quality of unit cost data for the model.

The first key step in developing a robust framework has been definition of the units of volume. This is not straightforward because of the wide range of activities applied to a diverse set of assets. One of the key reasons for the current lack of robust unit cost data has been the difficulty in establishing consistent definitions and associated reporting processes in the past.

In each asset area the CAF aims to identify the major repeatable work activities for which meaningful volumes can be defined and which will account for the majority of asset expenditure. Unit costs can then be generated and reported for all these repeatable work types. The overall coverage of unit cost reporting will be extended progressively to cover around 80 per cent of asset renewal expenditure. However, some activities which are low volume or not expected to be repeated on a regular basis, together with some low value minor works activities, will not be subject to unit cost reporting.

The analysis of unit costs is most advanced for track, civils and signalling assets and we will build upon existing analysis in these areas.

For track, the biggest single spend area, benchmarks have been produced based on 2003/04 data and unit costs are being reported for the 16 activity mixes of plain line track renewals and 5 activity mixes for S&C. We also calculate a "composite unit rate" per plain line track mile, derived by dividing total expenditure by the unweighted sum of rail, sleepers and ballast renewed.

For assets where the CAF is not advanced to a stage where robust unit cost data is being produced, we have derived unit rates from analysis of actual costs of recent projects, tendered rates for current projects and professional judgement.

For maintenance, unit costs are being collected for key track and signalling activities identified from an analysis of the most significant areas of infrastructure maintenance expenditure. Activity types from other work categories such as electrification and plant and off track will be added to the maintenance unit cost framework at a later stage. However, costing of maintenance activity in this plan remains primarily resource-based with existing business unit budget data being used to calibrate maintenance cost forecasts.

For both maintenance and renewals unit costs, the expectation is one of continuous improvement through time rather than on a focus on particular milestones.

As the CAF framework is rolled out progressively across the business, the use of unit costs will also become the primary mechanism for efficiency measurement for renewals activity.

Business planning

As the periodic review progresses, our detailed activity plans will start to extend into CP4. These plans will be used to sense check the assumptions in the ICM. We are currently developing our bottom-up planning processes and systems which will help improve the quality of information underpinning these bottom-up plans. We have recently introduced a new planning tool, Oracle Financial Analyser (OFA), into the Operations and Customer Services (O&CS) and Maintenance functions. OFA will enable us to produce more transparent, detailed analysis of our expenditure maintenance and operating costs. This should enable us to improve the robustness of our 2007 Business Plan. We are currently extending the use of OFA for maintenance and operating costs to all other functions. We are also in the early stages of introducing new systems for renewals and enhancements, although these will not have been introduced until the second half of 2007 at the earliest.

Supporting documents

We are providing the following supporting documents to ORR:

- the asset management policy statement together with the asset policies and justifications for track, signalling, civils, telecoms, and electrification and plant;
- the functional specification for the ICM; and
- AMCL's ICM audit report.

We are also providing a copy of the ICM.

4. Efficiencies and input prices

Introduction

ORR's Initial Assessment challenged Network Rail to "develop its own view of its efficiency and the scope for further improvements". This section demonstrates how we are rising to that challenge. In the last three years we have delivered a major change in the way the network infrastructure is run and managed. Since Network Rail took over the network there has been a strong focus on challenging costs and driving efficiency through the business. As an organisation we now have processes in place which allow us to challenge the levels of expenditure we make and only incur the expenditure where it is warranted. We recognise that we have further to go. However, this self challenging behaviour allows us to take the lead in demonstrating a robust justified view of the level of savings that are achievable through CP4. This view will be supported by independent expert opinion where appropriate and will be subject to review by ORR.

The sections in this chapter explain:

- the context in which we are developing our efficiency plans as part of a world class transformation programme;
- an assessment of the expected outturn of our CP3 efficiencies;
- a brief description of progress on the workstreams which have been completed and those areas in which work is underway but has not yet been completed;
- how we anticipate that we will use this work to help form a view on the efficiencies that we will be able to make in CP4; and
- an explanation of the initial reference assumptions for efficiency improvement and input price inflation which we are using in developing our initial CP4 expenditure forecasts. This view will be refined through subsequent plans.

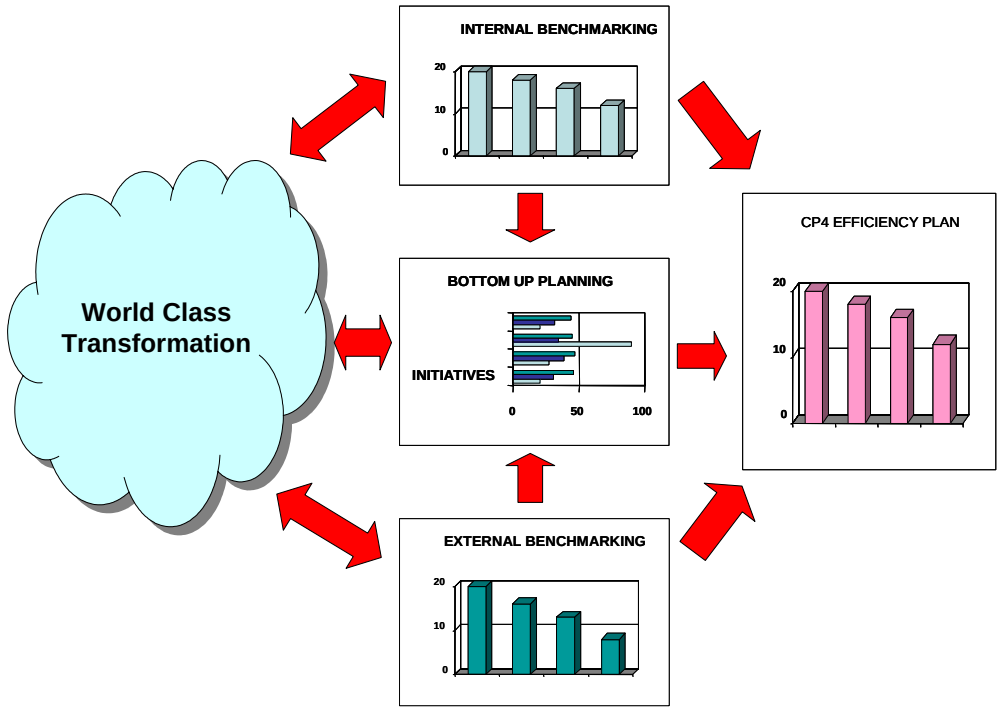
World class

In developing our efficiency plans, there are several closely related areas of work and many of our initiatives feed into each of these areas:

- internal and external benchmarking of our processes, expenditure and outputs to inform each of the following;
- identification and delivery of efficiencies and other improved opportunities which will allow us to meet or beat our existing short term targets;
- understanding of the potential for further improvements to inform our view of what can be achieved in CP4 , and to provide robust justification for these projections; and
- the development of a world class transformation programme to identify and deliver the organisation and other changes that we require to achieve progress in the two areas described above and for the longer term.

The relationship between these workstreams is illustrated in the figure below.

Figure 12 Framework for efficiency planning



In subsequent submissions for PR2008, the balance of work in these areas will shift from the current emphasis on work underway and expectations for delivery in CP3 to a robust view and justification of the level of efficiencies we can achieve in CP4.

Across the network there has been a significant increase in the volume of traffic since 2001. Between 2000/01 and the third quarter of 2005/06 total passenger kms increased by nearly 12 per cent to 11 billion and the volume of freight moved increased by over 19 per cent to nearly 5.6 billion net tonne kms. Network Rail was challenged through ACR2003 to deliver efficiencies of around 30 per cent. We have made good progress so far towards achieving this stretching target, while both accommodating this significant level of growth, and delivering both a considerable reduction in delay minutes and an improvement in asset stewardship measures.

The first three years of Network Rail's tenure focused on "getting the basics right" on today's railway, being safe in everything we do, creating the right structure, improving performance, controlling and reducing costs, and providing the appropriate environment in which to develop our people. Our results demonstrate that we have succeeded in this, and the organisation is now close to the level of maturity and stability from which we can start to move towards developing a world class organisation.

Becoming a world class organisation will only be achieved by focusing on being world class at everything we do. As we move into the final phase of the recovery programme, "becoming the best" we will need to deliver a step change in our processes and attitudes. Our aim to be a world class organisation is a key part of our long-term strategy, but it will not be achieved easily or quickly. We are starting to develop our plans now. By the start of CP4 we aim to have them fully developed for all parts of the business and to be able to demonstrate the delivery of world class performance in some areas.

To get there we will need to streamline processes; improve performance; tighten project controls; reduce unit costs; and deliver all of our activities safely, successfully and efficiently. We want to develop a record of success in delivering major enhancements and capacity upgrades so that we are trusted by the rest of the industry and are able to provide the level of leadership which is expected from us. To do this we need to develop strong and common direction and engagement with all of our stakeholders and funders.

All of these aims will form a fundamental part of the plans we are developing, for CP4 and beyond, to deliver a level of performance that satisfies the safety, reliability and capacity needs of our stakeholders at an affordable price.

CP3 efficiencies

We are now nearly half way though CP3 and have made significant progress in meeting our efficiency challenge. While the more obvious and easily achievable savings have been secured, there is still much that we can achieve through developing and deploying increasingly effective and consistent processes, better and more joined-up planning and monitoring, and a continuing vigilance over cost control. We are continuing to develop the plans required to deliver improved efficiency through the remainder of CP3.

An assessment of the expected level of outperformance over CP3 as a whole was provided in our 2006 Business Plan. The key issue for our CP4 plans relates more to the level of efficiency at the end of CP4 and the momentum which is achieved as a result of initiatives we are planning to implement over the next few years.

The efficiency savings achieved in the first two years of CP3 are summarised in the table below. Further details of these savings will be provided in our 2006 Annual Return to be published at the end of July.

Operating and maintenance expenditure

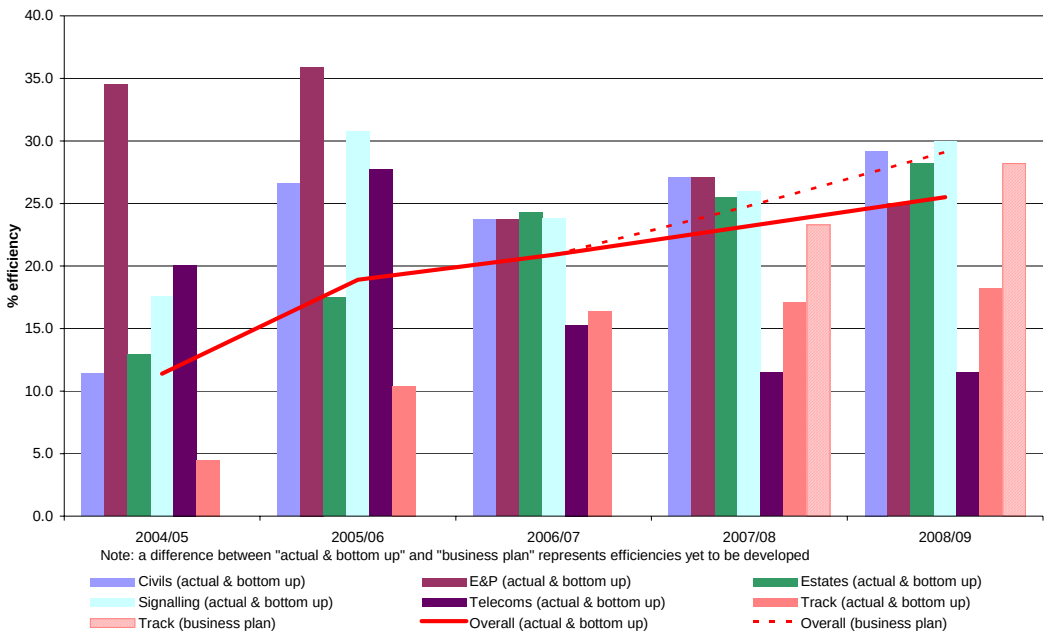
For operating and maintenance expenditure, we have achieved overall efficiency savings in the first two years of CP3 of 24 per cent and 19 per cent in controllable operating costs and maintenance respectively. Moreover, we expect to achieve significant outperformance of the ACR2003 operating and maintenance expenditure projections over CP3 as a whole.

Although we expect the rate of improvement to diminish as improvements become harder to achieve, we are forecasting that the level of controllable operating and maintenance

Figure 13 2005/06 efficiency savings analysis

	By end 2004/05		By end 2005/06	
	ACR2003 assumption %	Actual achieved %	ACR2003 assumption %	Actual achieved %
Controllable opex	8	16	15	24
Maintenance	8	10	15	19
Renewals	8	8	15	15

Figure 14 Efficiencies by asset



expenditure at the end of CP3 will be broadly in line with the level assumed in the last review. Given that the outputs (in terms of both reliability and traffic volume) are expected to be at least as high as assumed in ACR2003, this implies that we will start CP4 from an efficiency level in these areas which is at least as good as that implied by the review.

Renewals

For renewals expenditure, the position is more variable. In some asset areas, our bottom-up plans are not yet sufficient to ensure that we will start the next control period at the efficiency levels assumed in ACR2003. Moreover, we will have achieved some of the savings through scope efficiencies rather than pure unit cost efficiencies. This is clearly beneficial. However, it also means that the sustainable cost of a given volume of activity (as opposed to a given output) will not necessarily be reduced by the headline efficiency figure.

The figure above illustrates our current projected efficiency profile by asset category. This shows that allowing for risks from input price inflation we believe we will achieve overall levels of efficiency of between 26 and 30 per cent by the end of CP3. The graph also illustrates that there remains further work in several asset categories to identify how we will deliver those savings. Further details of the initiatives described below are contained in our 2006 Business Plan.

Track

For track renewals, efficiency performance in the first two years is behind target, and the current plans over the remainder of CP3 are not yet sufficient to close the gap. However, we still believe that the potential exists to achieve targeted levels of efficiency by the end of the control period.

Although high output plain line relaying and reballasting have been a feature of our strategy in CP3 and we have been progressively delivering additional capital plant and developing our methods of working, the full benefits have yet to be realised. In order to secure maximum utilisation and productivity of this plant, we need workbanks to be packaged to support continuous five shift per week working on individual route sections. This requires supporting access strategies, which need to be agreed with operators.

In addition there may be a compelling case to support additional investment in a further high output relaying and reballasting system, allowing the proportion of work undertaken by high output plant to increase from around 25 per cent to 40 per cent. The detailed analysis to support this strategy and evaluate the associated efficiency gains will be concluded within the next nine months. This needs to be done in conjunction with the industry analysis of efficient (whole industry) engineering access options.

In addition, initiatives such as modular switches and crossings, which are being developed now, will be fundamental to the achievement of improvements in CP4. This involves the creation of a high quality dedicated production facility, together with supporting tilting wagons and installation plant. This lean production approach will allow reduced manufacturing and installation costs as well as a significant reduction in the core installation possession. We envisage that this new capability will be established during 2008, allowing full capacity to be reached early in CP4.

Signalling

Signalling efficiency has been running a little ahead of target to date, with forecast future savings broadly in line with target for the remainder of CP3.

The decision to in-source development and design activity has shown savings in development stage costs, and has generated significant scope efficiency. There has, however, been some delay in scheme delivery as we made sure that we had robust and efficient project scopes and specifications, and acceptable supplier proposals. The supply strategy has been completely overhauled, with contracting strategy now bespoke to each activity type, better reflecting the risks involved. National procurement has leveraged significant savings and with long term frameworks now established in all areas we are increasingly confident about the robustness of our forecast savings for CP3.

Civils

We expect that the pace of efficiency gains will slow as existing initiatives have already realised their full potential. However, we do expect to achieve the targeted 30 per cent improvement by 2008/09.

The efficiency strategy has involved a significant degree of standardisation of specification and design, for example in brick repair details, earthworks repair techniques and footbridges, all of which are being implemented this year. This is expected to yield increasing benefits over the next three years. As workbank definition and development is accelerated and stability of activity increased, further savings will progressively be delivered over the remainder of CP3.

Electrification and Plant

Improvements in efficiency have been delivered during this control period primarily through in-sourcing of development activity, competitive tendering and the entry into the market of some new suppliers. Where volumes of activity have grown, this has facilitated the adoption of repetitive installation processes so that productivity has been improved.

Telecoms

Efficiency improvements have been achieved, primarily through more effective national programme management, and economies of scale leveraged through national procurement. As a result, efficiency has out-performed targeted levels. Further improvements are expected through standardisation of specifications and designs, streamlining of internal development and project management process, and packaging of works to improve productivity.

Operational property

Some early improvements have been realised, through standardisation of specification and designs in the higher volume activity areas of platforms, roofs and lighting. In addition the national procurement strategy has realised savings with negotiated reductions in framework rates, and competitive pricing of tendered works. As a result budgeted efficiency levels have been outperformed in the first two years of CP3.

Review of ORR initial assessment

ORR's initial assessment of our CP4 revenue requirements included a broad range of the potential for efficiency improvement over CP4, ranging from two per cent to eight per cent per year. The upper-end of this range is heavily influenced by three key arguments:

- that increased CP3 costs for Network Rail compared to CP2 costs for Railtrack are driven by one-off, reversible, activities;
- that Network Rail shares characteristics with a "newly privatised utility" which implies opportunity for significant cost savings; and
- that comparisons with the experience of other regulators in other sectors can be translated to setting targets for Network Rail.

We believe the high end of the range is wholly unrealistic and address each of these three key arguments in turn below.

Reversible cost increases

Network Rail's costs allowed by the Regulator in CP3 are higher than Railtrack's allowance in CP2 largely because of significant increases in traffic, and the impact of unsustainably low levels of investment in the network and in people over a period of years before and after privatisation.

The increased levels of activity and costs are largely required to address a long period of under-investment in the network dating back before privatisation. The unit costs of these additional activities can be reduced as we improve our efficiency. However, the activities themselves do not represent 'inefficiency'. For the purposes of setting efficiency targets for CP4, therefore, these costs cannot be treated as one-off. These changes are reflected, for example, in enhanced asset stewardship measures, improvements in train performance, improved specifications and project control. Examples of specific additional activities include:

- increased maintenance and renewal of the network;
- accommodating significant growth in passenger and freight traffic;
- recruitment and training of new staff, for example the Network Rail apprenticeship programme;
- replacing engineering know-how lost in previous

years through a number of initiatives including the engineering conversion course;
- general up-skilling of the entire workforce to be in a position to meet the substantial challenges set for Network Rail; and
- developing and implementing enhanced information systems to support more sophisticated management approaches; and
- dealing with increases in the complexity of regulatory and safety compliance.

As described earlier in this chapter, there has been a significant increase in passenger and freight traffic over the past five years. Managing the infrastructure to facilitate increased traffic and passenger volumes is itself a substantial challenge, which explains part of the cost increase.

We examined the longer term historical information on expenditure and outputs in the rail industry to see if it helped to inform the understanding of the increased costs. The results for maintenance are shown in the diagram below. This shows that both maintenance expenditure and the normalised metric of maintenance spend per million gross tonne train km fell significantly between 1995/96 and 1999/2000. Over the same period, asset condition measures such as broken rails worsened. While we do not have information available for maintenance-related train delay incidents until 1998/99, these incidents increased significantly from 1999/00 until 2001/02.

These trends appear to demonstrate a lagging relationship between the decreases in maintenance expenditure and the increase in maintenance-related incidents resulting from the deterioration of the asset condition. This lagged-relationship appears to have been confirmed more recently as our maintenance expenditure has subsequently increased. In particular, the increase in maintenance spend per million gross tonne train km started in 2000/01, and by 2002/03 we observed a noticeable decrease in maintenance-related incidents. Clearly there is a range of other issues involved but we believe this supports the view that the level of maintenance following privatisation was at an unsustainable level.

There are also important external drivers of cost, such as real wage increases, which explain some of the past trends. This issue is discussed further towards the end of this chapter.

Newly privatised utility

We do not believe that Network Rail shares the major characteristics of a 'newly privatised utility'. The efficiency initiatives underway as we move through CP3 are becoming, by necessity, increasingly sophisticated, rather than focusing on the 'low-hanging fruit' changes associated with a newly privatised utility.

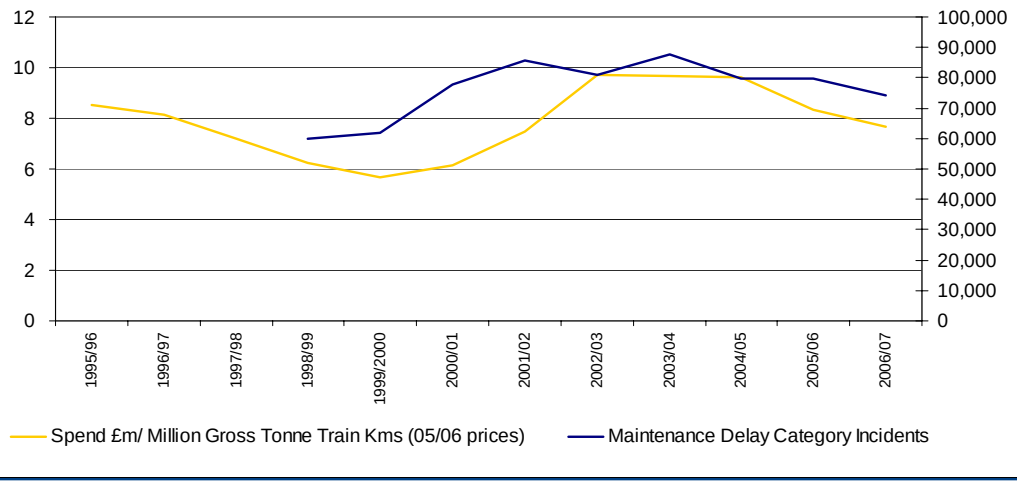
There were significant staff reductions in the lead-up to privatisation and staff levels remained static under Railtrack despite a growing industry. As a consequence, we are now having to devote significant resources to investing in our workforce. We therefore believe we are in a different position to a typical post-privatisation utility with significant scope to reduce staffing levels and costs.

Inter-utility comparisons

Inter-utility comparisons are fundamentally uncertain, and can only be taken as a broad guide to possible savings available in any other company. This is primarily because industry characteristics differ substantially in ways that affect the scope for cost-savings. For example, the nature of technology change and feasible options, differences in inputs used, expectations of changes in outputs, industry growth, and changing asset quality over time will all vary.

In addition, estimation techniques used in inter-utility comparisons are inevitably imprecise, and large confidence intervals must be applied to any

Figure 15 Maintenance expenditure per million tonne gross km against maintenance delay incidents



results, typically in the order of +/- 25 to 40 per cent. This is reflected in the significantly different results that have been generated by different studies of the same industry, or even the same group of companies.

This chapter describes a substantial programme of work to assess the efficiency opportunities which are available to us in order to derive robust efficiency plans for CP4. We believe this should be the focus of PR2008 analysis of our future efficiency targets, rather than analysis of experience of privatised utilities.

Internal benchmarking and cost review

This section summarises the internal benchmarking activity that we already undertake or are planning to develop. This activity is focused on delivering continuous improvement by identifying and spreading best practice in all areas. It will also inform an increasingly robust assessment of our potential to drive efficiency improvements in CP4. This section also outlines ongoing internal challenge of our cost base.

Maintenance

Network Rail has a robust set of internal key performance indicators which are used to measure the performance of delivery unit area and territory teams. This framework of KPIs is used for our own internal benchmarks and for comparing and contrasting the performance of the various maintenance teams. The following KPIs are prepared for each area and territory on a weekly basis:

- train delay minutes;
- number of asset failures;
- number of temporary speed restrictions and delays caused;
- broken rails;
- time on tools productivity;
- category B signals passed at danger;
- RIDDOR accidents; and
- wrongside signal failures

In addition, a fuller list of KPIs is produced each period and reviewed in monthly business review meetings at area, territory and national level. These KPIs include expenditure against budget, unit costs, resource levels, asset stewardship measures and progress on specific six sigma efficiency projects. These KPIs are scrutinised regularly and poorer performing areas and categories are targeted for improvement and corrective action is taken.

The continuous review of KPIs has demonstrated that small delivery units cannot always achieve similar levels of cost efficiency when compared to larger units. This has resulted in a review of our existing delivery unit and area structure and we are now planning to reduce the number of both maintenance areas and delivery units.

High performing areas are identified using internal benchmarking of KPIs and knowledge is shared via the territory maintenance improvement teams. Two examples of initiatives identified and shared through this benchmarking are:

- maintenance backlogs reported by the MIMS work planning system. The areas and delivery units in South East territory have proved to be very successful in managing this issue and have out-performed other territories. Their processes have been transferred to other areas, resulting in much greater control of work throughout the country; and
- the quality of time on tools productivity reporting has been much better in the two Scottish areas than it is in other parts of the country. The Scottish team has now shared best practice with other areas.

Six sigma projects are regularly established to tackle any areas where KPIs demonstrate opportunities for improvement across several areas. These six sigma projects are generally piloted in a single area and then replicated across the business.

We have developed a number of initiatives aimed at improving labour productivity levels. Four key aspects have been identified for prioritised attention in order to focus resource and facilitate good progress. These are:

- the establishment of a suite of productivity measures so that performance trends can be tracked;
- direct labour productivity improvement initiatives aimed at improving current performance;
- automation of repetitive manual activities that bring step changes to output levels; and
- plant productivity initiatives aimed at maximising the performance of high capital cost machinery.

An integrated framework for measuring direct labour productivity is also being developed. The objective is to develop a productivity indicator that translates the maintenance activities delivered each day into earned value, using standard “norm times” for each activity and compares this with the actual direct labour resource input. This concept is being piloted in a number of maintenance delivery units at present while work is progressing on automating national reporting capability.

In addition to measuring productivity trends, we are undertaking a detailed review of activity, working practices, work planning and productivity within a delivery unit to identify specific ways in which improvements in productivity can be achieved. The initial stage of this pilot study, involving the placement of a specialist project team within the

delivery unit at West Ealing, has given encouraging results and secured good engagement from front line staff. Over the next 18 months, the outputs from this project will be applied across all other delivery units in the network

It is anticipated that this will drive a step change in delivery unit culture, working practices and productivity, leading to substantial improvements in asset quality, reduced failure rates and increased labour productivity, and improved employee engagement. We also anticipate that maintenance costs and interventions will reduce as a result of improvements in work quality. This view is supported by our European benchmarking studies undertaken so far.

In addition, a wide range of discrete productivity improvement initiatives is being developed. Each territory has its own improvement team and is being encouraged to own and develop its own schedule of projects. Successful programmes will be then promoted for more general adoption across the network where appropriate.

We are tracking unit rates for major activities, including:

- ultrasonic testing;
- rail changing and re-sleepering;
- tamping and stoneblowing;
- wet bed removal;
- visual inspection (patrolling);
- IRJ renewal;
- manual geometry correction and ballast re-profiling; and
- track circuit and signal routine maintenance.

These unit rates are derived from the labour man-hours record in the MIMS work planning system, combined with the cost of plant and materials recorded in the cost accounting system. The unit rates are prepared and reviewed each month by the territory maintenance director.

Data quality for the unit rates is steadily improving. The next step change in data quality will occur with the roll out of hand-held computers to the workforce. When this equipment is introduced during 2006 and 2007, the work order data will be recorded directly on site and transmitted electronically into the MIMS system. This real time recording of man-hours will substantially improve the accuracy of data and will eliminate the need for manual processing of completed work orders.

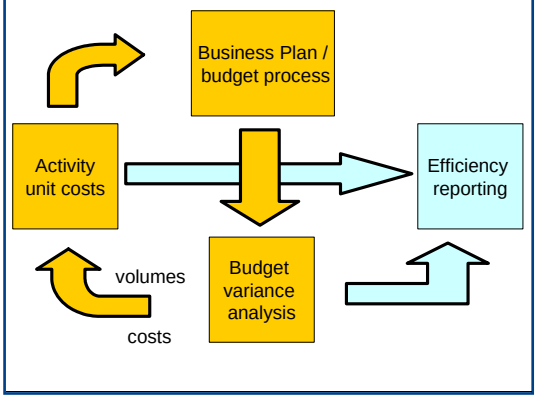
The internal benchmarking and productivity information discussed above will be used progressively to drive efficiencies and also to inform our view of the potential savings in CP4 as part of later submissions.

Renewals

Our internal efficiency measurement and management process centres around three main elements, shown in the figure below:

- the business plan process is used to establish efficient budgets, in line with or exceeding targets, as required;
- the analysis of actual volume and expenditure variances to budget is used to assess unit performance; and
- the matching of costs and volumes for repeatable activity is used to generate unit costs, such that efficient performance can be monitored at activity level.

Figure 16 Efficiency monitoring



This measurement reinforces the assessment of efficiency delivered in year. It also provides an updated basis for estimating future projects so that budgets can be robustly determined. Forecast performance against annual budgets is measured at project, sub-programme, programme and overall MP&I level each four weekly period. This allows differences in performance between projects and programmes to be identified and benchmarked, and root causes to be identified.

All framework contracts contain standard KPI suites (addressing safety, quality, cost and time, but tailored to each activity area), allowing performance of contractors to be compared on a range of inputs and outputs and steps taken to correct poor performance. Further, each asset programme promotes a range of efficiency initiatives, generating a forward forecast of efficiency improvement. We review these programmes and our progress with the relevant key suppliers in each asset area on a quarterly basis. This supplier engagement also identifies further opportunities for improvement.

Productivity measurement has not been a feature of our measurement framework to date, as we have tended to rely upon our contractors to drive productivity. However, we are now seeking to adopt a more intrusive approach in certain areas:

- productivity within possessions – we are

implementing a performance indicator that will monitor the activity output being achieved per possession hour for various key activities. We expect to commence reporting this KPI internally during 2006/07;
- track construction productivity – we have been working with our suppliers to establish production norms for all repeatable activity, and to understand the key drivers impacting this productivity. A six sigma project has been looking specifically into switches and crossings construction activity, and this has established planning norms for sub-activities. Associated improvement actions are expected to be implemented later this year;
- civil engineering minor works – a six sigma project has been seeking to establish measurement around minor works productivity. Routine measurement is being undertaken currently and we expect this information to allow improvements to be developed through 2006/07.

We have established a comprehensive framework for monitoring and driving improvement in renewals unit costs. Historically unit cost reporting has been undertaken only in the high volume repeatable activities of track and civils renewals, for which the measurement framework was defined in 2002/03. Comprehensive reporting has been undertaken since this time, allowing trends to be monitored, and allowing us to establish a good understanding of cost drivers.

We now have sufficient data integrity and understanding of cost drivers in these areas to use our activity unit cost analysis as a basis for benchmarking and driving supplier performance. We are sharing this information regularly with suppliers, and exploring how we can normalise the data further in relation to job lengths, technical specification, access regimes, and various other structural factors, in order to more clearly isolate underlying performance. We expect to be able to use this analysis to inform the potential for efficiency targets in CP4.

In other assets, the Cost Analysis Framework (CAF) has only been established within the last year. We have now defined a set of repeatable work items (RWIs) which address around 80 per cent of our expenditure, and we are now routinely collecting cost and volume data for all of these. In 2005/06 this data collection covered 57 per cent of our expenditure, and we expect this to increase to 80 per cent by 2007/08.

We have allocated some historic costs against this framework, for example in signalling, telecoms and operational property. However, it has not generally been possible retrospectively to attribute costs against this structure, and it is therefore expected to take up to three years to establish a robust Baseline, depending upon the volume of activity undertaken.

In relation to our internal activity, our main focus has been to reduce our project management and development overheads by a review of our Guide to Investment Projects (GRIP) process, and in particular to tailor this to the risk profile appropriate to different activity types. This review has been completed in signalling, civils and enhancements programmes, and we are now extending to all other assets. We expect this change to reduce the time and cost taken particularly during the development stages.

The comparative data on unit costs and their trends will be used to inform the potential for efficiency improvements in CP4 as part of later submissions.

Signalling

The main area of our operating costs for which internal benchmarking activity is valuable is signalling activity. We employ 5,000 signalling staff at a cost of almost £200 million per annum. An extensive review of all aspects of signalling staff costs commenced in 2005, aimed at fully understanding cost drivers, assessing the impact of potential changes in working conditions and driving efficiency improvements.

Our approach has been to:

- determine the key drivers and basic economics of signalling staff costs;
- develop metrics to allow comparisons to be made between business units; and
- use these metrics to identify and eliminate inefficiency.

These internal benchmarking metrics underpin a simple improvement process which is driven centrally but managed and delivered by area-based teams. With local ownership, this process involves:

- using the internal benchmarks to identify comparable cost differences between business units, representing potential problems and opportunities;
- carrying out further investigation to identify the root cause of these differences and evaluate the potential for improvement; and
- designing and delivering action plans to eliminate inefficiency.

We plan to start producing and sharing results across the business on a period basis to demonstrate improvements. In the next phase of activity we will refine the cost benchmarks by incorporating additional drivers of cost, such as actual box actual operating times and locations.

These changes to the benchmarks will improve their quality while ensuring that they remain simple and easy to interpret. Once implemented, the results will be used to more effectively identify

areas of opportunity, and enable a view to be taken of the scope for future efficiency savings.

The roll-out the benchmarking methodology highlighted the lack of formal processes in place to share best practice across this area of the business. We are putting in place a more thorough best practice-sharing initiative to ensure that ideas for improvement and successful action plans are developed fully and shared across the business.

We are not yet in a position to draw realistic conclusions about potential CP4 efficiency savings in this area of the business. Nevertheless, we recognise the importance of building on this benchmarking activity, which we propose to extend to include all rostered employees, ensuring that a process is in place to form a robust view of efficiency savings during the current review process.

Our operating costs include an element relating to the continuing use of mechanical signalling systems. Many of these mechanical systems date from early last century. We have started work to assess the optimum number of signalling and control centres that we would require in the future in order to facilitate the delivery of a modern world class network. This work is in its very early stages, but will include developing alternative options that would allow us to modernise and rationalise our systems, and to reduce our opex costs.

Currently there is no cost effective and technically feasible option that would permit the replacement of mechanical signalling systems in the short to medium term.

Bottom up cost review

It is recognised that the cost base of operating the network has increased significantly since privatisation and following a number of changes, most recently the functional reorganisation, direct comparisons over time are not practical. Consequently, it is important to understand fully the key financial cost drivers, and that these cost drivers are able to stand up to vigorous challenge.

We have therefore commenced a detailed "bottom-up" cost review, analysing and challenging all elements of our cost base. The objective of this review is to develop a much more robust understanding of the cost drivers in the business, using activity-based costing, and identify opportunities to reduce costs that are not already being addressed.

The cost review team has a responsibility to analyse the cost base to a high level of granularity to enable the evaluation of a theoretical minimum cost for the operation of the network. It may be that the theoretical minimum cost in some areas is, in fact, unattainable without significant further industry restructuring or changes in industry processes. By analysing financial information in detail across the functions we will gain a much more robust understanding of the cost drivers in the business. Activity Based Costing (ABC) is used to identify the cost drivers, simultaneously identifying all financial opportunities not already being addressed. However, in some cases zero budgeting will be the appropriate approach. All of the identified financial opportunities will be assessed to generate an outline plan on how to realise the benefits possible.

The overall objective is to drive out unnecessary cost, including waste and process inefficiency. There are a number of efficiency initiatives underway in the business, principally concentrating on process efficiency. It is necessary to avoid duplicating the work of these teams but it is also important that the state of play and rigour applied to their work is understood fully in order to provide an overview and assurance to the company that all opportunities are being explored fully.

The bottom-up cost review benchmarking will be leveraged both internally and externally as a key tool in highlighting opportunities. The internal benchmarking will compare appropriate metrics between business units and territories within Network Rail in order to identify best practice. These metrics will be adjusted to normalise cost drivers and utilised to estimate the potential savings to be made if all units meet a defined benchmark. Attention will then be focused on specific initiatives to achieve best practise. The external benchmarking will build upon the process benchmarking work described elsewhere to compare relevant functions with companies outside the railway industry to identify best practice benchmarks and estimate the potential savings from meeting the benchmark.

Changes planned or implemented now as part of this process will be fundamental to the delivery of improvements in CP4. As we approach CP4, this process will also progressively inform initiatives which are implemented in CP4 even where the benefits largely flow through in future periods.

International railway and other benchmarking

International railways

We continue to be active participants in the UIC Lasting Infrastructure Cost Benchmarking (LICB) studies. LICB was established in 1996 as a mechanism to share and benchmark asset management and cost data between European railway infrastructure operators. Annual surveys of expenditure, activity and usage are undertaken with reports published each autumn.

These studies have proved useful in identifying broad areas of interest which can then be further explored in greater depth. Although the analysis is

now quite mature and provides a long time series, the figures provide little insight on the causes of variations. It is not possible to make direct comparisons between the activities carried out by and costs incurred by different network operators, as expenditure, activity and outputs are not recorded consistently, and different safety regimes apply.

The information collated relates primarily to maintenance and renewals expenditure and volumes. These are normalised with respect to size and utilisation of network, and also input prices. In addition there has been limited comparison of unit costs for principal categories of track renewal activity. We plan to develop the analysis, particularly in relation to activity unit costs and the main drivers of these. This will require the co-operation of other European network operators.

During 2005/06 we worked with SNCF in France and SBB in Switzerland to conduct detailed comparison of network infrastructure and maintenance outputs between our respective networks. This provided useful information about overall levels of cost and asset quality. It is helping us to understand both how our internal KPIs compare with these other networks and why they differ.

As a result of this exercise we concluded that our rail management strategy was of an equivalently high standard and comparable with other European countries. However, it highlighted the need to focus more effort on reducing the number of temporary speed restrictions, an area in which we are substantially higher than other networks. We have authorised additional money to investigate ways of reducing TSRs and have redeployed staff to focus on this activity.

The number of signal failures on our network is also higher than that occurring on comparable networks. We have set up a signal failures project team to deliver a step change in the number of signal failures. This team is delivering the following improvements:

- developing a new standard maintenance procedure for the management of signal failures;
- running a series of six sigma project to improve reliability of various pieces of equipment, such as clamp-lock points mechanisms;
- running a training and publicity campaign to increase the knowledge of track workers about how the signalling system operates, in order to minimise adverse impacts from other activity.

We are also participating in a UIC study which is undertaking a detailed comparison of maintenance regimes, intervention limits and track quality measures between countries. The final report from the group will be issued to UIC members in August 2006. The key benefit of this benchmarking exercise is to highlight the differences in maintenance policy. By understanding these differences we can review our own procedures and deliver improvements.

Studies undertaken to date point to wide variations of plain line track inspection frequencies. We carry out manual inspection of track at higher frequencies than other networks. Intervention limits are broadly similar between networks but asset condition measures appear to be significantly better in other countries. The study also indicates that it may be possible to achieve simultaneously:

- high standards of asset quality;
- leading to the need for low inspection frequencies and less routine servicing of equipment; and
- leading ultimately to low maintenance costs

Achieving this virtuous circle is clearly a major objective for Network Rail. The strategy is dependent upon being able to achieve high asset quality and thereby reducing inspection and servicing frequencies. Further work is being undertaken to compare asset quality measures. However, work done to date suggests a higher incidence of track defects within the UK, compared with other networks, such as Germany.

Over the next 18 months we will review and challenge our engineering standards in this area, so that, where appropriate we can take advantage of reduced inspection frequencies and maintenance interventions. It is anticipated that delivery of improved track quality will facilitate the ability to reduce inspection frequency.

We have also attempted to benchmark labour productivity with other European networks but this exercise has not generated meaningful data, as the recording of labour man-hours is not consistent. Some companies classify clerical man-hours as productive while others, including Network Rail, classify these as a non productive overhead. In assessing the data we have observed a large number of anomalies and have therefore concluded that meaningful benchmarking of labour productivity cannot be undertaken as a theoretical exercise.

We are planning to send our own people to visit delivery units in other European networks. They will use the same techniques that we applied during the West Ealing productivity study described in the internal benchmarking section above. This will enable us to compare our own productivity with other countries using a consistent system of measurement. The team will conduct a series of "day in the life of studies", assessing a number of metrics including:

- work gang size;
- volume of work undertaken in a shift;

- losses from booking on including time to travel to site;
- time arranging a safe system of work;
- preparation and transport of materials from road vehicles to work site; and
- productivity lost due to train interruption.

We believe that by sampling work productivity in this way, we will be able to draw meaningful and usable comparisons of workforce productivity and to learn new techniques from the practices observed in other countries.

Several areas for more in-depth international benchmarking of renewals activity are currently proposed. The Innotrack (Innovation in track) and RIMARE (Railway Infrastructure Maintenance and Renewals Efficiency) studies are two related proposals which have been submitted jointly by a large number of European railway administrations and contractors during the last year for European Union funding.

Both of these studies involve some degree of benchmarking of existing activity, as a means of identifying future improvements in technology and installation and maintenance practices. The emphasis in both cases has been on track construction, but it is likely that once these forums are established they will allow us to expand the scope to consider other major expenditure areas, such as signalling and overhead line. A final decision on funding is awaited in each case. Subject to this, it is likely that information exchange will commence later this financial year, with potential initial results during 2007/08.

The Business Improvement Team, a forum of track renewals contractors and Network Rail, also provides a mechanism for future external benchmarking, analysing the overseas renewals operations of our contractors or their affiliates. We propose to use this as a mechanism for benchmarking track renewals activity once we have concluded our initial phase of internal benchmarking with these parties. It is planned that this will commence later in 2006/07. Since we aim to draw upon the measurement framework already adopted for internal benchmarking, and engage directly in interviews with practitioners in order to understand cost drivers and working practices, it is possible that this will yield early results which can inform our future strategic business plans.

In signalling we have undertaken a number of visits to overseas railways, in conjunction with our suppliers, in order to explore improved approaches to design and installation activity. We plan to incorporate these practices into new and ongoing resignalling projects. We have also been comparing our performance in design and installation of level crossings with overseas suppliers. Through dialogue with our international supply base, we are identifying products and practices which could generate cost savings. Examples of this include product development and approval of level crossing predictor technology, originating in the USA, which has the potential to reduce costs for train detection and operation at level crossings.

Other benchmarking

Initial exploratory discussions are taking place with Metronet and Tubelines with a view to establishing a regular formalised exchange of performance information. This will support the aspirations of each organisation to drive continuous improvement, and facilitate the PPP requirement for generating external comparators. It is envisaged that comparisons will potentially include project management, safety management and activity unit cost performance.

For civils we have had initial discussions with other UK major external client organisations, including the Highways Agency and Severn Trent Water, to compare practices and supply strategy. We plan to develop benchmarking activity with the Highways Agency. Potential areas for analysis include pre-qualification, forms of contract and unit costs.

One area which we have already explored is the sharing of best practice experience with our suppliers, and internally, through the sponsorship of subject specific conferences. Two such events were held in 2005, on earthworks design and treatment, and tunnel repair. This proved a very effective mechanism to communicate best practice, and in each case also resulted in specific efficiency opportunities. A further event on the subject of steel bridges is planned in Autumn 2006.

Our property estate renewals programme has engaged with a number of UK organisations to share in best practice supply chain management. Discussions have been held with Stanhope Plc, Yorkshire Water and BAA to compare supply chain and efficiency management methodologies. Additionally we have recently shared ideas with Anglian Water, Tube Lines, Cambridgeshire County Council, British Nuclear Group and the Highways Agency in relation to ways of maximising delivery through partnering and framework arrangements. In each case our approach was compatible with the best practice employed by these organisations, and similar to the National Audit Office recommendations contained in 'Improving Public Services through Better Construction'. This would seem to indicate that the existing strategy on which we are building is sound.

External process benchmarking

Our focus in external process benchmarking is to measure our performance in activities that are not rail-specific such as Finance, Human Resources (HR), Information Management (IM), and asset management, measuring ourselves against other large organisations to establish the appropriate benchmarks that we need to attain in order to become world class in these areas.

To facilitate this, we have commissioned a number of consultancy studies to benchmark some of our processes against outside companies and organisations. The scope of these studies covers the activities in asset management, Finance, HR and IM.

We also explain in this section the work we are doing to benchmark our procurement and project management processes and capability.

Asset management

An initial assessment into the appropriateness of our asset management framework has been carried out by AMCL. This work is being used to influence the further development of our asset policies, which will subsequently be reviewed in more detail by AMCL. This is discussed in greater detail in Chapter 3.

Finance and Human Resources

Earlier this year we appointed KPMG LLP to benchmark the cost of our Finance and Human Resources (HR) functions against best practice. The scope of this study included understanding the key variations to benchmarks, and, where appropriate, identifying an associated range of potential efficiency improvements. It also included identifying where further benchmarking could be undertaken to enhance our planning processes.

In defining the scope of the study, the unique aspects of our organisation, such as the diverse geographical presence, multiple stakeholders and reporting requirements, and significant recent organisational change have been taken into account.

The study does not rely on a single quantitative benchmarking comparison. Wherever possible, multiple sources of quantitative and qualitative benchmarking data have been identified. These comparisons included:

- quantitative – Network Rail's data was assessed against appropriate databases and surveys;
- comparative –current performance was assessed against process benchmarks and maturity profiles; and
- qualitative – assessment of each function by experienced functional specialists.

In each of these areas, the consultants have access to significant levels of proprietary and independent benchmarking reports. The exercise is examining our actual costs for 2005/06 and forecasts for 2006/07. However, given the size of organisational change that has occurred over the last three years, some limited data from 2004/05 has also been used.

The general cost drivers within a typical finance function can be sub-categorised as:

- people and their specific skills and competencies;
- processes including the level of manual intervention required;
- systems integration with business processes, for example purchase to pay and the maturity of the technology utilised; and
- service level agreements from both internal customer and regulatory reporting perspectives.

The Finance study of has taken account of these key cost drivers when assessing potential efficiency improvements. The assessment has been based on a combination of KPMG's own proprietary benchmarking database and publicly available information.

The main activities benchmarked in HR include staff in a core human resources role. Some elements of training and development have been included, for example leadership development and resourcing, as this a key component of HR activity found typically in larger organisations.

The general cost drivers in the HR function are:

- the HR organisation structure used, the skills and competencies contained within it, and the level of outsourced services;
- processes and activity levels including levels of recruitment;
- systems including level of automation; and
- service level requirements from managers and employees.

The DLA Piper Rudnick Gray Cary benchmarker tool survey formed the core of the Baseline comparison data for HR, supplemented by information available from other available sources. These included publicly available information and data relating to large comparable organisations. This tool was used as it provided a fully comprehensive set of benchmarking data, including training and development indicators. The analysis breaks down HR indicators by a variety of criteria, separating out public and private organisations and providing further detail for managerial, professional and operational, and support staff. The data set is viewed as a credible well respected HR benchmarking survey.

While this study had not been completed as this document was being finalised, we have received some emerging results. The key emerging findings for Finance are:

- the finance function, comprising 401 full time equivalent people and annual costs of £19.1 million, is low cost being around the first quartile relative to comparable organisations;
- there are opportunities to improve efficiency and effectiveness, particularly in areas of general accounting, management and project reporting. The cost implications of this will need to be understood further;
- there is also a need to improve effectiveness of finance in adding value to decision support activities.

The key findings for HR are:

- the core HR function, comprising 326 people and costs of around £12.5 million, is low cost compared to external comparators;
- HR appears most effective in key areas such as employee relations and leadership development, but there appear to be opportunities to improve efficiency and effectiveness through development of the shared service centre and standardisation of maintenance terms and conditions.

The study will be completed during July.

IM

We are part way through a transformation programme, which encompasses a number of projects to deliver a step change in performance in IM and help it to become a world class function within Network Rail. Over the last three years, much work has been done to improve the processes and performance within the IM function. The purpose of this programme is to continue these improvements in a manner which can be measured against recognised industry benchmarks. The programme commenced in October 2005 and is scheduled to be complete by November 2007.

The benchmarking standard that has been identified as most appropriate for the IM function as a whole is the IT Service Capability Maturity Model (CMM) for processes and organisational maturity. This model is widely adopted within the information management industry. Our objective is to achieve level 3 within this framework by the end of 2007.

Within IM, the Infrastructure and Support Services (ISS) division accounts for the bulk of the overall IM opex. The Information Technology Information Library (ITIL) framework has been identified as a more specific benchmarking framework for this part of the function.

A report carried out by Xansa in 2004 recorded ISS at a level of 1.5 against this ITIL maturity model compared to the target level for an effective organisation of 3.0. The results of this exercise provided a Baseline for key service procedures that needed to be either put in place or developed further. A recent review carried out by Atos Origin demonstrates that considerable progress has been made, with the current average rating rising to 2.5.

We commissioned a further study from Compass Management Consulting to provide high-level benchmarks to support the retendering of support contracts due in 2007. This covers key service delivery units within ISS:

- application support services;
- IT help desk;
- distributed computing;
- network services; and
- enterprise operation services.

The study concluded that our total benchmarked costs were 7.25 per cent lower than the reference group average, with some specific activities scoring higher and lower than the detailed benchmarks. Overall, quality targets are lower than the reference group mean, but the targets are generally being met.

The results highlight key strengths and weaknesses and these will be used to formulate service improvement plans delivered either as part of an internal initiative or as part of a contractual agreement between Network Rail and its service providers.

Procurement

During CP3 the Contracts and Procurement (C&P) function was overhauled and a new central team put in place, including a major contracts group. This has increased the levels of commercial professionalism and acumen in our contracting activities. Throughout the remainder of CP3 and into CP4 we will also improve discipline and simplify processes, to increase control and clarity in our commercial relationships. We plan to validate externally, using independent consultants, our processes and capability in this area.

We are piloting an industry best-practice approach to strategic sourcing (a standardised approach to management of contracted spend). This is supported by superior e-procurement systems and processes. In addition, we will continue to enhance and develop our supplier relationships through clear and quantified supplier account management. These initiatives will enable us to play a leading role in achieving our efficiency targets.

We will continue to attract talented people from inside and outside the rail industry and invest in training and development. We are implementing a

company-wide commercial skills enhancement programme and receive the first intake into the C&P graduate training programme in autumn 2006. The number of new graduates will increase during CP4. In addition to improving commercial capability, we will work with the business to develop improved relationship management and communication skills to improve supplier engagement. This is a major cultural change and will take some time to implement fully.

Strategic sourcing is an integrated approach to managing the sourcing process within Network Rail. This addresses all aspects of sourcing from determining demand and requirements, formulating a strategy and executing the deal, through to ongoing account management. Strategic Sourcing encompass a set of tools and templates including a contract database, news feed services, spend information, e-auction capability, and a knowledge repository to ensure best practice is retained.

This capability will optimise sourcing decisions and increase rigour and consistency. The benefits of this single, clear approach will ensure that the business and suppliers understand the process. Strategic Sourcing will also create opportunities to leverage company spend and support a sustainable approach to supplier account management.

The establishment of a major contracts group in CP3 provides improved support to the business in planning and delivering strategic deals, including contracts, acquisitions, disposals and other transactions, for example insourcing. To date we have worked on a number of major contracts, for example, the supply of steel, freight haulage, on-track machinery, concrete sleepers and ballast. In CP3, the team will be focusing on some key transactions including signalling renewals programme, IM sourcing, the development of modular switches and crossings capability, energy purchasing and professional services sourcing. During CP4 this expert team will remain in place to exploit value from major contracts as they come up for renewal.

In order to optimise the supplier pre-qualification processes and enhance assurance and safety within the supply chain, we will review and redesign the supplier accreditation and pre-qualification processes. Once reviewed, these processes will be integrated with product acceptance and supplier workforce safety identification and competence arrangements.

Building on the pilot in CP3, this process will mature and be focused on the 20 suppliers that account for more than 50 per cent of total spend. We will provide suppliers with:

- improved visibility of Network Rail's demand;
- a standard calendar of meetings; and
- clear KPIs and better quality data for account reviews and joint value improvement.

We expect this initiative to be implemented by the end of 2006 and see value flowing from this throughout CP4.

We are completing and deploying a revised set of contract documents and administration procedures across the business. These will reduce complexity and risk whilst aligning our contracting with industry standards and legal precedent. An intensive programme of awareness and training will accompany the launch of the new documentation and 100 per cent adoption will be achieved by CP4.

During 2006/07, we will deploy an improved requisition to pay capability across the business. The technical solution is i-Procurement, an Oracle application. The programme will be delivered as part of the company wide ERP programme and is linked closely with the Oracle Projects initiative. The project will be supported by a major programme of awareness and education. We estimate that around £2 billion of expenditure will be transacted through this system in 2007/08. As a result of this investment, transaction efficiency will increase while assurance, compliance and Network Rail's ability to pay on time will improve. It will also deliver a rich source of data on which C&P professionals can base decisions.

Project Management

The improvement in our project management practices will be measured using a Capability Maturity Model (CMM). This is based on a study originally funded by the Project Management Institute (PMI), and adapted to suit Network Rail. Every six months our capability will be measured and an improvement strategy put in place to drive key improvements successfully into the business. Key aspects include:

- application of processes at each stage of the project lifecycle (GRIP);
- application of the key project disciplines that are applied through the lifecycle, such as estimating, cost management, planning and risk management;
- application of the key system steps; and
- capability of our people measured through the competence framework and aligned to the maturity model.

Our maturity will be measured internally at project level and compared at asset programme level. The core elements will be compared externally against a wide range of worldwide organisations from a number of industries. Around 60 organisations are currently utilising this framework.

We will collect the maturity data from approximately 100 projects from the portfolio and determine their maturity. Using a detailed questionnaire and structured interviews we will verify the findings for a sample of projects. This will be repeated every six months, selecting 50 projects from the previous six months and 50 new projects.

This approach will enable us to demonstrate the link between the maturity of our projects and the performance across our project portfolio and the assessment will allow us to accurately focus and target local and asset programme improvement plans. It will also allow us to monitor and forecast improvements in output performance and efficiency.

Following a successful pilot early in 2006 the benchmark will be set in July 2006. This will build upon the successful implementation of new project management systems and processes.

Possessions strategy

In March 2005, ORR initiated a possessions review to assess the impact of implementing Efficient Engineering Access. Following its initial consultation, ORR recognised that there was still further work required to establish whether there is a case for a significant change to the current possessions regime. An industry working group, chaired by ATOC, was set up to develop the way forward.

The overall objective of our work is to identify a framework of modern engineering access regimes that optimise the whole rail industry business case. This should be achieved by establishing a common view of the best way forward based on evidence that is both shared and understood, followed by implementation based on an agreed framework.

We are currently undertaking a pilot study in the Western territory to analyse the impact of alternative possession patterns and to identify the optimum strategy. The study includes an assessment of the operational impact of the options in more detail and an evaluation of the net effect of these options taking into account the impact on train operators' revenue and Network Rail's engineering costs. It is being carried out in close co-operation with operators. The framework for carrying this out has been agreed by the industry.

The ORR has appointed consultants to help facilitate this analysis and to undertake the cost benefit analysis. The focus is on industry optimisation. Based on work to date there may not be a change in access patterns which results in Network Rail cost savings as initial results are indicating that increased revenue resulting from taking shorter possessions enabling unaltered services to run on Sunday afternoon appear to be give greater benefits.

For Western, we would expect implementation of the results to begin taking effect on our maintenance and renewal plans by the end of 2007. This study will also provide a source of comparative possessions productivity data across all maintenance and renewals activities. It is likely that this will identify specific constraints, practices and opportunities which can be analysed further through the RIMARE study.

The consultants' final report will be produced at the end of July. However the Western findings are on a very small part of the network and are therefore not conclusive. Some of the access options under investigation are specific to Western and are not viable for other routes. Not every route will behave identically and in some cases Network Rail's cost savings could outweigh the TOCs' revenue earning potential.

Following completion of the Western pilot study, we will develop with operators an approach to extend the assessment across the network with further studies being carried out between July and December. This needs to enable both the identification and implementation of optimum possession strategies, and an assessment of the impact of these strategies on Industry costs for inclusion in future strategic plans. At this point we are looking at undertaking another pilot on the ECML within a shorter timeframe of ten weeks. We would like to carry out this study without the support of consultants but in close co-operation with operators, while reporting progress to ORR. It is our intention to develop our methodology further and understand more fully the impact any changes will have on the Industry. We will also be looking for other opportunities across the Network to investigate different access patterns.

In assessing alternative possession strategies, we recognise that we must take account of the trade-off between moving towards a "seven day" railway with minimal disruption to train operators, and the maximum level of efficiency that Network Rail can achieve in carrying out its maintenance and renewal operations. Central to this trade off is gaining a better understanding of the demand for a "seven day" railway as this will determine how and when access is taken.

In addition to assessing the impact of alternative access strategies, we must also continue to make better use of possessions and the existing capability of the network. In particular, we continue to drive improvements in the efficiency of engineering works. We will benchmark our use of possessions with international railways to identify opportunities for improving the planning and management of engineering access from July to October. Lloyds Register Rail has been appointed

and we are currently working with them to provide the necessary support to the programme. In particular, we are currently working with the industry to identify ways of improving the speed with which we take up, and hand back, possessions.

We are also developing a suite of KPIs to monitor possession planning and management, which will be used as the basis for providing regular reports to the industry. We are currently working with the industry possessions working group to develop these measures.

Input price trends and external influences

A critical element in the assessment of the potential for future efficiency improvement is understanding the influence of trends in the prices of our key inputs, particularly the extent to which these may cause trends in real costs to diverge from the retail price index (RPI), which is used to index our income.

Many input prices are outside our direct control. While we can influence trends in some area, for example, by changing the way we let contracts or programme our workload in order to ease the pressures on our supply chain, our influence in other areas, such as key commodity prices is clearly limited.

We therefore commissioned a study by LEK to examine key input price trends which influence our costs. Through a combination of analysis of historic trends and future indicators, and interviews, both internal to Network Rail and with external organisations, LEK has estimated a range of input price change assumptions. Their study analyses the potential for change in each of our major cost categories, separating out renewals by asset group, and then disaggregating further by labour and materials costs, in order to identify the likely variance of costs against the RPI.

The generic areas examined included the availability and costs of specific categories of labour, major external influences, such as the impact of major construction projects and events, and changes in materials and commodity prices. Changes in fuel prices were examined as a sensitivity and do not feature in the input price range analysis and calculation.

The main rail-specific areas which LEK identified as having a potential inflationary impact on input prices are:

- major transport infrastructure projects – where the demand generated by a number of major schemes, including Crossrail, Thameslink, Olympics infrastructure projects and LUL projects, will put increasing pressure on a narrow supply market;
- safety regulation – where continuing incremental changes, such as the Railway and Other Guided Transport Systems regulations (ROGS), due to be introduced later this year, may continue to create price pressure;
- specialist labour supply – the shortage of labour in specific areas has resulted in salary premiums and high wage inflation. Whilst this is being addressed by the industry, and specifically by Network Rail through the engineering conversion courses and apprentice schemes, it will take some time for the benefits to be felt.

Input prices will also be affected non-rail specific activity in the wider economy. The overall level of construction activity forecast to take place over the next ten years in the South East is £143 billion, of which approximately £29 billion (20 per cent) will be directly generated by Thameslink, Crossrail, and the work in support of the Olympics. It is estimated that this will add around two per cent on tender prices nationally over the five year forecast, while inflation in the South East could be higher. A similar situation arises in Scotland over the next five years, which will see in excess of £1.5 billion expended on Network Rail and other rail industry projects. This expenditure, which is currently projected to peak in 2008/09 is expected to drive localised inflation because of the need to compete for labour across a range of general and specialised sectors.

The impact of materials costs is also significant, and many of the materials we use are heavily affected by commodity, utility and oil prices. There also other drivers that have a bearing. In technology driven areas, for example, telecoms and to some extent signalling, the rapid change of pace in the underlying technology may give rise to changes lower than RPI. However, this may be offset to some extent by the increasing rate of obsolescence of computer-based technology.

Over the last two years Network Rail has negotiated a number of contracts which insulate it to some extent from the volatility in spot market commodity rates. These contracts fix the level of price increases that may be passed on, and give a degree of certainty in the expenditure that will be made throughout the period of the contract. However, if the material price falls after the contract is let then the prices will appear to be inefficient. These contract prices reflect better procurement and supplier management, but any long term inflation in underlying prices will inevitably be reflected in increased rates when the contracts are renewed.

Within each asset category there are a number of materials sub-elements examined, for example, reinforcing steel, concrete and aggregates in civils, and overhead line materials, third rail materials and points heaters in electrification. Each sub-element

has been assessed, based on its historic price profile, make up of raw materials and their historic price profile, and where available any independent industry forecasts, as to the future level of its raw materials. This is used to generate a potential range of variation in the unit price of the sub-elements, which are then weighted appropriately, to generate an overall range for materials relevant to that asset group.

There are some variations in the forecast levels of change across the materials costs of differing assets and these are weighted appropriately to derive an overall forecast of change in input prices relative to RPI. The figure below shows the ranges of variation by expenditure category against RPI identified by LEK.

Further work is required to assess whether these projections are robust and what we can do to mitigate their impact. For the purpose of this submission, however, our expenditure projections take account of the results of the LEK study as described in the final section of this chapter. The input price analysis will be refined and updated in our future PR2008 submissions.

Work programme

This chapter has described the work we are doing to improve efficiency, partly in the context of forming a view on the potential for efficiency improvements in CP4. More fundamentally these initiatives are central to our efforts to drive efficiency improvements throughout the business as part of the development of our vision to be a world class organisation. This vision is a key part of our long-term strategy, but it will not be achieved easily or quickly. We are starting to develop our plans now.

Our programme must be firmly grounded in a common understanding of the company's aims and priorities in order for the functional and cross-company elements of the plan to deliver coherent performance which is recognised as world class by passengers, customers and other stakeholders. It is essential that this phase of design is thorough but rapid in order to build early momentum. We expect to have it completed during Autumn 2006.

Work has already commenced to define key workstreams at functional and company level to deliver the key priorities for world class performance, and we expect to have specific actions with delivery timescales and resources incorporated within the 2007 Business Plan. In many cases, this will build upon work described in this chapter.

The development of these core workstreams will implicitly include definition of outcomes and benefits from the change activities. These will be further developed and integrated with all other aspects of the regulatory review so that the projections for CP4 in the 2008 Business Plan are as credible and robust as possible, reflecting the step change to be delivered by the world class programme.

We expect to be able to demonstrate clear progress in delivery of the key enablers for world class performance by the start of 2008/09, with some areas of the business demonstrating world class performance by the start of CP4 in April 2009.

Reference assumptions

To enable us to provide a realistic view of the level of funding we will require we need to develop a robust view of the efficiencies we believe that we can deliver in CP4. However, until we have a clearer view of the forecast outturn efficiency of CP3 the quantum of what we can achieve in CP4 will remain unclear. In addition, much of the work which will be carried out to enable us to form a view of the CP4 efficiency potential is in its early stages.

For the purposes of producing initial projections of our overall expenditure and income requirements we have developed a set of reference efficiency assumptions. We have assumed the following:

- a core efficiency improvement profile which diminishes over time, starting at five per cent in the first two years and declining to two per cent in year five;
- that input price changes relative to RPI should be netted off from the core profile, for which we have drawn on the work carried out by LEK; and
- that specific alternative assumptions should be applied to certain categories of expenditure.

There are clear differences in the potential for efficiencies in rostered staff costs (signalling and operational staff) compared to maintenance, renewal and other operating costs. In addition, insurance and pensions costs should also be considered separately. We have therefore applied separate assumptions for these costs.

We do not believe it is appropriate to apply the core efficiency assumptions to insurance or pensions costs, both of which account for a substantial element of our operating costs. The factor that will drive changes in these costs are quite specific and should be analysed separately. We will develop robust assumptions in future submissions but, for the purposes of this initial plan, we have assumed these costs are constant in real terms in CP4.

For other operating costs, maintenance and all renewals costs we have applied the reference efficiency improvement profile and used the mid-point of the range of real input price forecasts

identified by LEK. This produces the net profile shown in the figure below with cumulative savings over CP4 of 11.5 per cent.

We have not applied any efficiency assumptions to those areas of expenditure over which we have no direct control, such as EC4T, cumulo rates, BT police and ORR charges.

In future submissions we will develop more robust views of the potential for efficiency improvements and update the analysis of trends in input prices. We would expect this analysis to differentiate between maintenance and renewals, and between different asset categories.

For illustrative purposes, we also show in Chapter 5 the implications of assuming the upper and lower ends of the range identified by ORR in its initial assessment of between two and eight per cent per year. We believe that the upper end of this range is unrealistic if we are to continue to deliver a network which is sustainable in the longer term, but also that the lower end of the range is below the level that we believe should be achievable during the early part of CP4.

The ORR's initial assessment made no specific allowance for any changes to input prices over the control period. Given the work carried out in this area by LEK we do not regard this as a realistic assumption and we have therefore dealt with this separately.

Supporting documents

The following commercially confidential supporting documents are being provided to ORR:

- LEK report into input prices;
- KMPG study into external process benchmarking on HR and Finance;
- Compass IM benchrmaking study;
- AMCL asset management study.

Figure 17 CP4 efficiency reference assumptions

per cent	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Renewals	-5.0	-5.0	-4.0	-3.0	-2.0	-17.6
Maintenance	-5.0	-5.0	-4.0	-3.0	-2.0	-17.6
Controllable Opex	-5.0	-5.0	-4.0	-3.0	-2.0	-17.6

These efficiency assumptions have not been applied to rostered staff costs, insurance, pensions or non controllable opex costs.

Figure 18 Input price variance ranges relative to RPI

per cent	2009/10	20010/11	2011/12	2012/13	2013/14	CAGR (2008/09-13/14)
Opex	1.0 - 1.5	1.0 - 1.5	0.0 - 3.0	0.0 - 3.0	0.0 - 3.0	0.0 – 4.5
Maintenance	0.5 – 4.5	0.5 – 4.5	0.5 – 4.5	(1.0) – 2.5	(1.0) – 2.5	(0.5) – 3.0
Renewals						
Track	0.5 – 3.5	0.5 – 3.5	0.0 – 3.5	(1.5) – 2.5	(1.5) – 2.0	(1.0) - 3.0
Signalling	1.0 – 5.0	0.5 – 5.0	(1.0) – 3.0	(1.5) – 2.5	(2.0) – 2.0	(0.5) – 3.5
Civils	0.5 – 4.5	0.5 – 4.5	(1.5) – 2.5	(1.5) – 2.5	(1.5) – 2.5	(0.5) – 3.0
Operational property	0.5 – 4.0	0.5 – 4.0	(1.5) – 2.5	(1.5) – 2.5	(1.5) – 2.5	(1.0) - 3.0
Electrification	0.0 – 3.0	(0.5) – 2.5	(2.5) – 2.5	(3.0) – 2.5	(3.0) – 2.5	(1.5) – 2.5
Telecoms	0.0 – 3.5	0.0 – 3.5	(2.0) – 2.0	(2.0) – 2.0	(2.0) – 2.0	(1.0) – 2.5
Other	(4.0) – 0.0	(4.0) – 0.0	(4.0) – 0.0	(4.0) – 0.0	(4.0) – 0.0	(3.5) - (0.5)
Plant & machinery	(1.0) – 1.0	(1.0) – 1.0	(2.0) – 0.0	(2.0) – 0.0	(2.0) – 0.0	(1.5) – 0.5
Total	**0.5 – 4.5**	**0.5 – 4.5**	**(1.0) – 2.5**	**(1.0) – 2.5**	**(1.0) – 2.5**	**(0.5) – 3.0**

Figure 19 CP4 net costs savings (efficiency assumption less input price variation relative to RPI)

per cent	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Renewals	-2.6	-2.6	-3.3	-2.3	-1.3	-11.5
Maintenance	-2.6	-2.6	-3.3	-2.3	-1.3	-11.5
Controllable Opex	-2.6	-2.6	-3.3	-2.3	-1.3	-11.5

These net cost savings have not been applied to rostered staff costs, insurance, pensions or non controllable opex costs.

5. The Baseline plan – today's railway

This chapter describes the Baseline plan. The Baseline plan is based upon maintaining a non-degrading infrastructure at an efficient minimum cost for delivery of committed outputs on a sustainable basis. This chapter describes:

- activity volumes and expenditure forecasts in summary and by asset;
- the committed enhancement projects;
- our income projections; and
- the expected outputs

Activity and expenditure forecasts

Summary

The Baseline plan is based upon maintaining a non-degrading infrastructure. Although this plan would not accommodate substantial growth, it provides an important benchmark for understanding our costs.

The projected cost of operating, maintaining, renewing and enhancing the network under the Baseline scenario have been developed using the ICM and are summarised below in Figures 1 and 2.

The average annual cost of operating, maintaining and renewing the network falls from around £5 billion in the current control period to just over £4 billion per year in CP4. We expect this to reduce to just over £3.5 billion per year in CP5. Total expenditure in CP4 is £20.5 billion compared to £20.9 billion forecast in BP2005.

Non-controllable operating costs are forecast to be £705 million higher principally due to increases in electricity for traction costs and cumulo rates. This is explained in more detail in the operating costs section below.

Maintenance costs are forecast to be £76 million higher, primarily as a result of increases in the assumed level of traffic since publication of BP2005.

Renewals are forecast to be £1,145 million lower in CP4, primarily as a result of a reduction of £1,468 million in signalling resulting from a detailed review of strategy and the required levels of activity through the Signalling Review process. The lower forecasts for signalling are partially offset by an increase of £231 million for operational property, driven by increased forecasts for stations. The reasons for these changes are explained in more detail later in this chapter.

Figure 3 shows the Baseline plan against the range of expenditure in ORR's initial assessment of revenue requirements published in December 2005 (ORR's initial assessment). The total cost for operating, maintaining and renewing the network is £241 million higher than ORR's 'high' assessment. This is due to the higher non-controllable operating costs. In total, our other costs of operating, maintaining and renewing the network are £473 million below ORR's 'high' assessment. Within this however, maintenance costs are £77 million higher and renewals costs are £433 million lower than the 'high' assessment.

Figure 20 O,M,R&E expenditure

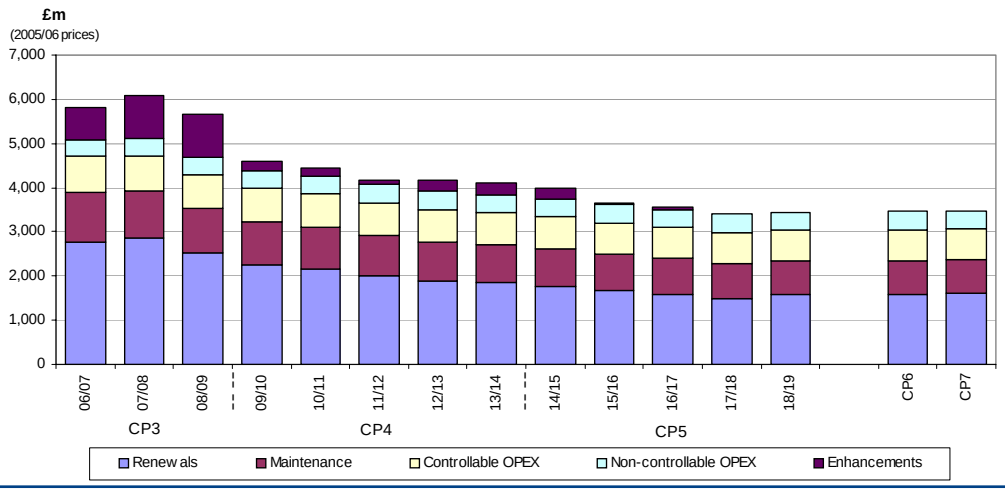


Figure 21 Renewal expenditure

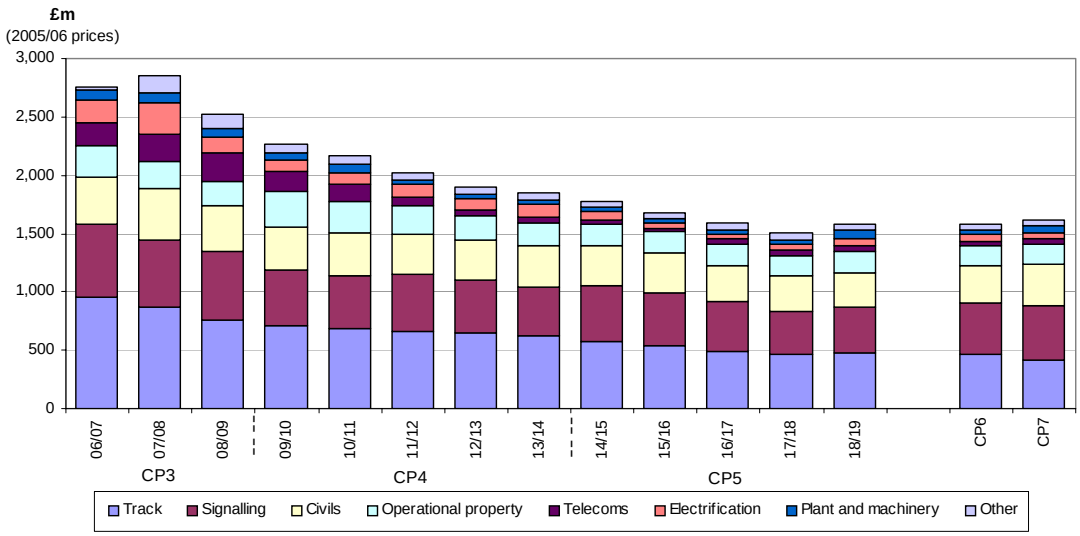
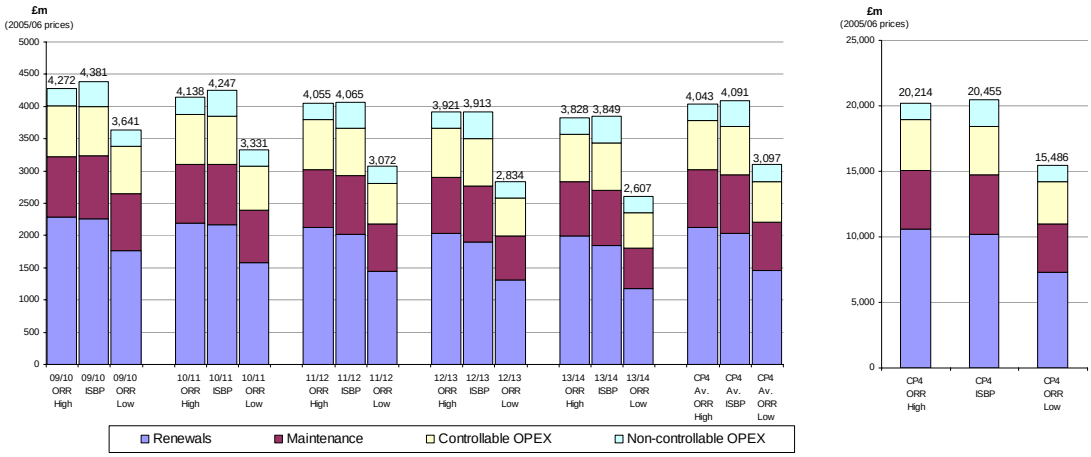
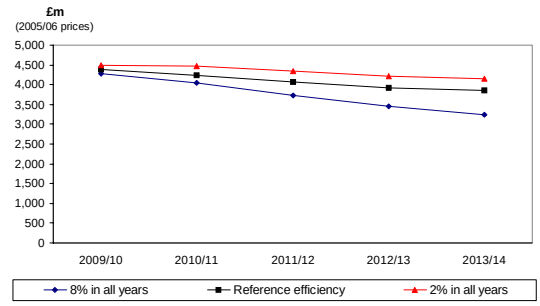


Figure 22 O,M&R comparisons to ORR's initial assessment for CP4



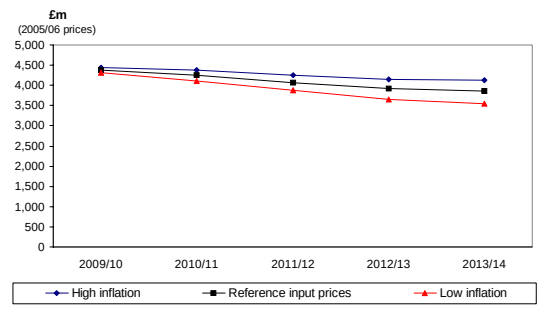
We have analysed the impact on operating costs, maintenance and renewals of applying ORR's high and low annual efficiency assumptions of eight per cent and two per cent respectively. This is illustrated in the graph below. Applying the eight per cent assumption results in a reduction of £1.7 billion over CP4. Applying the two per cent assumption results in an increase of £1.2 billion over CP4.

Figure 23 Impact of efficiency assumptions on O,M&R



We also illustrate the impact of applying the top and bottom of the range of input price inflation included in LEK's report. Using the higher inflation assumptions results in an increase of £0.9 billion over CP4. Using the lower inflation assumptions results in a reduction of £1.0 billion over CP4.

Figure 24 Impact of input price assumptions on O,M&R



Operating costs

For our controllable costs, we have derived CP4 forecasts by applying the reference efficiency assumptions profiles, as described in Chapter 4, to our 2006/07 budget.

Forecasts for EC4T, cumulo rates and other joint industry costs have been developed by making specific assumptions about the trends in costs.

Following the recent receipt of tender returns from electricity suppliers, we are forecasting a substantial increase in EC4T costs in CP3 compared to those reflected in BP2006. Our latest view is that costs in 2008/09 will be around £222 million, up from the £192 million reflected in BP2006.

The considerable volatility in the UK energy market in recent years has made it extremely difficult to predict forward costs of purchasing electricity. In order to provide some indication of the likely costs that we will see in future years we have modelled three key scenarios:

- scenario1 - market rates remaining constant (i.e. a reduction in costs in real terms);
- scenario 2 - market rates tracking inflation (i.e. constant in real terms); and
- scenario 3 - market rates showing a ten per cent increase in real terms between 2008/09 and 2013/14.

Our current view is that scenario 2 best represents the likely increases in market rates through CP4 (i.e. that EC4T costs will be £222 million in each year of CP4).

Although this is our best estimate based on current information, there is clearly a high level of uncertainty around this forecast and we will ensure the assumptions used are refined further in later submissions. It should also be noted that increases in EC4T costs are reflected in increased income from EC4T charges. However, it is important for the industry to work to reduce the impact of these changes by improving energy efficiency, for example through investigating options for investment in regenerative braking.

We have assumed a marked increase in cumulo rates through CP4 from £71 million in 2009/10 to £93 million in 2013/14. We managed to achieve a large reduction in our rate liability at the last assessment, which resulted in lower cumulo rates. However, from the start of CP4 this discount ends and we are forecasting increases in our rate liability as the profitability of our property portfolio increases.

Other costs that are not within our control including items such as the ORR licence fee and British Transport Police costs, are assumed to remain constant in real terms, although these have increased significantly in CP3.

Maintenance

The forecasts have been derived using the infrastructure cost model (ICM) by modelling volumes of key activities, applying unit costs and making appropriate allowances for other activities, indirect costs and overheads, ensuring that the forecasts are calibrated to existing budgets. The reference efficiency profile, as described in Chapter 4, is applied to all maintenance costs.

Traffic is a key input in this modelling of maintenance activities. In addition, there is some

interaction between modelling of maintenance and renewals, particularly with regards to track.

Although the ICM has been developed with the functionality to produce maintenance costs at area level, the modelling to date can only be considered to be robust at the national level.

Track

Sixteen core track activities which are managed at an area level have been modelled in detail. These include items such as ultrasonic rail inspection, rail changing, re-sleepering, tamping, stone blowing and S&C unit renewal. In addition, four key activities which are managed at network level, including rail grinding, have been modelled.

Algorithms for the calculation of maintenance activity frequencies have been developed based primarily on standards. For example, frequencies of ultrasonic rail inspection are derived from standards which define frequencies by track category and rail type. Reactive activity volumes are estimated based on forecast defect rates.

Unit costs are applied to the volumes in order to calculate costs. Allowances are made for other track activities that are not modelled explicitly, and for off-track activity (including vegetation management, fencing and drainage).

Signalling

The forecasts for signalling are based on estimated labour input for inspection and maintenance of 16 key assets in six categories.

The labour input in minutes per asset per year is assessed for both planned and reactive work. The assessments for planned work are based on standards. The assessments for reactive work are derived from analysis of actual recorded times in our maintenance scheduling system.

Unit labour costs per man hour are then applied with allowances for unproductive time and small plant and materials.

As with track maintenance, allowances have been made to cover other signalling activities to reconcile to the overall signalling budget.

Electrification and plant

These costs have been developed in a similar way to signalling maintenance costs. There are 24 electrification and plant activities modelled with scheduled activity volumes based on standards or assessments of 'hours per asset'. Additionally, specific allowances have been made for unique assets such as the Severn Tunnel pumping station and Kingsferry Bridge.

Telecoms

The forecasts for telecoms have been derived on a 'cost profile' basis by assessing current levels of expenditure on seven key areas of maintenance, including operational communications equipment, retail equipment and radio systems. Both external contract costs and internal costs have been assessed to derive a base level of expenditure for each of these seven key areas.

Other maintenance

Our maintenance forecast also cover the civils inspection and assessment regimes and operational property activity, based on existing levels of expenditure.

Allowances are also made for other costs of national projects, and for indirect costs and overheads incurred at area, territory or network level. developed through calibration to the 2006/07 budget.

Renewals

A number of generic approaches are used within the ICM to develop the expenditure forecasts for the Baseline plan. These approaches are shown below:

- life cycle - forecasts are based on life-cycle cost modelling using alternative intervention cycles;
- service life - forecasts are based on the expected service life of an asset, defined in cumulative tonnage or some other measure of usage, with renewal predicted when this life is reached;
- age profile - forecasts are based on an assumed average asset service life, defined in years, where age is treated as a proxy for condition and

Figure 25 Maintenance expenditure

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14	CP4
Track	471	454	436	423	415	2,198
Signalling	122	118	115	112	111	577
Electrification and plant	44	43	42	41	40	210
Telecoms	61	59	57	56	55	288
Civils inspections	34	33	32	32	31	163
Operational property	29	29	28	27	27	140
Other	207	200	193	187	184	971
Total	**968**	**937**	**902**	**877**	**862**	**4,546**

there is reliable data on the current age profile of the assets;
- age steady state - forecasts are based on assumed average asset service life but there is little reliable data on the current age profile, so a "steady state" renewal rate is derived from the assumed asset life, i.e. a 50-year asset life implies two per cent renewal per annum of the total asset population;
- cost profile - forecasts are based on previous patterns of expenditure and assumed trends where specific activity is difficult to forecast.

These terms are used throughout this section as generic references to the type of approach adopted for each spend area.

The reference efficiency profile, as described in Chapter 4, is applied to all maintenance costs.

Track

The planned track expenditure and activity volumes are shown below.

The forecasts for plain line track (rail, sleepers and ballast) and switches and crossings (S&C) have been produced using the ICM.

The model uses a 'service life' approach, with asset service lives defined in equivalent million gross tonnes (EMGT). The model is driven by the traffic input with the service life being a function of the traffic level over a particular section. The model contains flexible rules and prioritisation criteria based on route categories. As assets are renewed the age and type of asset is updated; hence the impact of a changing age profile affects both network outputs and maintenance activity.

The ICM allows renewal volumes to be constrained, both to allow for limits on deliverability and to smooth the profile of activity. When the predicted volume of renewal is greater than this limit, then the assets furthest beyond their forecast replacement date are assumed to be renewed first.

Costs are derived by applying unit rates to the forecast volumes of work for each track asset type, reflecting the mix of delivery methods.

The other expenditure line covers fencing, drainage, longitudinal timbers and other items.

The asset service lives assumed in producing these forecasts have been revised following detailed peer review, informed by the available evidence on actual service lives and asset condition information. This has resulted in increases in the predicted service lives for some assets and, hence, reductions in the forecast volumes of renewal. For example, the assumed life of continuously welded rail at 20 EMGT per year has been increased by approximately 12 per cent. As a result, the overall level of plain line renewal activity projected for CP4 is three per cent lower than the level projected in BP2005.

The volume of track renewal, particularly for rail, has been relatively high since 2000/01, in order to address the impact of under-investment in the 1990s, the underlying asset age profile (reflecting historic peaks of activity) and the problems caused by rolling contact fatigue. The delivery of planned volumes of activity over the remainder of CP3 will mean that approximately 22 per cent of our plain line assets will have been renewed between 2000/01 and the end of CP3, at an average annual rate of 2.8 per cent. The level of S&C renewal has also increased significantly in recent years to an annual renewal rate of around 2.5 per cent.

Our forecasting indicates the need to maintain plain line renewal activity at these levels for a few more years into CP4, before the required level of activity reduces in CP5. We have constrained the planned level of activity in CP4 to around 2,550 component kilometres per annum, in line with

Figure 26 Track expenditure

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14
Plain line	483	469	449	437	414
Switches & crossings	203	196	189	185	183
Other	27	26	25	25	24
Total	**712**	**691**	**663**	**646**	**621**

Figure 27 Track volumes

		2009/10	2010/11	2011/12	2012/13	2013/14	% of network renewed (CP4 annual average)
Rail	km	900	901	902	901	750	2.9%
Sleepers	km	838	801	802	801	801	2.7%
Ballast	km	851	851	851	851	852	2.8%
S&C	units	605	600	600	601	601	3.0%

planned delivery in the last year of CP3.

For S&C, the volume of around 600 units per year is the total number of assets to be worked on, some of which would be partially renewed. The total equates to around 540 equivalent units, in line with planned activity in CP3. In terms of equivalent units, a renewal rate of around 2.7 per cent needs to be sustained throughout CP4.

The current average age of our plain line track assets is about 27 years which will fall to 26 years by the end of CP3. The planned level of renewal activity will reduce this to about 24 years by the end of CP4. The average age of S&C units will fall from 24 to 22 years over CP4. This gradual reduction in the average age of assets will contribute to further improvements in track geometry and other track output measures, which are set out later in this chapter.

Signalling

The planned signalling expenditure and volumes are shown below.

Since BP2005, the basis of the renewal forecasts has been substantially developed. We have conducted a detailed review of the scope and timing of resignalling schemes and developed detailed workbanks for minor works which were previously based on an overall high level assessment of requirements.

The projections of resignalling expenditure are based on a detailed "ERTMS-ready" long term resignalling workbank, which details the type and timing of conventional resignalling activity required at every interlocking over the next 40 years.

The underlying basis of the workbank is the Signalling Infrastructure Condition Assessment (SICA) renewal date for each interlocking. However, the timing of interlocking renewals in the workbank takes into account a number of inter-related factors including the following:

- professional judgement of the nominal remaining life of each interlocking, assessed initially by our territory signal engineers and peer reviewed centrally, recognising that the SICA process generates an indicative assessment of remaining life;
- assessments of nominal remaining life of adjacent interlockings in order to form appropriate route based delivery packages;
- alignment with the rolling stock replacement plan wherever possible, in order to facilitate efficient ERTMS implementation; and
- deliverability issues, relating to resources and engineering access, to develop a smooth profile of work that allows efficient use of resources.

The workbank distinguishes between 14 different types of full and partial resignalling activity and applies different unit costs to the volumes of activity required, depending on the type of activity being undertaken. This is a significant improvement over previous plans, which have assumed full resignalling for each interlocking.

In constructing the workbank, there has been a general increase in the number of planned life extensions of mechanical interlockings. In previous plans we have generally assumed that mechanical interlockings would be subject to complete renewal as part of a resignalling scheme. The costs for life extension are included within the minor works forecasts described below.

Unit rates have been derived from a combination of analysis of the actual costs of resignalling schemes, indicative tendered rates for current resignalling schemes and professional judgement. The establishment of the Cost Analysis Framework (CAF) for renewals projects will, over the next few years, bring significant improvements in the quality of unit cost data for resignalling activity and we expect the robustness of our forecasts to

Figure 28 Signalling expenditure

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14
Complete resignalling (design & structures)	325	288	318	293	264
Partial resignalling	20	38	45	38	44
Minor works and life extension	130	126	122	119	118
Total	**474**	**453**	**485**	**450**	**425**

Figure 29 Signalling volumes

		2009/10	2010/11	2011/12	2012/13	2013/14
Renewed SEUs commissioned	SEUs	2,355	1,488	1,981	1,976	1,663
"Equivalent" SEUs commissioned	SEUs	2,355	1,437	1,802	1,895	1,663

strengthen progressively as this data becomes available.

The costs of each resignalling scheme are profiled across the years preceding and following the scheme commissioning date based upon the assumed contract delivery type and generic assumptions for the duration of each GRIP (Guide to Railway Investment Projects) stage.

Minor works workbanks for the next four years have been developed 'bottom-up' at territory level to identify the life extension work required, consistent with delivery of the ERTMS-ready resignalling workbank. The workbanks contain minor works activity volumes for 21 system sub-elements for each interlocking on the network. These system sub-elements are consistent with the SICA methodology. For the remainder of CP4 and beyond, we have used an average of the forecast volumes in years 2006/07 to 2009/10, from 2010/11 onwards.

The minor works expenditure has been derived by applying unit costs to these activity volumes. The unit rates have been produced from recently tendered rates as part of the set up of the new territory-based five-year minor works contracts, known as Type C contracts. Adjustments for project management and contingency have been made to produce an "all-inclusive" rate. An allowance of around £13 million per year has been added for non-interlocking specific minor works such as relay re-servicing, painting of trackside equipment cases and structures and other 'reactive' type work. An additional allowance has been made of around £26 million per year for minor works renewals delivered by our maintenance organisation. These are typically very small items of renewals work that are identified locally and delivered by the maintenance teams.

The result of these substantial changes in approach to our forecasting of signalling renewals costs is a reduction in expenditure over CP4 of £1,468 million, compared to the forecasts in BP2005. This lower level of spend was antipicated in ORR's Baseline assessment and the new forecast therefore fits between the lower and upper ends of the range indicated.

The average number of equivalent SEUs commissioned per annum in CP4 is 1,830 which represents just under three per cent of the network total number of SEUs. This is broadly in line with previous assumptions that, signalling systems have, on average, a 35 year asset life. The average through to the end of CP6 is 1,900 implying that the forecast SEU volumes in CP4 are approaching 'steady state' levels of investment. This is, however, subject to developments such as ERTMS which are discussed separately.

Civils

The planned civils expenditure is shown below. We have included all of this expenditure within our renewals projections, which is consistent with the treatment of ACR2003. However, it is noted that around £100 million per year is treated as maintenance expenditure in our financial accounts.

The forecasts of expenditure are based on the 2003 Structures Annual Cost Profile (SACP) work which produced long term forecasts of the total expenditure that would be incurred in managing each different type of civils asset in accordance with each of the civils asset policies, as described in Chapter 3.

The SACP forecasts have been consolidated within the ICM which provides capability to vary the mix of asset policies by route.

The Civil Engineering Cost and Strategy Evaluation (CECASE), which builds on the SACP work from 2003, will deliver updated and improved information to support the management of our civils assets and provide a more flexible tool which will enable us to consider the expenditure and activity volumes that result from the application of different

Figure 30 Civils expenditure

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14
Masonry overbridges	28	27	27	26	26
Metal overbridges	29	29	28	27	27
Concrete overbridges	11	11	11	11	11
Masonry underbridges	65	64	62	61	61
Metal underbridges	74	72	71	69	69
Concrete underbridges	7	7	7	7	7
Footbridges	16	16	16	15	15
Culverts	25	25	24	24	24
Tunnels	17	17	16	16	16
Earthworks	45	44	40	39	39
Retaining walls	8	8	8	8	8
Coastal defences	25	24	24	24	24
Bridgeguard 3	20	19	19	18	18
Total	**371**	**363**	**350**	**345**	**344**

management policies to different assets on the network.

The key improvements being delivered through this work are:

- improved asset data including latest SCMI data;
- increased range of policies and better policy definition;
- a big increase in the number of sample studies used to underpin the modelling process;
- detailed improvements to the modelling process; and
- updated base data for costs

The Baseline plan is based on the application of policy A to primary routes, policy B to London and South East commuter and secondary routes and policy C to rural and freight routes, consistent with the level of funding in the later years of CP3. For comparison, application of policy B throughout would result in an increased funding requirement of £131 million over CP4.

Our forecasts for major structures have increased from the levels in BP2005 as our dedicated team have developed more detailed plans for specific major structures such as the Forth Bridge. These forecasts now average £43 million per annum in CP4. However, within this Baseline plan we have assumed that we could continue to manage our major structures within the overall BP2005 level of expenditure, although this would mean a departure from the policy outlined above and an increase in costs for future control periods.

The Baseline plan also contains updated forecasts of Bridgeguard 3 costs through to completion of the programme of work. The profile is broadly in line with previous forecasts.

Operational Property

The planned operational property expenditure is shown below.

Forecasts have been completely revised since BP2005, which was largely based on rolling forward historic expenditure rather than detailed assessments of activity and expenditure. In particular we have:

- fully updated the Managed Stations workbanks; and
- developed activity-based modelling for franchised stations costs.

The forecasts for Managed Stations are based on workbanks covering each of the 17 Managed Stations. Over CP4, the levels of spend are £146 million higher than BP2005.

The most significant expenditure is at King's Cross and Edinburgh Waverley. At King's Cross we are forecasting £92 million to conduct train-shed re-roofing works, structural repairs and extensive platform renewal works. These renewal works are being delivered together with the enhancement works described later in this chapter. At Edinburgh Waverley we are forecasting £71 million to carry out major re-roofing, structural repairs and platform renewal works.

The expenditure for franchised stations has been derived through improved activity based modelling focusing on the key elements accounting for the majority of costs such as platforms, roofs, footbridges, lifts and escalators. For each of these elements, activity rates are defined for specific activities, covering planned and reactive maintenance and renewals.

For each activity, unit costs have been developed through consideration of a variety of source data. However, more work is required to develop more robust unit rates.

The CP4 expenditure of £724 million is £208 million higher than the previous forecasts in BP2005.

Development of station modelling within the ICM represents a big step forward in the production of more robust forecasts for operational property activity and expenditure and we believe this more detailed modelling approach better represents the true costs of proper asset stewardship. However, it is only the first step and there is a great deal of further work to do in developing the robustness of these forecasts. Previous projections were based on rolling forward levels of activity that we believe were insufficient for efficient long-term stewardship

Figure 31 Operational property expenditure

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14
Managed stations	118	84	55	40	31
Franchised stations	153	149	144	140	139
Light maintenance depots	14	14	13	13	13
NDS depots	2	2	2	2	2
Lineside buildings	10	10	10	9	9
MDU buildings	11	11	11	10	10
Total	**308**	**269**	**234**	**215**	**204**

of the assets.

We note that the work carried out by Corderoys for ORR as part of the Long Term Station Charges Review suggested a level of £1,138 million in CP4 for franchised stations, a significantly higher level of expenditure than our forecast of £724 million in CP4.

It should be noted that the forecasts shown represent the costs of sustaining the existing station assets only. Big improvements will only come from implementation of enhancement schemes. The leadership role in determining station strategy that we describe in Chapter 3 is an important step in establishing the shape of these enhancement schemes in the future.

The industry is currently considering changes to the responsibilities held by Network Rail and the station facility owners with regards to the renewal and maintenance of franchised stations. Until agreement on these changes has been reached and the changes implemented, we are continuing to plan on the basis of existing responsibilities.

Forecasts for light maintenance depots, NDS depots and lineside buildings have been developed on a cost profile basis, using the average of the BP2006 figures for the next three years.

Following the transfer in-house of the maintenance contractors, forecasts for expenditure on Maintenance Delivery Unit buildings have also been included. These assets were not part of the telecoms portfolio in previous plans and we are still developing a full understanding of the condition of these assets. We expect to have a much better understanding of the required expenditure in time for the Strategic Business Plan in October 2007.

The development of ATRIUM, described in Chapter 3, is also expected to result in more robust forecasts of expenditure in future submissions of PR2008.

Telecoms

The planned telecoms expenditure and volumes are shown below.

The forecasts for telecoms expenditure are dominated by the GSM-R/FTN programme. The numbers shown represent the programme installation costs through to completion in 2012. Beyond 2012, forecasts for the renewal of these assets have been calculated using an 'age profile' approach based on the original installation date of the assets.

The following key assumptions have been applied when determining the programme cost profile:

- RETB radio bearer systems (which use similar components and radio frequencies to National Radio Network (NRN) equipment) can remain in operation in Scotland and East Suffolk beyond 2012, pending development of a suitable replacement for the RETB signalling system. There is a risk that earlier renewal may be required due to interference from European digital video broadcasting (DVB). We are currently carrying out testing to understand this risk more fully;
- we will retain the Permitted Development Rights for construction of radio masts for operational purposes on our land;
- the GSM-R system trial in Strathclyde will demonstrate to the satisfaction of both the users and HMRI that the system functionality, operation and performance are fit for purpose for introduction into service as a train radio system for operation in the UK and that migration of users from existing systems onto GSM-R can be carried out safely;

Figure 32 Telecoms expenditure

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14
GSM-R/FTN - cables	15	22	9	0	1
GSM-R/FTN - sites	35	28	8	0	0
GSM-R/FTN - other	64	52	15	0	0
GSM-R/FTN total	**114**	**102**	**31**	**0**	**1**
Large concentrator	23	12	16	11	15
DOO CCTV	1	0	0	0	1
PETS	0	1	0	0	1
Small concentrator	5	3	1	1	1
Voice recorder	0	1	1	0	6
CIS	8	7	7	7	7
Security CCTV	0	0	6	6	0
LLPA	1	1	1	1	1
Cable & routes	4	4	4	3	3
Clocks	0	0	0	0	0
Other	12	14	14	13	17
Total	**168**	**144**	**82**	**43**	**53**

Figure 33 Telecoms volumes

		2009/10	2010/11	2011/12	2012/13	2013/14
GSM-R/FTN - cables	km	2,224	3,933	1,279	0	36
GSM-R/FTN - core sites	No.	9	8	0	0	0
GSM-R/FTN - co-lo	No.	320	293	103	0	0
GSM-R/FTN - FTN sites	No.	79	78	1	0	0
Large concentrator	No.	25	13	19	13	18
DOO CCTV	No.	23	0	14	0	23
PETS	No.	33	49	24	18	66
Small concentrator	No.	72	47	17	23	14
Voice recorder	No.	5	30	50	25	304

- the condition of the existing cable routes and copper cables proves to be consistent with projected levels of renewal;
- Cab Secure Radio (CSR) can remain in operation until end 2010. There is a risk that CSR may be required to be replaced ahead of the current programme driven by either risk of interference from European UHF radio transmitters, component availability or escalating cost of maintenance; and
- the NRN can remain in operation in certain geographic areas until end of 2013 to allow completion of train radio changeover following infrastructure fitment. There is a risk that NRN may be required to be replaced ahead of the current programme driven primarily by the increasing difficulty of maintaining the equipment and the potential for interference from European DVB.

A change in any one of these may have a significant impact on the overall project costs and phasing of expenditure.

Re-phasing of the GSM-R/FTN project during and since ACR2003 has resulted in a slower than expected migration from the legacy copper and transmission network onto the FTN network, and there are some interim costs associated with maintaining these two systems in parallel. We have included £19 million during CP4 to cover the additional activity, included within the 'other' line in the expenditure table. The amount required is dependent on the programme, currently under development, for circuit migration and legacy system decommissioning. We have included an additional £12 million during CP4 for the GSM-R network Nortel support contracts and system upgrades. This consists of ongoing support contracts and a five-yearly system upgrade to maintain the GSM-R network in a supportable condition. These figures are our best current estimates but will be dependent on agreement of contract deliverables.

The forecasts for large and small concentrators, driver-only operation (DOO) CCTV systems, public emergency telephone systems (PETS) and voice recorders have all been developed using an 'age profile' approach.

The levels of concentrator spend are around £30 million higher in CP4 than in BP2005. This is principally the result of more robust modelling of the complete asset base leading to the planned renewal of some concentrators, being brought forward to CP4 from CP5.

As described in Chapter 3, the industry is currently considering changes to the responsibilities held by Network Rail and the station facility owners with regards to the renewal and maintenance of retail telecoms assets. Until agreement on these changes has been reached and the changes implemented, we are continuing to plan on the basis that we will retain responsibility for the renewal of Network Rail owned retail assets at franchised stations. The planned expenditure does not reflect the possibility of Network Rail gaining any additional responsibility as a result of the changes described. Forecasts for these retail assets - customer information systems (CIS), long line public address (LLPA) systems and clocks - have been developed on a 'cost profile' basis.

Forecasts for security CCTV, cables and routes and other telecoms expenditure have also been developed on a 'cost profile' basis.

The security CCTV forecasts include £12 million in CP4 for the renewal of security CCTV systems installed between 2003 and 2005 at our Managed Stations in London. Additional work is required to enhance the CCTV at the Managed Stations outside London. We are spending £23 million (and £1 million per annum for ongoing maintenance) for additional cameras and to enhance the FTN to provide remote access facilities. Renewal costs for the new assets created by this work have been included in CP5 and beyond. There are a further 60 franchised stations for which funding may be required within CP4 once the CCTV strategy is finalised.

The unit rates used in the production of these forecasts have been derived from analysis of actual costs of recent projects, tendered rates for current projects and professional judgement. We expect the quality and robustness of these data to improve significantly over the next few years as data becomes available through the Cost Analysis Framework (CAF) process.

Electrification

The planned electrification expenditure and volumes are shown below.

The forecasts for overhead line equipment (excluding renewal of OLE structures on a stand alone basis) have been developed using a 'life cycle' approach. This approach breaks down the life of the whole OLE system into a number of distinct phases during which different types of partial (and ultimately full) renewal activities are carried out.

The amount of work carried out annually during each phase of the life cycle is defined per tension length and is a function of the total amount of work required in the phase and the duration of the phase, based upon empirical evidence and expert judgement.

Life cycle models have been developed in this way for each of the five OLE system types. In addition, the models have been developed to differentiate between light, medium and heavy use.

This new modelling approach represents a significant improvement from the largely 'bottom up' approach used in previous plans. Importantly, using the life cycle models ensures coverage of all assets in all years and creates transparency of the planning assumptions used in generating the forecasts.

The forecasts for OLE structures painting, AC HV switchgear, AC grid supply points, DC HV switchgear, DC HV cabling, DC LV switchgear and transformer rectifiers have been developed on an 'age profile' basis.

Forecasts for renewal of AC Grid Supply Points have increased by around £15 million over CP4 since BP2005. The Distribution Network Operators (DNO) are responsible for the renewal of these assets and therefore the timing and costs of this work are outside our control. However, since the production of BP2005 we have established new data from DNOs on the installation dates of the assets enabling us to produce more robust forecasts of expenditure.

The forecasts for protection relays, AC other and DC other have been developed on a 'cost profile' basis. The forecasts for conductor rail, DC LV cables and booster transformers have been developed on an 'age steady state' basis.

We have been unable to use a more refined approach for conductor rail because of our limited current knowledge of conductor rail age and condition. A major cause of asset degradation is usage, leading to loss of cross sectional area through rail wear. Our understanding of requirements for conductor rail renewal will improve significantly over the next two years as train-borne conductor rail wear measurements start to become available. These measurements will allow us to move towards a forecasting methodology based on degradation rates.

The forecasts for supervisory control and data acquisition (SCADA) systems have been produced using a 'workbank' approach, aligned to our Central Master Station (CMS) strategy. The CMS strategy will result in a completely new SCADA system architecture and changes to the geographical location of masterstations and associated infrastructure. The plans for the CMS strategy are still being developed and this, coupled

Figure 34 Electrification expenditure

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14
AC systems					
OLE	12	19	21	16	17
OLE structures painting	0	1	5	5	5
OLE structures (early)	1	1	1	1	1
AC HV switchgear	12	13	14	13	13
AC grid supply	1	1	3	2	2
Protection relay	2	2	2	2	2
Booster transformers	2	2	1	1	1
AC other	4	4	4	4	4
DC systems					
DC HV switchgear	13	13	12	14	11
DC LV switchgear	9	11	11	10	10
Transformer rectifiers	8	7	9	5	9
DC HV cable	10	10	12	10	12
DC LV cable	5	5	5	5	5
Conductor rail	7	6	6	6	6
DC other	3	2	2	2	2
SCADA	3	3	6	7	4
Total	**92**	**101**	**113**	**103**	**105**

Figure 35 Electrification volumes

		2009/10	2010/11	2011/12	2012/13	2013/14
OLE - early	tl	7	0	0	0	0
OLE - campaign A	tl	172	226	301	309	321
OLE - rewire	tl	81	155	172	116	130
OLE - campaign B	tl	0	0	0	0	0
OLE - full renewal	tl	0	0	0	0	0
AC HV switchgear	No.	132	175	178	197	179
DC HV switchgear	No.	103	114	109	159	140
DC LV switchgear	No.	178	223	237	213	231
Transformer rectifiers	No.	38	32	43	25	48
DC HV cable	No.	59	58	72	66	74
Booster transformers	No.	65	65	65	65	65
Conductor rail	km	55	55	55	55	55

tl = tension length

with the rapid rate of change that exists in the areas of systems control and information technology, makes it possible that our forecasts for SCADA renewal could change significantly over the next few years.

Plant and machinery

Our forecasts of plant and machinery expenditure are shown below.

The forecasts for points heaters and signal power trackside distribution have been developed using an 'age steady state' approach. The forecasts for signalling supply points, HV distribution (non-traction), pumping installations, lighting, lineside buildings and other fixed plant are based on a cost profile approach.

The largest portion of fixed plant spend relates to point heaters, on which we plan to spend around £7 million per year through CP4.

The forecasts for depot plant cover expenditure on items such as carriage washers and electrical supplies at light maintenance depots and have been generated using a 'cost profile' approach.

Forecasts for National Delivery Service (NDS) fleet, high output renewal plant and remote condition monitoring (RCM) equipment have been developed on an 'age profile' basis.

The plans for RCM include expenditure on new systems for the monitoring of power supplies, track circuits, bridges, wheel impact and points condition. The forecasts also cover the renewal of our existing RCM systems, such as points heater monitoring, hot axle box detectors, relay event logging and pantograph monitoring.

The NDS forecasts cover expenditure on assets such as stoneblowers, rail-head treatment trains,

multi-purpose vehicles, snowploughs and wagons.

We have made a £48 million provision in the first two years of CP4 for an additional track relaying system and high output ballast cleaning system in order to support the delivery of the Baseline plan. Beyond CP4, we have also costed the renewal of existing high output plant based on previous purchase costs.

Figure36 Plant and machinery expenditure

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14
Fixed plant					
Point heaters	7	7	7	7	7
Signalling supply points	3	3	3	3	3
HV distribution	2	2	2	2	2
Pumping installation	1	1	1	1	1
Depot plant	9	9	9	8	8
Fixed plant other	5	5	5	5	5
Machinery					
NDS fleet	1	7	0	5	2
High output renewal plant	24	37	0	0	8
Remote condition monitoring	15	8	7	4	2
Total	**67**	**79**	**33**	**34**	**37**

Figure37 IT expenditure

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14
IT	71	64	55	56	54

IT

The planned IT expenditure is shown above. Our total IT expenditure projections are based on assumed percentages of our overall operating, maintenance and renewal expenditure. These percentages are derived from benchmarking levels of IT spend against comparable businesses. Further work is required during PR2008 to refine the forecasts for IT renewals in CP4.

Committed enhancement projects

Set out below is a brief summary of the enhancement projects in the Baseline plan.

West Coast Route Modernisation

The West Coast is a principal UK rail artery serving London, the West Midlands, the North West and Scotland. The modernisation of the West Coast will deliver the following improvements:

- 125 mph route capability for tilting trains delivering much faster journey times;
- capacity for significantly more long distance passenger trains;
- capacity for freight growth;
- benefits for other users of the route, such as key commuter flows, with enhanced capacity and faster journey times;
- better and more resilient performance;
- improved safety measures.

The next key improvement in service delivery as a result of the project is the introduction of the new timetable in 2008 with improved journey times. There are a small number of significant works in the next control period necessary to ensure the sustainability of the benefits of the project.

Stafford remodelling and resignalling

The objective of the works at Stafford is to resolve the capacity constraints in the least disruptive manner to the operation of the railway and to provide enhanced functionality and capability that will deliver improved reliability, maintainability, and journey times. The construction of a bypass route is one option being investigated. The project will also include the renewal of signalling in the Stafford station area.

Bletchley – Milton Keynes

The relay interlockings at Bletchley power signal box are due for renewal at the start of CP4. There is consequently an opportunity to undertake cost-effective remodelling and resignalling at this point. The objective is to provide increased capacity, infrastructure reliability and improved recovery from perturbations. The remodelling and resignalling project will renew track, switches and crossings, and signalling equipment in the Bletchley power signal box control area. It will also deliver the transfer of signalling control to the Rugby signal control centre, a simplified layout with 12-car platform extensions and 125 mph on the up-fast at Bletchley. At Milton Keynes additional capacity will be provided with a new down fast platform, and fast and slow line centre turn backs.

West Cost Main Line power supply upgrade

This project will provide supervisory control and data acquisition (SCADA), data and voice telecommunications infrastructure to support the autotransformers (AT) programme. The works comprise the installation of SCADA equipment related to Rugby, Crewe and Cathcart electrical control rooms and other works to facilitate the introduction of AT on the WCML.

Colwich / Armitage

This is a linespeed enhancement scheme to remodel the junction.

King's Cross

The new Thameslink station will open in 2007. In the same year, international services will start operating from St Pancras, putting additional pressure on the capacity at King's Cross.

The programme will deliver a new western concourse with greater passenger capacity and a new mezzanine level concourse. The southern façade of the suburban train shed will be demolished to allow integration with the new western concourse. The programme represents part of the largest inner city regeneration scheme in Europe and will transform the busiest transport interchange in the UK. The project is critical for the Olympics with a deadline to complete in 2011.

Railways for All

This project will deliver various works to improve station accessibility including level access to platforms from street level, new or upgraded customer information systems and new tactile paving to platform edges. Level access works include ramps, lifts, automatic doors and new drop kerb car parks to service new disabled parking provision. The first tranche of stations has been agreed with DfT for completion in CP3. The scope of work in CP4 has yet to be agreed with DfT.

Third party schemes

There are a number of key projects that, although they may be funded and delivered by others, will change the nature of the network and its services during the next control period and need to be taken account of in our planning. The key projects are identified below. The impact of these schemes on our plans could be significant. These schemes

represent significant railway engineering activity, concentrated in London. This is expected to constrain resource availability and put cost pressure on the deliverability of our plans for CP4 (this is discussed further in Chapter 4). They are also likely to require additional operational resource such as extra manning at stations during the Olympics. We are working with the ODA to understand in more detail the impact of their proposals.

East London Line Extension

The East London Line Extension will extend and upgrade the existing East London Line. Phase 1 of the northern extension of this project will extend the current line northwards through Hackney to Dalston Junction, with new stations at Shoreditch High Street, Hoxton, Haggerston and Dalston Junction. The existing line will also be converted and connected to the national rail network south of New Cross Gate to allow services to run to Crystal Palace and West Croydon.

Olympics

Network Rail is delivering, on behalf of the Olympics Delivery Authority and TfL, a significant number of projects to support the success of the Olympics including Lea Interchange, North London Line capacity enhancements and freight loops and works to enhance capacity at Stratford station.

Income

Our income falls into four broad categories: fixed access income, incentive regime income, single till income, and variable access income.

Our fixed income currently comprises fixed access income from franchised passenger operators and grant income received from the Department for Transport and Transport Scotland. As part of the "building block" methodology for determining our revenue requirements, the amount of fixed income that we will require in CP4 to deliver the outputs specified in the HLOS will be the output of our calculations, rather than an input to them. This is discussed in Chapter 7.

More detailed descriptions of how we have estimated each of these categories of income are provided below. Our base assumption in this submission, however, is that there is no substantive change to the current regulatory regime for determining the amounts payable by operators in each of these categories.

A full list of our categories of income is included in the figure below.

Figure 38 Income categories

Fixed income	Fixed track access Grants
Variable income	Variable track access Capacity charge EC4T income Electric asset usage
Incentive regimes	Schedule 4 Schedule 8
Single till	Freight income Open access income Station income Depots income Property income Property sales Other income

Incentive Regimes

Our projections of the impact of the Schedule 4 and Schedule 8 incentive regimes are shown in the figure below.

Schedule 4

Schedule 4 to the Track Access Agreement requires us to pay compensation to the franchised passenger operators when we restrict access to sections of the track to allow for engineering work to be carried out.

As part of ACR2003, we devised a high-level model to estimate possession costs based on assumptions relating to the volume of work planned to be undertaken on the network and an appropriate mix of notification to operators.

In order to estimate Schedule 4 costs in CP4, we have used the same high-level model. We have amended the rates used in the model to take into account the changes in the Schedule 8 regime that came into place in April 2006.

We have used the ICM output to estimate the volume of possessions that we will need to take across CP4 to resource our planned activities. For the purposes of this submission, we have also assumed that we will continue to achieve the following notification profile, which was agreed to

Figure 39 Incentive regime income projections

£m 2005/06 prices	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Schedule 4	(97)	(95)	(91)	(90)	(87)	(461)
Schedule 4 access charge supplement	97	95	91	90	87	461
Schedule 8	-	-	-	-	-	-
Schedule 8 access charge supplement	-	-	-	-	-	-
Total	-	-	-	-	-	-

be efficient in PR2003:

- 50 per cent of all possessions will be booked in sufficient time to achieve maximum discount;
- 40 per cent will achieve intermediate discount timescales;
- 10 per cent will be at the minimum discount.

This mix of notification timescales recognises that a small number of possessions will always need to be taken at short notice to deal with, for example, the impact of extreme weather conditions.

In addition to the core Schedule 4 costs that are calculated from the high-level model, we are also required to compensate operators when there is significant disruption to the network as a result of large-scale renewal and enhancement projects. In these circumstances the payments that we make are either known as "Significant Restrictions of Use" (SRoU) or are made under Part G of the Network Code. We have made a broad assumption on the level of these costs (which does not take account of any benefit that may be achieved by Part G reform) based on our projected renewal and enhancement expenditure.

Our projections show that the core Schedule 4 cost derived from the high-level model is £85 million in 2009/10, with a further £12 million being required for SRoU and Part G payments. In total we therefore expect to pay out £97 million of Schedule 4 costs in 2009/10. The amount we expect to pay reduces to £87 million in 2013/14 based on the volume of work, and is in total £461 million across the five years of CP4.

The regulatory mechanism for Schedule 4 allows for us to recover the expected cost of possessions from franchised passenger operators. This cost recovery mechanism is calculated as a supplement to the fixed track access charges levied on each operator. We have assumed that cost of the possessions derived from the high-level model is efficient, and have therefore assumed that we will receive an access charge supplement equal to the expected cost calculated by the model.

Schedule 8

The Schedule 8 regime is designed to compensate operators for the delays that we cause. The mechanism is designed so that if we cause delay in excess of the performance targets set we will provide compensation to the operators, but if we are able to reduce delay below our regulatory targets we will receive payments from operators for doing so.

In considering the regime in CP4 we have assumed that our plan will exactly achieve the performance targets that will be set. As such, we expect the Schedule 8 regime will be neutral to us in each year of the control period and we have thus assumed no net Schedule 8 cost/income in CP4.

As part of the current regulatory regime we receive an access charge supplement from franchised passenger operators to cover the payments that we expect to make under the passenger's charter arrangements. However, we have seen recently that a number of train operators have been removing themselves from the passenger charter access charge supplement arrangements due to our continued outperformance of the Schedule 8 benchmarks. We have therefore assumed that all operators will have stopped paying the access charge supplement before the end of CP3, and have therefore assumed no income (and no cost to Network Rail) for this in our CP4 projections.

Single till income

Single till covers all other sources of income including our property income, property sales, freight and other open access income, stations and depots income and other income. Our projections of other single till income are included in the figure below. In the following sections we set out how we have calculated our projections for each of these areas.

Property income

Our property portfolio remains core to our business. Our overall strategy is based on the active management of our asset base to ensure a secure income base, while at the same time reviewing the estate and identifying other opportunities that will further enhance our income through the economic use of our surplus property estate.

Our latest projection is that we will receive £218 million of property income in 2009/10, increasing to £227 million in 2011/12, before

Figure 40 CP4 single till income projections

£m 2005/06 prices	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Property income	218	224	227	216	216	1,101
Property sales	26	22	12	14	10	85
Freight income	101	101	101	101	101	505
Open access income	16	16	16	16	16	80
Station income (inc QX)	295	295	295	295	295	1,477
Depot income	47	47	47	47	47	236
Other income	6	6	6	6	6	29
Total	709	712	705	696	691	3,513

reducing back to £216 million 2013/14. In total we expect to receive £1,101 million across the five years of CP4. Our projections have been influenced by a number of factors, set out in the following sections.

Commercial lettings and retail income

Income growth for these portfolios is primarily driven by a mix of investment and organic growth. Investment projects for these mature portfolios are typically small-scale, and are generally based on improving the exploitation of retail space or changing the tenant mix and, in the case of commercial lettings, railway arch refurbishment programmes.

In respect of commercial lettings income we have assumed that organic growth will lead to an annual average increase of 1.2 per cent and that our continuing investment programme will lead to a further growth of 1.3 per cent per year. We will also be looking to exploit opportunities arising from the Olympics, the regeneration of Stratford, and the opening of CTRL Phase 2. We have not yet reflected the potential income from these opportunities in our plans, but will revisit the potential opportunities in future submissions.

Organic growth within our station retail portfolio is projected to lead to an average of 2.5 per cent growth per year, with investment activity generating a further 1.5 per cent of additional income per year. However, it is likely that these figures may be reduced by the installation of revenue projection barriers and congestion relief schemes at the managed stations. Our 2006 Business Plan assumed a loss of £2.5million of retail income per year at Waterloo from 2008/09. We have not yet been able to quantify the potential impact at the other managed stations, but will endeavour to do so in future submissions.

Station development

As mentioned elsewhere in this document we are in the process of producing a station development programme. Our current view is that the station development programme will have a significant negative impact on retail income in the short-term as developments are undertaken and retail units have to be taken out of service. We have reflected this in our income projections for CP4 and CP5.

The station development programme is designed to release value from the property estate and capture much of this value in the form of rail benefits (hypothecated gains). Currently we do not receive any financial benefit from these hypothecated gains and as a result they are treated as a cost to the development. It is too early to fully quantify the value of the anticipated hypothecated gains over CP4 however they are anticipated to be significant; for those schemes that are currently being worked up it is estimated to be in the region of £146 million.

We also expect that our station development programme will have a positive impact on our longer term income. At this stage of the programme development it is too early to be able to quantify this in any meaningful way due to the uncertainty of the scope of developments. On this basis we have not factored any increase into our projections as a result of this programme.

Advertising and other income

Our overall assumption on advertising income is based on the 10-year concession recently agreed with Maiden (since taken over by Titan). The concession is based on a minimum guaranteed rent for both station and roadside advertising. The trigger for exceeding the minimum level is set at an extremely challenging level and would require very high performance on the part of Titan. In consideration of current market conditions we have therefore based our projections of advertising income on the minimum guaranteed level in the contract agreement.

The telecoms market is showing some signs of recovery but income in CP4 is likely to be lower than that assumed in ACR2003 as there is expected to be reduced utilisation of the cable network, and a further reduction in payphone usage as mobile phone usage saturates the voice market. It should be noted that under our internal accounting guidelines we treat telecoms income as "other operating income", and our projections for this are therefore included in our projections of operating costs which are outlined earlier in this chapter.

Property sales

Our property sales strategy is based on maximising sales income subject to protecting longer-term rental income, station clusters and station development opportunities. Our projected sales in CP4 and beyond will be significantly lower than in CP3 as our land bank diminishes.

Our current estimate is that we will receive £26 million of property sales income in 2009/10 falling to £10 million in 2013/14, with a total of £85 million across the five years of CP4.

At this early stage of the station development programme it is assumed that the disposal value of our contribution to station developments will be in the form of rail benefits (i.e. modern stations capable of handling future capacity demands). As a result, there will be neither a cash surplus nor a funding gap requirement as a result of this programme.

Freight income

In addition to receiving track access income from passenger franchised operators, we also receive income from freight operators for their use of our network. In order to calculate our forecasts of freight income we have assumed that the charging

mechanism for freight operators, and the rates paid, will be unchanged in CP4 from that currently in place.

In calculating freight income we have considered the number of freight services that we expect to run on the network in CP4. The demand forecasts that underpin our Baseline plan are shown in Chapter 2. Our Baseline plan projection is that traffic will remain constant in each year of CP4.

We have therefore projected forward our 2008/09 income forecast for each year of CP4. As a result we expect to receive around £101 million in each year of CP4.

Open access income

As well as franchised passenger operators and freight operators, there are a number of open access operators using our network, including Eurostar, Hull Trains and Heathrow Express.

Our underlying assumption on open access is that the majority of open access operators will offer broadly similar services in CP4 as have been offered in CP3. The key exception to this is Eurostar. Our assumption on Eurostar is that all open access income ceases to be received once CTRL Phase 2 is opened in 2007.

The potential impact of the services planned by Grand Central will be reflected in future submissions as details of its operations are developed.

Our current assumption is that we will receive £16 million of open access income in each year of CP4, consistent with the 2008/09 figure in BP2006. We expect to receive a total of £80 million of open access income in CP4.

Stations and depot income

Our projection of station and depots income is consistent with that assumed in BP2006. Other than the impact of the station development programme identified above, we do not expect that there will be any significant change in the level of station long-term charge, station and depot lease income or qualifying expenditure at managed stations in CP4.

Our current view is that we will receive £343 million of station & depot income in each year of CP4, giving a total of £1,713 million.

Other income

We also receive income from the passenger franchised operators for providing services on their behalf (e.g. litter clearance and insurance). Our latest projection is that we will continue to receive around £6 million per year for this, a total of £29 million across the control period.

Enhancement income and supplemental track access income

For the purposes of this submission we have assumed that there will not be any "ring-fenced asset" income from any enhancement projects that we undertake in CP4.

We have also assumed that all existing supplemental track access income will be absorbed in the new fixed track access charges calculated for each operator at the beginning of CP4.

We have made these assumptions on the basis that they are economically neutral. Any income we assume in this category will be compensated by an equivalent reduction in the fixed access income that we would require in CP4. We will, however, revisit these assumptions in future submissions.

Variable access charges

As described above, our variable access income consists of four different sources: variable track access income, capacity charge income, electric asset usage income and electricity for traction (EC4T) usage income. Our projections of variable access income are included in the figure below. In the following sections we describe these income sources in more detail and outline the way we have created our forward projections for CP4.

For the purposes of this submission we have assumed no change in the structure of the variable charging mechanism. We have also assumed that the planned mix of vehicle types on the network that underpinned the final year of BP2006 will be substantially unchanged in CP4. We will revisit these assumptions in future submissions.

Variable track access

Variable track access income is received from franchised passenger operators and is intended to enable us to recover the additional operating,

Figure 41 CP4 variable access income projections

£m 2005/06 prices	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Variable track access income	227	227	227	227	227	1,133
Capacity charge income	7	7	7	7	7	36
Electric asset usage income	28	28	28	28	28	138
EC4T consumption usage income	207	207	207	207	207	1,034
Total	468	468	468	468	468	2,340

maintenance and renewal cost associated with each extra vehicle travelling on the network. The income is driven by the number and type of train services that run on our infrastructure. The calculation is based on the distance travelled and the characteristics of the rolling stock used.

Our Baseline plan assumes no change in the number of passenger franchised operator services expected to be operating in CP4 from the level assumed to be running in 2008/09. We have therefore based our forward projections of variable access income on the figure for 2008/09 included in BP2006.

As a result, our Baseline plan projection is that we will receive £227 million of variable access income in each year of CP4; a total of £1,133 million.

Capacity charge

This income is intended to provide economic signals to franchised passenger train operators about the marginal cost of running additional services on capacity constrained areas of the network.

As our Baseline plan assumes no change in the number of passenger franchised operator services expected to be operating in CP4 from the level on 2008/09, we have based our forward projections of capacity charge income on the forecast for 2008/09 included in BP2006.

We therefore expect to receive £7 million of capacity charge income in each year, giving a total of £36 million across the five years of CP4. This excludes the element of capacity charge which is implicit in the fixed charge.

Electrification asset usage

This income is intended to remunerate us for the wear and tear of our electrification assets due to their use by electrified traction units.

As with variable track access income and capacity charge income, our Baseline plan assumption is that there will be no change on the number of trains operating on the network in CP4. We have therefore used the 2008/09 figure from BP2006 as our projection of the income we will receive in each year of CP4.

This leads to an expected income of £28 million per year, giving a total of £138 million across the five years of CP4.

EC4T consumption usage

In order to achieve economies of scale and to minimise transaction costs we purchase electricity for traction power on behalf of all train operators. The regulatory regime enables us to recover these costs through access charges. The regulatory regime is designed so that we have an incentive to drive down the unit cost of electricity on behalf of the industry by taking the price risk, and the operators have an incentive to be more efficient in their use of electricity by taking on the volume risk.

The cost recovery calculation for EC4T has two key variables: the number of electrified traction units operating on the network, and the movements in market electricity prices. As with the other elements of variable access income, our Baseline plan assumption is that there will be no change in the number of services operating on the network in CP4 (compared to the services predicted to be operating in 2008/09), and no change to the mix of traffic operating on the network.

The mechanism for calculating the rates that we are able to charge the train operators for procuring electricity is linked to the Moderately Large Users Index (MLUI) as published by the Department for Trade & Industry.

In order to estimate the impact of changes in market prices we have undertaken some sensitivity analysis. Our analysis has shown that based on our central view of how prices will change in CP4 the current regulatory mechanism would provide us with a significant over-recovery of costs in each year of the next control period.

On the basis that the regulatory mechanism is designed to be broadly neutral to us over a control period, we have assumed that the calculation will be rebased in 2009/10. As a result we have based our income projections for CP4 on matching the costs that we will incur on behalf of the passenger, freight and open access operators. We will discuss this with ORR before our next submission.

The recovery of freight and open access EC4T costs is covered by our freight income and open access income respectively. We expect to receive £207 million of EC4T consumption usage income from passenger operators in each year of CP4, giving a total of £1,034 million across the five year period.

Disaggregation between Scotland and England & Wales

We have disaggregated our expenditure and income projections between Scotland and England & Wales in order to understand their respective revenue requirements. The disaggregated expenditure and income projections are included in the appendices. This section sets out the methodology assumed.

Expenditure

Our expenditure projections have been derived from the ICM which applies modelling principles consistently across the whole network. Wherever possible, activity and expenditure is forecast at strategic route section level based on the specific assets on the route and the level of traffic. The

disaggregated projections are the sum of the relevant route sections.

However, not all expenditure is directly attributable to route sections and some categories of expenditure need to be allocated to routes using the most relevant metrics. This is particularly the case for activities which are managed at network level. The figure below summarises the elements of cost which are allocated and the metrics that have been used.

Figure 42 Cost disaggregation

Operating Costs	
Route/area operations	Route/area budgets allocated by train km
Engineering / NDS / Safety	Train km
HR	Staff costs (direct and other allocated)
HQ functions	Train km
Pensions	Staff costs (direct and other allocated)
Other controllable opex	Train km
EC4T costs	National costs allocated using electric train km
Other non-controllable opex	Train km
Maintenance	
Off track	National budgets allocated using train km
Civils inspections	Track km
Other network costs	Train km
Renewals	
Machinery	Track km
IT / Other	Train km

Our approach to disaggregation of expenditure is different in some respects to the methodology applied in our 2006 Business Plan, which used assumptions from previous analysis carried out with DfT, ORR and Transport Scotland in the context of separating funding for CP3. In particular, this work assumed that all nationally managed maintenance costs would be allocated in proportion to area budgets, resulting in Scotland's share of total maintenance being 9.3 per cent. This same proportion was used by ORR in their CP4 initial assessment.

The ICM forecasts a higher proportion of total maintenance expenditure in Scotland than the level currently incurred. Further work is necessary to establish the extent to which the emerging figures are valid or whether the ICM methodology needs to be refined. In particular, we plan to review in detail the variation in costs by route category and to evaluate the impact of regional input cost variations.

For the purposes of this submission we have used the core ICM forecasts for CP4 without attempting to calibrate to existing expenditure, except at network level. We have used train kilometres as a cost allocation metric for costs managed at network level, rather than allocating in line with the (higher) estimated proportion of total maintenance expenditure. At present Scotland accounts for 10.2 per cent of total train kilometres.

The overall level of renewals forecast for CP4 in Scotland is above the 'high' figure identified in ORR's initial assessment. This is largely due to the higher proportion of track renewals forecast by the ICM. As noted earlier, we will be undertaking a detailed review of our forecasts by route section to improve the robustness of these figures.

The CP4 maintenance and renewal projections for Scotland in this plan are therefore higher than the levels set out in ORR's initial assessment for CP4. Developing a more robust assessment of activity and expenditure requirements in Scotland is a key priority for the coming months.

There are also some differences in the choice of metrics for allocating operating costs. The previous analysis used total maintenance and renewal expenditure as a metric for allocation between Scotland and England and Wales. The ICM is working at a much lower level of disaggregation, 300 route segments, so it is not appropriate to use a metric involving renewals expenditure, which, at route section level, is highly variable from one year to the next. For the purposes of this submission we have used train kilometres as the allocation metric.

Income

For the purposes of this plan, we have broken down our national income forecasts on the same basis as we prepared the 2006 Business Plan. Details of the methodologies we have used are included in the figure below.

Figure 43 Disaggregation methodologies

Variable track access income Capacity charge EC4T income Electric asset usage	ScotRail income allocated to Scotland all other operators allocated to England & Wales
Schedule 4	% of maintenance & renewals spend
Freight income	% of freight miles planned
Open access income	All in England & Wales
Station income	% of stations in each country
Depots income	% of depots in each country
Property income Property sales	% split agreed with DfT and Transport Scotland
Other income	-

This does not include fixed track access charges and grants, which are discussed in Chapter 7.

Outputs

Traffic volumes

In the Baseline plan, additional traffic (other than changes already committed) can be run on the network only if it is self-financing, and can be accommodated within the capacity of the existing network (plus committed enhancements).

Passenger traffic

We believe that there is very little additional passenger traffic that could meet both these criteria, particularly on those parts of the network and at those times of day in which the need to accommodate growth is most pressing. Providing extra capacity for peak services generally does not pay for itself in purely financial terms (even were there to be capacity on the network), because the extra fares revenue is outweighed by the cost of extra rolling stock that may only be used for a few hours each day. And although there may be a purely financial case for extra long distance services on the most heavily used routes (such as ECML and WCML), these are routes on which, by the end of CP3 if not before, there will be little or no spare capacity.

We have therefore assumed that, in the Baseline plan, passenger traffic on the network, that is, the number and length of passenger trains run, remains constant after the end of CP3.

Freight traffic

Freight traffic operates on a purely commercial basis. The forecasts of rail freight growth being used in the Freight RUS, and summarised in Chapter 2 of this document, are of traffic growth that is expected to be commercially viable. In the Baseline plan, therefore, the constraint on freight growth is the extent to which it can be accommodated within the capacity and capability of the existing network.

This is a complex issue. The extent to which growth can be accommodated depends on a number of factors including whether:

- there are spare freight paths in the existing timetable;
- these paths are at suitable times of the day and/or week;
- additional paths could be made available; and
- longer trains could be run.

In addition, freight flows often run across a number of different routes, thus requiring coherent paths to be found on each route.

A lot of work is therefore often needed in order to understand the extent to which the existing network constrains growth. Much of this work is ongoing in the Freight RUS; and such work will also be needed for the development of business cases for specific freight-related enhancement schemes.

For purposes of this plan, we have used the detailed work to date in the Freight RUS to identify what are likely to be the most significant constraints to freight growth; and have attempted to estimate, using a high level approach, to what extent these constraints would reduce growth.

Based on the work to date in the Freight RUS, the key constraints on growth in the Baseline plan are:

- Glasgow South – Western and Settle and Carlisle lines;
- Specific sections of the West Coast Main Line between Carlisle and Stafford and Rugby and Wembley;
- East Coast Main Line between Finsbury Park and Doncaster;
- Great Eastern Main Line;
- Felixstowe to Peterborough;
- Hare Park Junction to South Kirkby Junction;
- Manchester Piccadilly to Deansgate; and
- Barnetby to Scunthorpe.

Although these constraints have been identified from detailed work already done in the Freight RUS, this work has not estimated the potential combined effect of these constraints on freight growth.

For purposes of this plan, we have therefore used a high level approach of constraining growth on these parts of the network in line with the current Working Timetable (WTT). The nature of the freight business makes it infeasible to utilise all the paths that are theoretically available in the timetable. Whilst current utilisation of paths varies across the country and between commodities, average utilisation is around 50 per cent of paths. For this exercise, we have assumed that, with growth and efficiencies, 75 per cent of paths would be utilised. We have therefore identified flows which could be accommodated if we applied the rule of thumb that train numbers would be limited to 75 per cent of current WTT paths, with the exception of those specific flows where our planners believe that more trains can be accommodated.

The results of this exercise were that freight traffic was constrained to a level broadly similar, at a national level, to that which we expect to be reached by around the end of CP3. This should not be taken to mean that, after 2008/09, we do not expect to accommodate any further freight traffic anywhere on the network. The exercise described above was inevitably a high level piece of analysis, which could not take account of all of the specific issues that would need to be considered by more detailed work. And there are likely to be some parts of the network on which additional traffic could be accommodated for some time to come.

However, taking the network as a whole, this exercise did indicate that the existing capacity and capability of the network will substantially constrain freight growth within a relatively short timescale. This is consistent with the fact that much of recent freight growth has been, and much of future growth is anticipated to be, on flows that use some of the most heavily constrained parts of the network, such as the ECML, WCML and Great Eastern Main Line.

For purposes of this plan, and without prejudice to the more detailed work being undertaken in the Freight RUS and in developing business cases for specific schemes, we have therefore assumed that, at a national level, freight traffic in CP4 will be at a similar level to that reached by the end of CP3. In order to model the effect of traffic growth on infrastructure costs, and on performance, we have therefore held freight traffic constant from the end of CP3 onwards.

Asset stewardship measures

Although our understanding of the relationships between activity and asset stewardship output measures has continued to improve over the last year, we are not yet at a stage where we can predict outputs with complete confidence. This is partly because these output measures are not solely driven by the absolute volume of maintenance and renewal activity. They are also affected by the quality of work carried out and the extent to which it is accurately targeted. Various external factors, the impacts of which are not completely controllable, also contribute to the uncertainty. Weather is the most significant of these external factors.

In this plan our forecasts for CP4 assume continuing incremental improvements on the levels forecast for CP3. However, we will continue to challenge ourselves and are working to achieve step changes in asset performance in some areas. This would enable us to deliver further improvements in operational performance and capacity. Improved asset performance will also help drive efficient maintenance and renewals as, for example, we will be able to reduce the level of reactive and repeat work. This in turn will support the move towards delivering a seven-day railway. We will be developing a more robust view of the potential for improving asset performance alongside our efficiency plans as part of our world class transformation programme.

As described in BP2006, we are forecasting a continued improvement in each component of the asset stewardship incentive index through to the end of CP3. Since the publication of BP2006, we have reduced our forecast of signalling and electrification failures to take account of out-performance against our targets in 2005/06.

For the signalling equipment failure measures, we are forecasting continuing reductions of five per cent a year throughout CP4. We are carrying out further analysis on the practicality and cost-effectiveness of delivering more challenging reductions in the number of failures. For electrification failures we are forecasting further improvements of one per cent a year in CP4.

We have achieved substantial reductions in broken rails over recent years and it is possible that further significant reductions may not be cost effective. We are therefore forecasting further reductions of about two per cent a year, driven by the gradual reduction in average rail age resulting from our renewal programme and the continuing impact of improvements in inspection and maintenance. Similar improvements are anticipated in other track outputs.

For structures and earthworks TSRs, in CP4 we have estimated the network total number of TSRs as a weighted average of the expected number of TSRs under each civils asset policy (A, B or C). These weightings have been derived using the network total volume of assets to which each civils asset policy has been applied.

We believe that the gradually improving trajectory of target output measures shown in the appendices is realistic and achievable. Development of version 2 of the Infrastructure Cost Model over the coming year will lead to a greater ability to model the critical input-output relationships and this will, in turn, inform development of the High Level Output Specification (HLOS) as part of PR2008.

Capacity and crowding

In the Baseline plan the railway will be unable to accommodate the levels of growth described in Chapter 2. This will be reflected in a mixture of increased crowding and, where crowding is sufficiently severe, reduced growth in passenger numbers.

London and South East services

In the London and South East (L&SE) peak, levels of crowding will increase well beyond acceptable levels.

It is difficult to make precise projections of crowding measures, such as %PIXC, as they can be sensitive to the detailed design of timetables, and will be affected by the extent to which passengers choose to travel earlier or later in response to crowding.

However, to illustrate the likely scale of crowding in the Baseline, we have assumed that we can maintain crowding broadly at existing levels for the rest of CP3, then provide no more capacity thereafter, while peak demand grows at two per cent per year.

This indicates that, by the end of CP4, all of the train operators in the South East would breach the current crowding standards. The proportion of passengers in excess of capacity (%PIXC) would range from 3.6 to 10.7 per cent, against a standard of three per cent. The number of passengers standing would rise in the morning peak from 70,000 in 2004 to approximately 130,000 by the end of CP4; and in the evening peak from 29,000 to approximately 67,000. We estimate that on this basis, of the additional morning peak passengers accommodated between now and the end of CP4, 70 per cent would have to stand.

Such levels of crowding would increasingly choke off growth in demand. For example, analysis for the South West Main Line RUS predicted that unconstrained growth in peak demand, over ten years, would be of the order of 23 per cent if no measures were taken to accommodate it, growth would be only 19 per cent. By the end of CP4, crowding would therefore be deterring a significant proportion of potential growth.

Long distance services

An increasing number of long distance services are already full or close to full. The expected growth in demand, of close to 50 per cent in 10 years, could not therefore be accommodated in full under the Baseline scenario. The outcome would be a mixture of impacts on crowding, demand and fares.

There would probably be an increase in standing on trains that also serve commuter markets, on which some passengers may reluctantly put up with standing as the price of a quicker journey.

However, leaving this market aside, standing is not a realistic or acceptable option for most passengers on long distance services. Train operators would seek to manage capacity, by combinations of cheap off-peak fares and ticket restrictions on peak services. However, there is a limit to the extent to which demand can be moved to off-peak trains, so some of the potential growth would inevitably be lost to rail.

A lack of capacity, in a market with generally unregulated fares, would also be expected to lead to average fares rises above that assumed in the demand forecasts (RPI + one per cent).

Forecasting the mix of these impacts is difficult, as standard industry demand forecasting tools are not designed to address issues such as fares management. To forecast with any precision would require knowledge of train by train loadings, and of the extent to which operators can match demand to capacity through fares management, both of which are commercially confidential to operators who compete with car, airlines and (in some cases) each other. Further work would therefore be required, in conjunction with operators, in order to quantify these impacts.

Regional services

The Baseline scenario would see increasing amounts of localised crowding on regional services, particularly on peak hour services approaching major cities. For example, the West Midlands RUS identified that, under a "medium" growth scenario, if no action were taken to increase capacity, Centro's crowding standards in the busiest peak hour would be breached before 2011.

This crowding could be expected to constrain growth to some extent on particular routes and at peak times of day. However, the impact on aggregate demand growth in this sector would be likely to be less than for London & South East or for long distance services.

Scotland

The Baseline scenario would see increasing amounts of localised overcrowding on certain services, particularly around Edinburgh and Glasgow. At peak times of the day this crowding may constrain growth on particular routes. Based on the published Scottish Planning Assessment, these are likely to include services on the main Edinburgh to Glasgow route, between Fife and Edinburgh, and between Paisley and Glasgow.

Performance

The improvements in asset condition and outputs, described above, will drive corresponding improvements in train performance. We would also expect continuing improvements in non asset-related sources of delay, in incident management, and in delays attributable to train operators.

Taken together, these improvements might give similar performance improvements to those described in the Base Case plan in the next chapter, were it not for the impact that passenger crowding levels would be likely to have on performance.

As described above, by the end of CP4 levels of crowding would rise significantly. This would inevitably have a substantial effect on performance. As trains become more crowded, the time taken at stations for passengers to board and alight from trains increases significantly, as the presence of passengers standing in doorways and in aisles (and in increasing numbers on platforms) obstructs the free flow of people.

To attempt to quantify this with any accuracy, particularly at levels of crowding that would be beyond anything previously experienced, would require a substantial amount of data collection and modelling work. However, based on our operating experience, we believe that the effect would be significant.

For example, on London and South East services, a train "fails" on the PPM measure if it arrives five or more minutes late at its destination. If the effect of increased crowding were that, on each route into London, one extra train in the morning peak, and one extra train in the evening peak, failed against the PPM measure, then this would reduce PPM across the network by approximately 0.1 per cent. Operating experience, for example during times of disruption to the network (when train loadings can be unusually high), suggests that the effect of crowding in the Baseline plan could be much greater than this.

When the impact on services in other sectors (i.e. long distance and regional services) is also taken into account, there is clearly the potential to negate a substantial proportion of performance gains that might otherwise be made over CP4. A further complication is that, in this situation, it might in practice be preferable to increase scheduled journey times in order to maintain service reliability.

Because of the uncertainty over the effect of crowding, we have not attempted to quantify the expected level of performance in CP4 under the Baseline plan.

Safety

We are supporting RSSB in the development of a projection of possible improvement in safety on the railway. This is due for publication in January 2007. We are also working with DfT and RSSB on the development of the HLOS safety metric, based upon a measure of risk on the rail network, not just risk directly controlled by Network Rail. In light of these developments we have agreed with ORR that the inclusion of a safety output projection in this Initial Strategic Business Plan would not add any value to the regulatory review process. The inclusion of risk reduction projections would, at this stage, be both aspirational and without a Baseline comparator.

For the next significant submission in October 2007 we are planning to develop a costed plan to deliver safety improvements, measured by improvement in the HLOS safety output measure, as follows:

- for each area of safety risk, identify specific costed safety initiatives, across the industry, and the related reduction in risk;
- identify within each risk area, the improvements which will be obtained as secondary benefits of other output improvements, for example the reduction in broken rails; and
- for each risk area, project the additional continuous improvement in risk which might be extrapolated from recent improvements across the industry and cost these using a value per fatality (VPF) approach.

These factors will be aggregated and reviewed in order to provide an industry based projection of safety risk improvement, in line with the anticipated HLOS requirement.

In addition consideration will be given to any emerging legislative requirements which might give rise to additional capital expenditure without significantly reducing the safety risk profile.

The key enablers which will facilitate this approach are:

- to extend Network Rail's safety improvement planning horizon during the next business planning round;
- RSSB developing and publishing an industry wide strategic safety plan in early 2007;
- satisfactory progress in defining the HLOS measure.

Supporting documents

We are providing the ICM and the performance model to the ORR..

6. The Base Case plan – responding to growth

This chapter describes the Base Case plan. This plan is intended to help inform discussions with government on the development of the HLOSs. The HLOSs will specify the outputs required in CP4 in terms of metrics covering capacity, reliability and safety. This plan therefore seeks to set out the options to provide the capacity needed to accommodate a reasonable projection of growth in passenger and freight demand whilst delivering sustained good performance at or above the level we plan to achieve by the end of CP3.

This chapter describes:

- our approach to the accommodating growth and the process of analysis adopted;
- the key constraints to growth on the network today;
- the proposed route strategies to respond to the growth forecast, summarised at a sector level;
- the major enhancement projects within the Base Case plan;
- the activity volumes and expenditure forecast in summary and key differences to the Baseline plan;
- our income projections; and
- the expected outputs

Our approach to accommodating growth

The Base Case plan sets out a strategy to respond to the forecasts of unconstrained growth outlined in Chapter 2. In developing this strategy, as with our RUS process, we have sought to understand and reconcile:

- the existing infrastructure and the train services that currently use it (see Chapter 2);
- the forecast of demand of passenger and freight customers that in future would wish to choose to travel by rail (see Chapter 2);
- the translation of this demand into the potential demand for trains services on the network (this chapter);
- the gaps in the ability of the infrastructure to accommodate this traffic demand in terms of the impact on performance and capacity (this chapter); and
- the identification and assessment of options for closing the identified gaps (this chapter).

Our planning work uses a common toolkit of options for addressing possible gaps or shortfalls between the demand and supply for rail travel on parts of the network. We recognise that some of the toolkit solutions will clearly not address the gap, depending upon the specific nature of the route and the gaps. However the approach allows a systematic, incremental and consistent approach across the railway which is focussed on the ultimate service to passengers and freight users.

The current toolkit considers changes to:

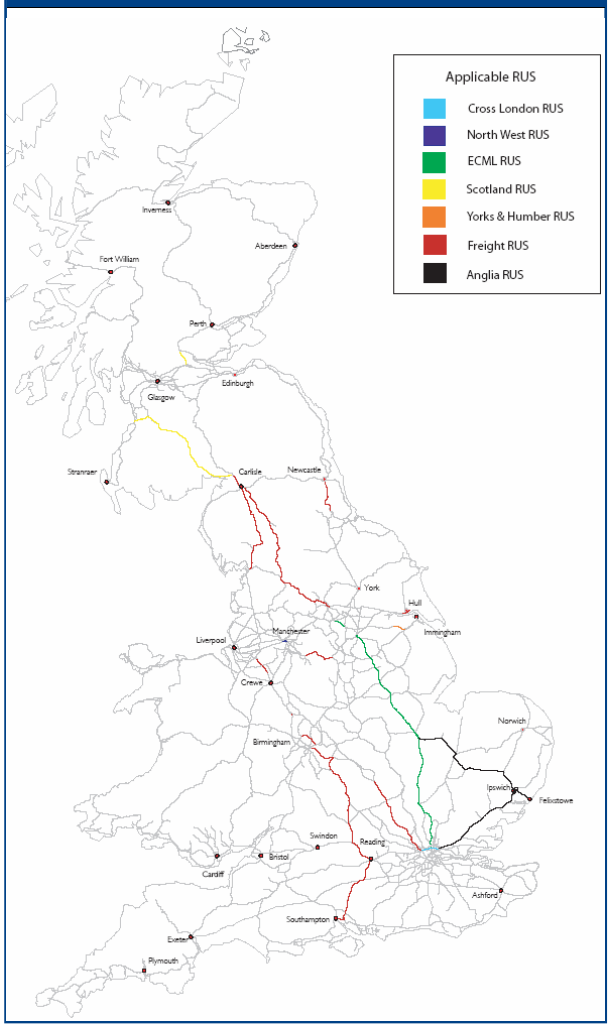
- demand management measures;
- the mix, frequency and length of trains;
- the deployment and configuration of rolling stock; and
- the infrastructure.

This toolkit has been used in developing options and strategies for each route on the network contained in this plan.

Key constraints to growth

The most severe capacity constraints are centred around the approaches to London, followed by capacity constraints on the main north – south routes of the West Coast (WCML), East Coast (ECML) and Midland Main Line (MML). There are also a number of regional hotspots centred on Birmingham and Manchester, and on the North Transpennine corridor (see the CUI map in Chapter 2).

Figure 44 Freight key capacity constraints



The complex nature of freight movements on the network means that freight capacity constraints are not easily highlighted by the CUI approach. Localised constraints exist on a network-wide scale. The map of capacity constraints illustrates the constraints on the network compared to the long term traffic forecasts developed by the Freight RUS. Strategic constraints include lack of capacity for Anglo-Scottish coal movements on the Settle to Carlisle line and for the growing demand for maritime container services from south east ports on the Great Eastern and East Coast Main Lines.

Mitigation measures to address these constraints will initially concentrate on timetable solutions. A good example is the recent re-timetabling of the Settle and Carlisle line, which has created significant capacity for freight traffic. Examination of detailed timetabling options to optimise use of existing infrastructure is part of our timetable development process.

Route strategies

Set out below is a summary of the issues by sector and options to address these issues that we have included in our plan, based on the RUS toolkit approach. These are also summarised in the table below.

London and the South East

Across London and the South East (LSE) the key issue is peak carrying capacity to support the commuting market into central London and the high load factor experienced on key routes into London.

Figure 45 Responding to growth - RUS interventions by passenger sector

		RUS interventions				
		Demand management	Rolling stock configuration	Longer trains	More trains	Infrastructure enhancements
Sector	London & South East	Possible in the short term but doesn't address growth.	Possible in the short term but doesn't address growth.	Yes but requires platform lengthening.	Not generally without significant infrastructure enhancements.	Yes. Key schemes include: Major programmes & route upgrades: Thameslink programme West Anglia route development North London Line enhancements Platform extenions, track layout & power supply upgrade to facilitate longer trains: 12 car operation Hayes route, Tonbridge-Hastings, Dartford-Rochester, Sevenoaks 10 car operation BML / Sussex route suburban area 10 and then 12 car operation on SWML route suburban area 12 car operation East Grinstead line 8 car operation Uckfiled line Key station & junction works: Waterloo Masterplan Clapham Junction remodelling & station capacity Reading station remodelling Paddington station capacity enhancements Gatwick station remodelling West Croydon remodelling East Croydon station capacity
	InterCity	Yes. Levels of fares is a major determinant of demand in this market.	No.	Yes.	Yes but will require key capacity constraints to be addressed.	Yes. Key schemes include: WCML: Stafford re-modelling (baseline) Bletchley - Milton keynes (baseline) Power supply (baseline) ECML: York to Leeds Horseshoe electrification Hitchin - Cambridge Junction grade separated junction Shaftholme Jn re-modelling Kings Cross platform Y ECML level crossings ECML power supply Peterborough station redevelopment Wakefiled Westgate longer platforms & loops York Holgate Junction 4th line Hertford loops GWML: Paddington station capacity enhancements Reading station remodelling
	Regional	Possible intervention in conurbations.	Possible intervention in conurbations.	Yes	Yes	Limited infrastructure enhancements primarily in conurbations. Key schemes include: Platform extensions, track layout & power supply upgrade to facilitate longer trains: West Midlands area North West urban area Birmingham New Street station redevelopment Liverpool Central passenger capacity Manchester Airport 3rd platform

In the short term peak demand management measures could provide limited opportunity to encourage passengers to alter their travel patterns. However many passengers have limited opportunity to change their travel patterns in the short term and this will not provide a sustainable solution to the expected growth and associated crowding problems anticipated.

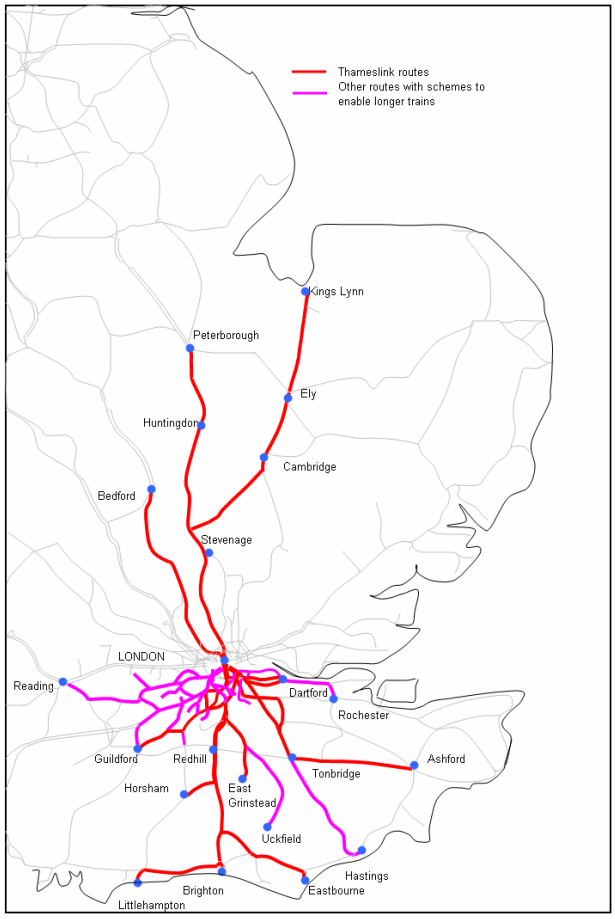
Other short term measures include the re-deployment and re-configuration of rolling stock to provide additional standing capacity but again this is not considered an appropriate long term solution.

Given the limited and route-specific opportunities to run additional trains in the peak, the core strategy in the short to medium term is the lengthening of existing services on the major commuter routes and the infrastructure works required to facilitate this, such as platform lengthening.

The most pressing routes that require train lengthening are:

- Routes in Kent including Dartford, Hayes, Tonbridge – Hastings, Dartford – Rochester , and Sevenoaks (12 car);
- Brighton Main Line suburban services (10 car);
- East Grinstead line (12 car);
- Windsor and Reading lines (10 and 12 car options);
- Tilbury Loop (12 car); and
- Midland Main Line (8 car and then 12 car with Thameslink).

Figure 46 Proposed train lengthening for L&SE



In the medium to longer term further growth requires key capacity constraints to be addressed such as London Bridge, Waterloo and Clapham Junction.

The Thameslink Programme is the most significant project, in terms of scope and cost, within the Base Case plan. It is a key project aimed at providing additional capacity and crowding relief on London commuter and London Underground services.

Long distance intercity

The long distance intercity market is the passenger sector with the strongest potential demand over the next ten years. It is a market that is more sensitive than the commuter market to the level of fares and the assumptions about fare regime is a key variable in the level of demand. For the purpose of this plan and our demand forecasts we have assumed an RPI+1 per cent per annum fares increase.

At the southern end of the three main north-south lines (WCML, ECML and MML) there are high levels of utilisation and limited scope for additional trains. Likewise on the GWML, the section between Paddington – Reading is severely constrained.

The situation and proposed strategies are route specific. The WCML is nearing the end of a major route modernisation with a significant timetable change planned for 2008. Further growth in the short – medium term is likely to be accommodated by train lengthening.

The ECML is subject to an ongoing RUS. Analysis suggests that a number of solutions are possible including timetable changes and a series of schemes to improve capacity and performance.

On the MML growth can be met mainly by train lengthening and timetable improvements.

Timetable alterations will provide more capacity on the Reading – Paddington corridor but additional platform capacity at Paddington and Reading will be required.

Regional

Growth in the regional markets is strong but from a generally low base and a wide variability across the sector. Most growth can be accommodated by existing train capacity or train lengthening without significant infrastructure enhancements.

There are a few key capacity constraints around major conurbations such as Birmingham and Manchester. The North West RUS will examine options for providing additional capacity in the north west urban area. Likewise a series of options have been identified through various studies of the West Midlands and train lengthening and timetabling changes are being developed. The proposals under development to address pedestrian capacity at Birmingham New Street are included in this plan.

Scotland

The Scottish Executive set out its transport objectives in the 2004 Transport White Paper. The primary objectives were to promote economic growth, social inclusion, health and protection of the environment through a safe, integrated effective and efficient transport system.

In support this objective, Transport Scotland has identified seven major rail projects:

- Larkhall to Milngavie;
- Stirling / Alloa / Kincardine;
- Edinburgh Waverley re-modelling;
- Airdrie to Bathgate;
- Edinburgh Airport Rail Link (EARL);
- Glasgow Airport Rail Link (GARL);
- Waverley Railway.

The Larkhall to Milngavie project has been completed and construction is underway for Stirling / Alloa / Kincardie and Edinburgh Waverley. The four other projects have yet to be awarded. A summary of these four projects is provided later in this chapter.

There are a number of key capacity constraints around the major cities of Edinburgh and Glasgow. The Scotland RUS will include options for providing additional capacity in these areas.

Freight

The Freight RUS has developed industry generated forecasts for the next ten years by commodity. The RUS has also identified the key capacity and capability constraints to accommodating this traffic on the network. Options for addressing these constraints have been developed and will be subject to consultation through the RUS process. Schemes under consideration include Anglo-Scottish capacity, Southampton – West Coast, Felixstowe – Nuneaton and North London Line enhancements.

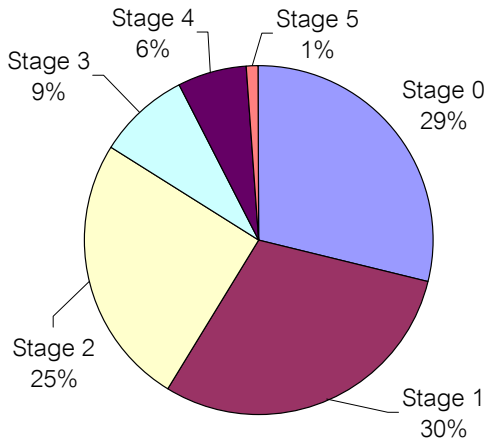
The Freight RUS will complete in 2007.

Major enhancement projects

The following section provides a summary of the major projects included within the Base Case plan for CP4. The Base Case plan contains route strategies and projects designed to provide additional capacity to respond to the challenge of accommodating more growth and traffic on the network. Further detail can be found in the supporting project summary document.

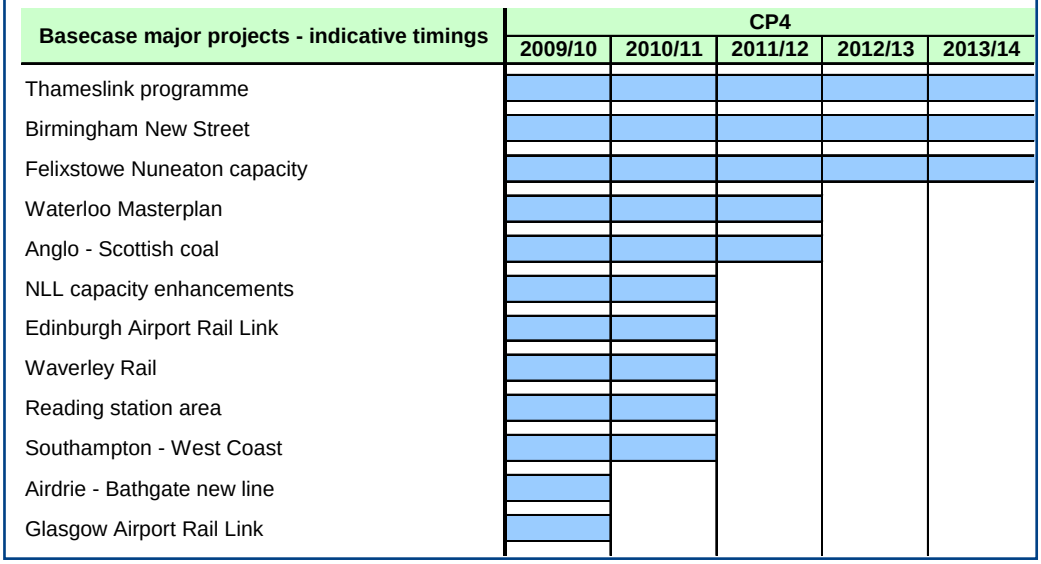
At this stage many of the projects are in the developmental stage and are subject to further design and costing work and agreement to funding for their implementation. The chart below provides a summary of where the proposed projects are in their project life cycle as defined by our Guide to Railway Investment Projects (GRIP) process.

Figure 47 Proposed enhancements – stages of development



The chart below is our view of the broad timescales for the potential implementation of the major enhancement projects A summary of the major projects contained in the plan follows.

Figure 48 Indicative phasing for major enhancement projects



Thameslink programme

The Thameslink programme has been developed to provide a major expansion of cross-London services. It will increase capacity on the vital rail link through central London resulting in better connections to destinations across the south east and south midlands.

The main features of the scheme are:

- the capability to operate 24 trains per hour through the central London in the peak periods between the new St Pancras Thameslink station and a reconstructed Blackfriars station;
- the connection of the existing Thameslink route to the Great Northern Line at King's Cross;
- the provision of an all day high frequency service between St Pancras and London Bridge;
- provision for 12 car trains; and
- the London Bridge station masterplan and resignalling works.

The scheme creates new train paths between London Bridge and St Pancras Thameslink. The scheme also involves substituting existing services and creating only a small number of new services. The services will be created by joining services that currently terminate at London Bridge, Blackfriars and Cannon Street in the south, with services that currently terminate at Moorgate and King's Cross in the north.

The new rail system will deliver 50 per cent more on-train capacity through the core with the potential for 20,000 additional seats in each three hour peak to and from London through the provision of longer trains. The key benefits will be to:

- reduce overcrowding on Thameslink and other London commuter services;
- reduce overcrowding on the Underground;
- reduce the need for interchange between mainline and underground services;
- provide for the introduction of new-cross London services including access to areas of expected demand growth such as London Bridge, Docklands, King's Cross and London's airports;
- facilitate the dispersal of passengers from St Pancras following the completion of the Channel Tunnel Rail Link.

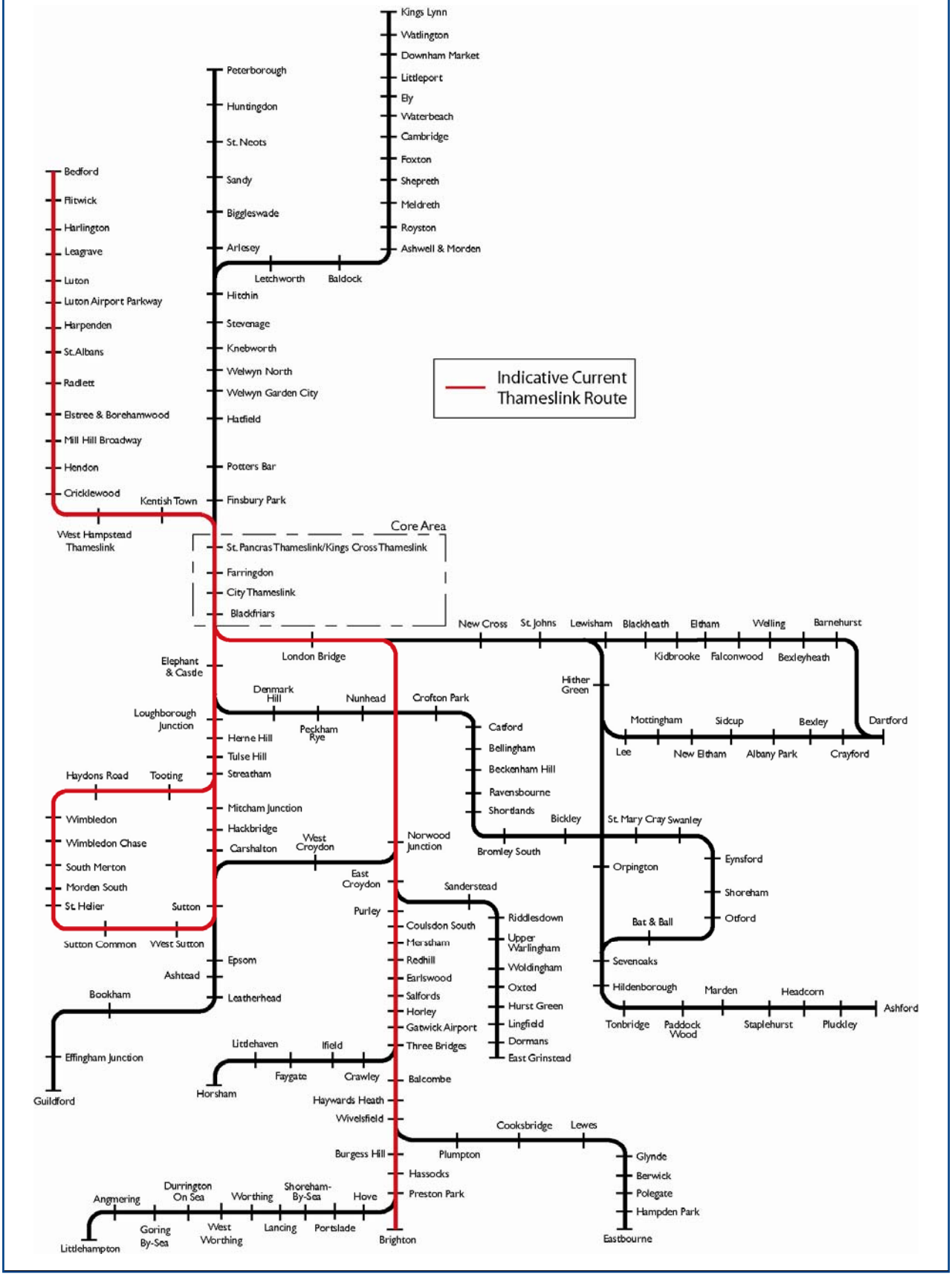
The DfT is responsible for defining the required outputs of the project and its business case justification. We are responsible for defining and delivering the emerging functional requirements related to the upgrade of the infrastructure and associated changes to the infrastructure operations and maintenance. Train operating companies will procure rolling stock, provide station staff and train crew as well as other TOC related infrastructure services.

The overall programme for delivery of the Thameslink project is under review between us and the DfT in order to ensure better resource management, improved risk mitigation and integration with our core renewals programme and reduced disruption to the travelling public.

The major infrastructure works include:

- new signalling and systems in the central London area;
- fit out of new tunnels from St. Pancras to ECML;
- reconstruction of Blackfriars and Farringdon stations;
- new two track viaduct at Borough Market to double the number of tracks to four;
- reconstruction of London Bridge station;
- track re-modelling in the central area;
- work outside the central area will include platform extensions and re-modelling and power supply reinforcement;
- over fifty stations will be affected.

Figure 49 New Thameslink network



London Waterloo

The project is currently subject to a TWA Inquiry, with the Inspector's report with DfT. A decision is expected later this summer.

The SWML RUS identified Waterloo as the key capacity constraint on the route, both in terms of concourse and platform capacity. We have examined a number of incremental options for the station but, given the current levels of crowding and the growth expected, the RUS concluded that significant works were required to redevelop the station, including the Waterloo International Terminal, which would double the concourse capacity and extend all platforms to accommodate at least ten-car trains. Remodelling of the station and, eventually, the track on its approach was recommended as the cornerstone of the strategy for the SWML.

The redevelopment of Waterloo station is a key step towards the operation of longer trains – first ten cars, later twelve – across the suburban network. It was recommended that the entire suburban network is extended for ten-car operation by 2014, beginning with the Windsor and Reading lines which are the most crowded.

Clapham Junction Remodelling

Track layout changes to provide straightening of platforms 14 to 17 and lengthening of all platforms is proposed to facilitate train lengthening. In addition the provision of additional passenger capacity and improved access by rafting over the station and providing a new entrance to the station. Remodelling of the depot access would be required due to the extension of platforms 7 and 8.

Reading station area

The station area has been identified as a key constraint in the SWML RUS. To deliver improvements at Reading it is necessary to re-model the track layout to minimise conflicting moves and provide more platform capacity, particularly through platforms. The delivery of this work will be achieved by taking a scheme developed and funded through Reading Borough Council (RBC) and undertaking Network Rail enabling works to allow the scheme to be implemented. These enabling works consist of modifications to the track and signalling and relocation of the existing signal box to the Thames Valley Control Centre. The enabling works are a combination of renewals and enhancement expenditure. The work is targeted for completion in 2010. The scheme as currently conceived is not able to be delivered without funding support by RBC.

North London Line enhancements

There is demand to operate additional passenger services by TfL on this corridor as part of its London Rail Concession. There is also demand for additional freight services on the North London Line corridor. However there is limited capacity to accommodate further services. The Cross London RUS is examining options to provide additional capacity including improved headways, four tracking and loops in order to provide for growth.

Birmingham New Street

Birmingham New Street is one of the biggest and busiest rail stations in the UK, and the hub of the local and national rail network in the West Midlands. We are working in partnership with Birmingham City Council, Advantage West Midlands and Centro to progress the development of the Birmingham Gateway project. The proposals would provide a significantly larger concourse area, with airport style departure lounges, and more than double the vertical access capacity between the concourse level and platforms, including direct lift access to each platform. On the platforms themselves, obstacles would be cleared to provide more space for passengers.

In addition to the internal station redevelopment works, the exterior of the station building would change. Under the Gateway proposals there would be significant works to the exterior of the building and the retail above to provide a striking addition to the city's built environment. It is anticipated this would be funded by a mix of public and private funds. We are working closely with the relevant stakeholders to enable decisions to be made about the future of the project.

West Anglia Route Development

We are examining with BAA options for the enhancement of the route to support the expected growth in demand for Stansted related traffic. A number of proposals are being examined including a second rail tunnel at the airport, platform extensions at Liverpool Street, Stansted, Bishop's Stortford and Tottenham Hale, power upgrade to support 12 car trains, signalling upgrade and gauge clearance work. The Greater Anglia RUS will examine the merits of these proposals.

Airdrie to Bathgate new line

This is one of a number of major enhancement projects described below being funded by Transport Scotland to deliver their transport objectives.

This project will provide a fourth direct rail link between Glasgow and Edinburgh. This involves the re-opening of the line between Drumgelloch and Bathgate and redoubling the Airdrie / Drumgelloch and Bathgate / Newbridge sections.

The line will bring benefits to the central belt of Scotland providing connections to Edinburgh and Glasgow. New stations will serve the towns of Caldercruix and Armadale, while the new town of Livingston will have an additional direct rail link to Glasgow.

Glasgow Airport Rail Link

Passenger numbers at Glasgow Airport are forecast to increase from the current 8.1 million per annum to 15 million in 2030. This projected increase has resulted in pressure to provide a sustainable transport link to the Airport from Glasgow city. Following a number of studies a heavy rail link has been proposed to achieve this and the associated plans are at an advanced stage.

The selected alignment for this link is to construct a branch from Paisley St James, on the Paisley Gilmour St to Gourock line, into the Airport. A dedicated four train per hour service will operate to the Airport from Glasgow Central High Level. This level of additional service drives a requirement to enhance the existing network at Glasgow Central High Level station and between Shields Junction and Paisley. Strathclyde Partnership for Transport and Transport Scotland are funding the project which is planned for completion in 2010.

Edinburgh Airport Rail Link

Passenger numbers at Edinburgh Airport are forecast to increase from the current 7.5 million per annum to 20 million in 2030. This projected increase has resulted in pressure to provide a sustainable transport link to the Airport from Edinburgh city centre and the rest of Scotland. Following a number of studies a heavy rail link has been proposed to achieve this and the associated plans are at an advanced stage. The proposals are being developed by transport initiatives edinburgh (tie).

The selected alignment for the heavy rail link is to construct a new section of alignment for the main Edinburgh to Glasgow route approximately three miles in length that will allow them to be diverted via the Airport. Additional chord lines are also planned to connect with this new alignment and allow access to the airport for services to and from Fife and the north of Scotland. City of Edinburgh Council and Transport Scotland are funding the development of the project which is planned for completion in 2011.

Waverley Railway

The proposals to re-instate the former Waverley Railway route from Newcraighall (terminus of the current Edinburgh CrossRail service) to Galashiels and Tweedbank, a distance of some 25 miles, has now been approved by the Scottish parliament. A consortium of City of Edinburgh, Midlothian and Scottish Borders Councils and Transport Scotland are funding the development of the project.

Providing the necessary funding can be secured, construction will commence in 2007 with completion planned for 2011.

Freight schemes

As with all RUSs, the Freight RUS has examined the growth potential for traffic and is examining the gaps in the network's capacity and capability to accommodate this growth. The Freight RUS has identified options for the short and medium term and those for the longer term (2014/15 and beyond). Most options are, however, subject to further review of the business case and potential funding.

A key market is the movement of Anglo-Scottish coal. A package of work has been identified to provide additional capacity to accommodate future growth in this market including partial re-doubling of Gretna – Annan.

Felixstowe – Nuneaton capacity is also a key scheme to move freight over the network and crucially, will provide an alternative route to the congested GE and NLL routes, and will provide additional capacity for traffic between Felixstowe port and the West Midlands.

Also under consideration is the provision of W10 gauge capability between Southampton and the WCML through the replacement of overbridges and track slewing plus track lowering through Southampton tunnel.

We are discussing with ORR, operators and funders the arrangements for freight charging and the options for funding these potential enhancements.

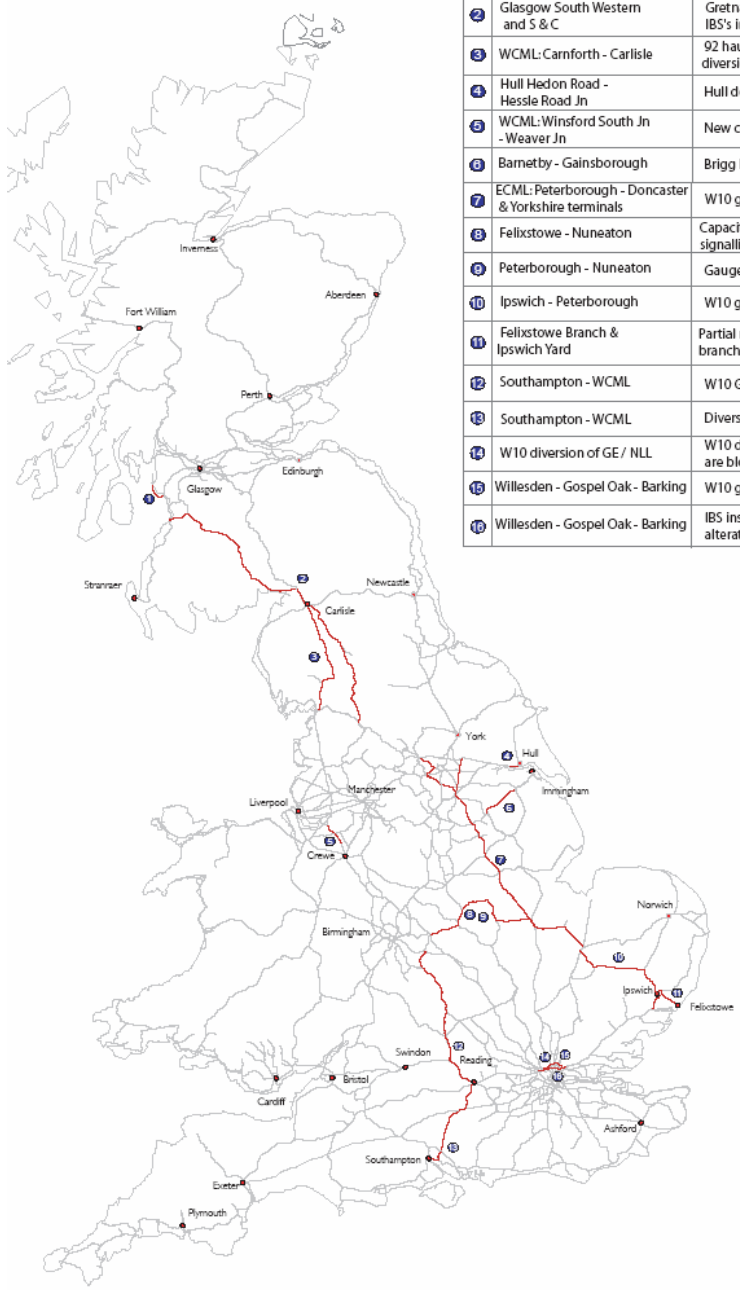
Discretionary funds

We have included a provision of £50 million per annum for the continuation of the Network Rail Discretionary Fund (NRDF) into CP4. This provides us with funding to exploit synergies with our renewals schemes, particularly for track and signalling, to provide enhancements in the most cost-effective way.

We have also included an allowance of £50 million per annum for expenditure on safety and environmental projects. Further work is required to develop the portfolio of schemes that would utilise this funding. However we aware of emerging issues that may require significant funding, for example the developing EU noise directive.

Figure 50 Proposed freight enhancement schemes

No	Location of Freight Scheme	Potential Options
1	Hunterston - Kilwinning	Extension of Stevenson Loop
2	Glasgow South Western and S & C	Gretna - Annan : partial redoubling, IBS's installed on GSW and S & C
3	WCML: Carnforth - Carlisle	92 haulage option, Loop lengthening, diversion of class 6 via Hellifield/Clitheroe
4	Hull Hedon Road - Hessle Road Jn	Hull docks branch upgrade
5	WCML: Winsford South Jn - Weaver Jn	New central loop in Hartford area
6	Barnetby - Gainsborough	Brigg Line Upgrade
7	ECML: Peterborough - Doncaster & Yorkshire terminals	W10 gauge enhancement
8	Felixstowe - Nuneaton	Capacity improvement options including signalling enhancements and loops/chord
9	Peterborough - Nuneaton	Gauge enhancement works
10	Ipswich - Peterborough	W10 gauge enhancements
11	Felixstowe Branch & Ipswich Yard	Partial redoubling/resignalling Felixstowe branch and Ipswich yard remodelling
12	Southampton - WCML	W10 Gauge enhancement works
13	Southampton - WCML	Diversionery Routes
14	W10 diversion of GE / NLL	W10 diversionery routes when GE / NLL are blocked, improve use of GOB
15	Willesden - Gospel Oak - Barking	W10 gauge enhancements works
16	Willesden - Gospel Oak - Barking	IBS installed on T & H & possible alterations at Gospel Oak Jn



The potential cost of the Base Case options

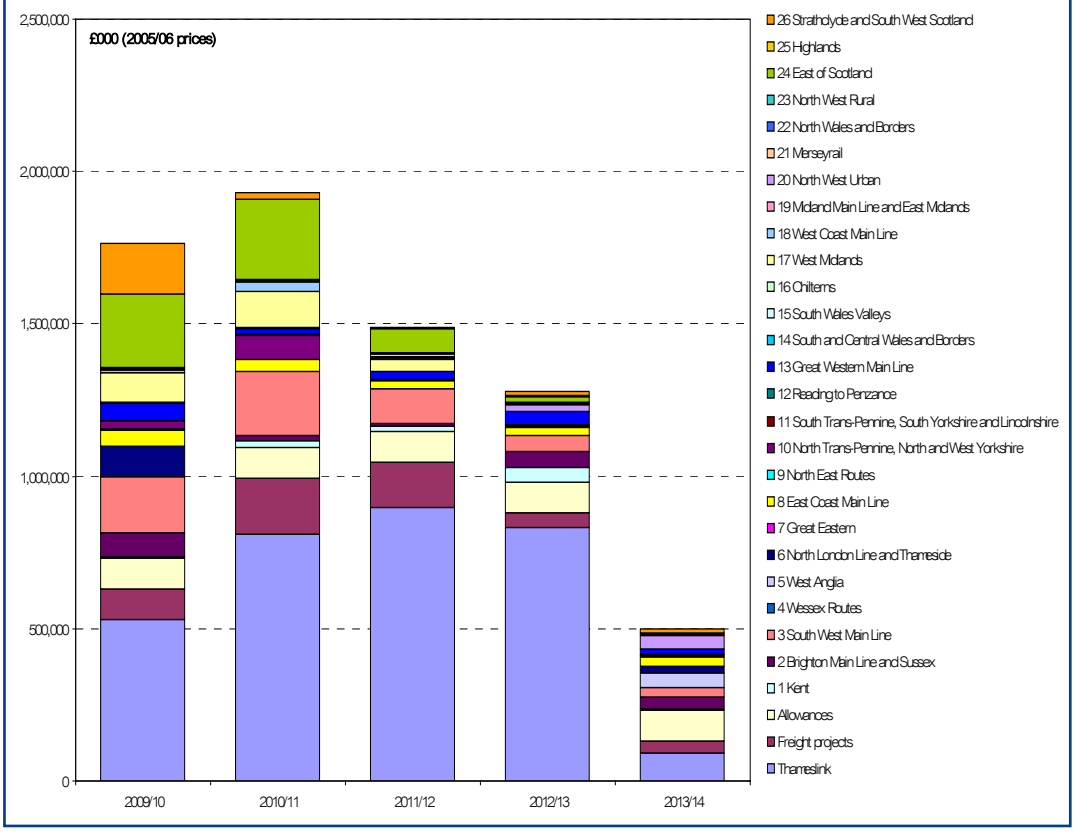
The table below sets out a summary of the capital cost estimates associated with the portfolio of projects within the Base Case plan. It should be noted that, within the portfolio, the projects are at different stages of their project life cycle. There is therefore variability in the robustness of the estimates. Where appropriate the estimates are net of any assumed third party funding but not funding provided by DfT and Transport Scotland.

The graph below provides a breakdown of the proposed projects by strategic route based on their capital cost estimate. The table and graph illustrate the significance of Thameslink within the overall portfolio, as well as the key works identified on the SWML, the freight projects and major schemes in Scotland. We have provided to ORR a summary of the strategy for each route in the supporting documentation to this plan together further details on individual projects.

Figure 51 Indicative enhancement cost estimates (£m 2005/06 prices)

Major Projects	Total CP4 cost	Total NR cost	GRIP* stage
Thameslink programme	3,163	3,537	3
Birmingham New Street	77	142	4
Felixstowe Nuneaton capacity	175	400	3
Waterloo Masterplan	385	400	2
Anglo – Scottish Coal	41	41	1
NLL capacity enhancements	101	200	1
Edinburgh Airport Rail Link	305	600	3
Waverley Rail	100	155	2
Reading station area	31	47	2
Southampton – West Coast	60	60	3
Airdrie – Bathgate new line	75	300	3
Glasgow Airport Rail Link	75	170	3
Other freight projects	241	244	
Other projects	2,041	4,353	
Sub-total	**6,901**	**10,701**	
Baseline (see Chapter 5)	**1,040**	**2,020**	
Total Base Case	**7,941**	**12,721**	

Figure 52 Base case enhancement expenditure by strategic route



Activity and expenditure forecasts

Summary of expenditure forecast

The Base Case plan seeks to accommodate a reasonable projection of growth in passenger and freight demand whilst delivering sustained good performance at or above the level we plan to achieve by the end of CP3. Under this strategy, the network would be developed and sustained to provide the capability and availability needed to respond to these demand forecasts.

The projected cost of operating, maintaining, renewing and enhancing the network under the Base Case scenario is shown below. Total expenditure in CP4 is £28.7 billion.

The key difference between the Base Case and Baseline plans is the major enhancements expenditure set out above. The Base Case plan also contains £321 million additional expenditure compared to the Baseline plan for operating, maintaining and renewing the network over CP4.

The largest element of this additional operating, maintenance and renewals expenditure is £216 million additional civils renewals expenditure. In the Base Case scenario we have applied the same mix of policies as in the Baseline, but have assumed that additional funding is required as a result of the new, higher forecasts for major structures. Although the number of spans for each major structure was considered within the SACP work, no allowance was made for the larger size of spans on major structures compared to normal underbridges and therefore underestimated the expenditure requirements quite significantly. We have therefore added the new forecasts for major structures to the SACP figures, whilst deducting the nominal amount included previously. In the Baseline plan, we would still expect to carry out this work but would make a corresponding reduction in other civils work which would increase costs in future control

Figure 53 O,M,R&E expenditure

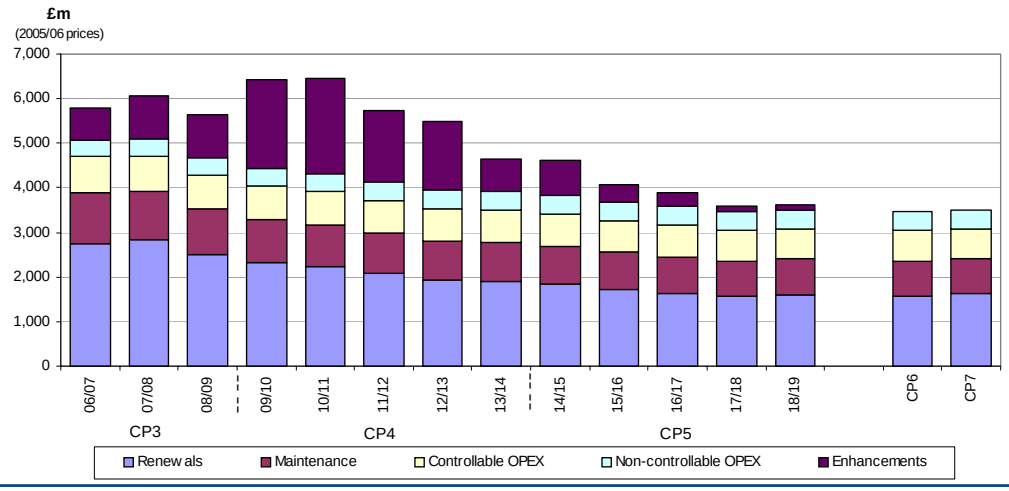


Figure 54 Renewal expenditure

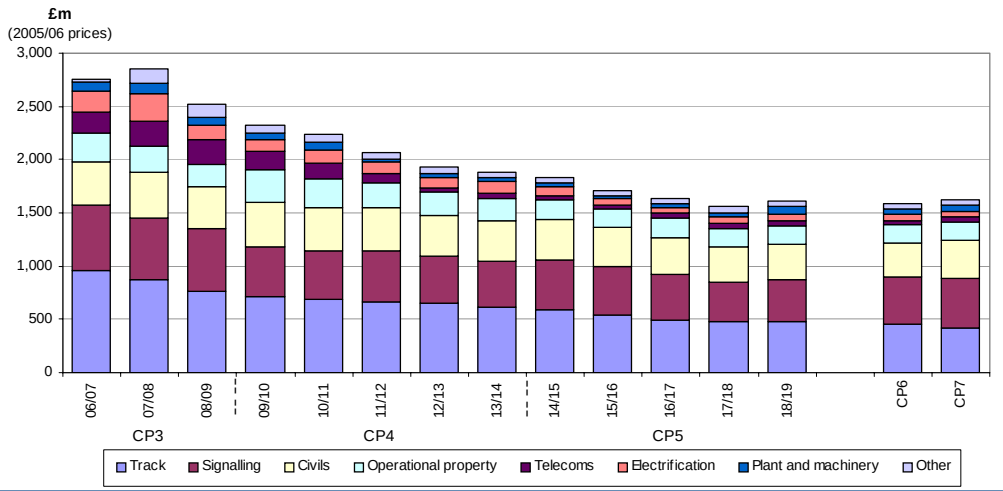
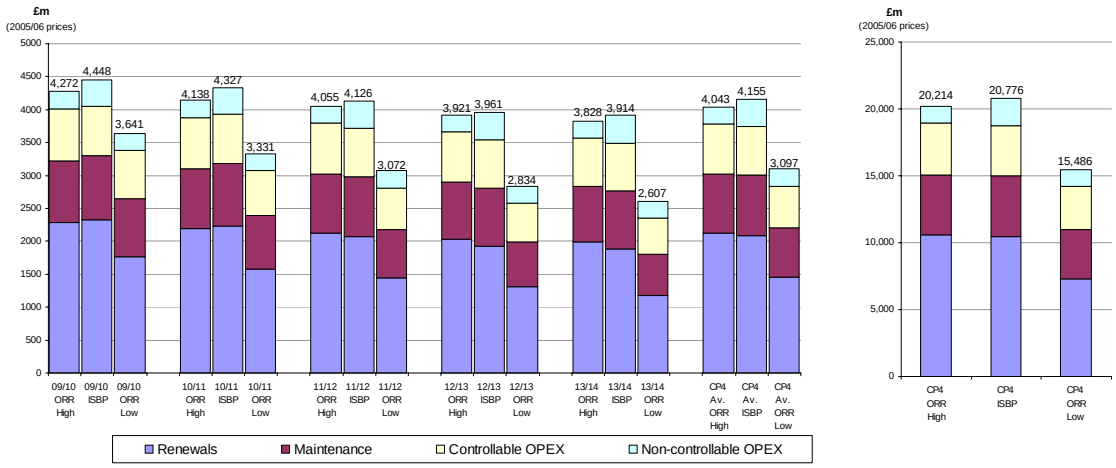


Figure 55 O,M&R comparisons to ORR's initial assessment for CP4



periods.

As described in BP2006, we are currently considering options for replacement of the overhead line equipment between Liverpool Street and Chelmsford/Southend Victoria with a modern, high reliability system. The existing fixed termination system design currently leads to the application of temporary speed restrictions during periods of high temperatures. In addition, a major dewirement occurred at Bow in the spring of 2005, closing Liverpool Street station and its approaches for 31 hours. The aim is to remove these design deficiencies and provide an automatically tensioned system which is easier to maintain and repair.

There are a number of other factors which have an impact on the business case for such a scheme, including developments emerging in the Stratford area such as the North London Line conversion to the Docklands Light Railway, East London Line Extension (phase 1), Crossrail and London 2012, as well as the 2007 opening of Channel Tunnel Rail Link (CTRL) phase 2 generating additional local traffic on the Great Eastern route from Stratford International.

Within the Baseline plan we have assumed that this equipment will continue to be managed through ongoing campaign changes and re-wiring. Specifically, this will involve a first phase of campaign changes through to 2016, with re-wiring between 2009 and 2020, followed by a second phase of campaign changes between 2020 and 2030. This represents a total spend in CP4 of £22 million.

However, in the Base Case plan, we have assumed the full system renewal would be brought forward and delivered in CP3, CP4 and CP5. This results in total expenditure of £60 million in CP4, an additional £38 million over the level of expenditure contained in the Baseline plan.

Non-controllable operating costs are £29 million higher in the Base Case compared to the Baseline plan as a result of higher EC4T costs caused by the increased traffic.

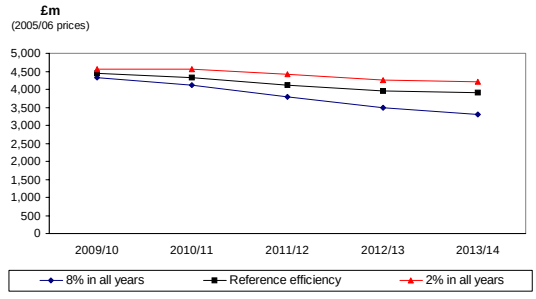
The higher levels of traffic assumed in the Base Case scenario also leads to additional maintenance of £41 million, primarily due to higher track maintenance costs.

As described in the Baseline plan chapter, constraints are applied to the volumes of track renewal to allow for deliverability and to smooth the profile of activity. During CP4, the predicted level of activity is greater than these limits. As a result, within the Base Case plan, no additional track renewal is forecast in CP4, despite the additional traffic. However, beyond CP4, the required activity reduces to levels below these imposed limits, resulting in an additional £43 million in the Base Case plan compared to the Baseline plan in CP5.

Figure 3 shows the Base Case plan against ORR's initial assessment. Total operating, maintenance and renewals expenditure is £562 million higher than ORR's 'high' assessment. Again, this is due to the higher non-controllable operating costs, which are £743 million above ORR's 'high' assessment.

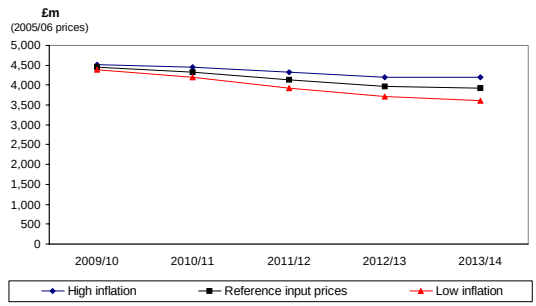
We have analysed the impact on operating costs, maintenance and renewals of applying ORR's high and low annual efficiency assumptions of eight per cent and two per cent respectively. This is illustrated in the graph below. Applying the eight per cent assumption results in a reduction of £1.7 billion over CP4. Applying the two per cent assumption results in an increase of £1.2 billion over CP4.

Figure 56 Impact of efficiency assumptions on O,M&R



We also illustrate below the impact of applying the top and bottom of the range of input price inflation included in LEK's report. Using the higher inflation assumptions results in an increase of £0.9 billion over CP4. Using the lower inflation assumptions results in a reduction of £1.0 billion over CP4.

Figure 57 Impact of input price assumptions on O,M&R



Income

The key difference between the Base Case plan and the Baseline plan is the impact of passenger and freight demand on the volume of services operating on the network. In the Baseline plan we assumed that there would be no growth in services beyond 2008/09. As a consequence, our projections for passenger franchised operator income and freight income were substantially flat for CP4.

In the sections below we present our initial Base Case plan projections of income.

Incentive regimes

Our projections of the impact of the Schedule 8 incentive regimes is identical between the Baseline plan and the Base Case plan; in both scenarios we have assumed the regime will be neutral to us in each year of the control period and we have thus assumed no cost/income in CP4.

Our projection of Schedule 4, however, is slightly different under the Base Case plan. The Base Case plan has a different mix of maintenance and renewals compared to the Baseline plan. We have therefore rerun the high-level Schedule 4 model with the revised work profile (but with all other assumptions remaining constant).

We have also amended our SRoU assumption based on the number of enhancement projects in the Base Case plan. Our SRoU projection under the Base Case plan is £38million in 2009/10 (compared to £12million under the Baseline plan). Adding the two components together generates the projections shown in Figure 1 below.

Our Base Case plan projection is that we will pay out £126million in 2009/10, reducing to £106 million in 2013/14, with a total cost of £568 million across CP4.

As with the Baseline plan we have assumed that cost of the possessions derived from the high-level model is efficient, and have therefore assumed that

Figure 58 Incentive regime income projections

£m 2005/06 prices	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Schedule 4	(126)	(120)	(109)	(107)	(106)	(568)
Schedule 4 access charge supplement	126	120	109	107	106	568
Schedule 8	-	-	-	-	-	-
Schedule 8 access charge supplement	-	-	-	-	-	-
Total	**-**	**-**	**-**	**-**	**-**	**-**

Figure 59 CP4 single till income projections

£m 2005/06 prices	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Property income	218	224	227	216	216	1,101
Property sales	26	22	12	14	10	85
Freight income	103	105	108	110	113	539
Open access income	16	16	16	16	16	81
Station income (inc QX)	295	295	295	295	295	1,477
Depot income	47	47	47	47	47	236
Other income	6	6	6	6	6	29
Total	711	717	712	705	703	3,547

we will receive an access charge supplement equal to the expected cost calculated by the model.

Single till income

With the exception of freight income, our projections of single till income are not specifically affected by the changed assumption on passenger franchised operator services, and are unchanged from those identified in Chapter 5 above. For completeness these are shown in the figure below.

Freight income

The demand assumption that we used in the Baseline plan was that there was no increase in freight traffic beyond 2008/09. Under the Base Case plan we expect freight demand to increase by 2 per cent in each year of CP4.

To estimate the impact of this growth on our freight income we have taken the 2008/09 figure in BP2006 and indexing this by the forecast change in freight tonne kilometres in each year of CP4. Our revised view of freight income, based on the current charging regime, is that we will receive around £103 million in 2009/10, increasing to £113 million in 2013/14, with a total of £539 million across the five years of CP4. We are, however, discussing the basis of future freight charges with ORR, operators and funders, as part of the ORR review.

Variable access charge income

Our projections of variable access charge income under the Base Case plan are included in the figure below.

As with the Baseline plan, we have assumed no change in the structure of the variable charging mechanism and that the planned mix of vehicle types on the network will be substantially unchanged in CP4.

Variable track access income

In order to calculate our projections of variable track access income in CP4 under the Base Case plan we have taken the assumed traffic operating on the network in 2008/09 as outlined in our BP2006 and then used the expected annual increase in passenger train tonne kilometres (around 0.9 per cent) to estimate the income in CP4.

The resulting calculation shows that we currently expect to receive £228 million of variable access income in 2009/10 increasing to £236 million in 2013/14, giving a total of £1,161 million across the five years of CP4. However this will need to be refined.

Capacity charge income

To calculate forward projections of capacity charge income we have used our assumed income in 2008/09 as outlined in BP2006 and have then used the expected annual change in passenger train kilometres (around 0.6 per cent) to index our projections.

The resulting calculation shows that we currently expect to receive £7.3million of capacity charge income in 2009/10 increasing to £7.5million in 2013/14, giving a total of £39 million across the five years of CP4. This excludes the element of capacity charge which is implicit in the fixed charge.

Electric asset usage income

Our revised forward projections of electric asset usage income are again based on the 2008/09 figures from BP2006, increased by the expected change in passenger train tonne kilometres.

The resulting calculation shows that we currently expect to receive £28 million of electric asset usage income in 2009/10 increasing to £29million in 2013/14, giving a total of £143 million across the five years of CP4.

EC4T consumption usage income

As described in Chapter 5, our view of the existing regime for recovering EC4T consumption usage costs from passenger franchised operators would lead to a substantial over recovery of income compared to our costs. We have therefore assumed that the calculation will be rebased in 2009/10.

For the purposes of this submission we have assumed that our income exactly matches our costs.

Our calculations project that we will receive £208 million of EC4T consumption usage income in 2009/10million increasing to £216 million in 2013/14, giving a total of £1,061 million across the five years of CP4.

Figure 60 CP4 variable access income projections

£m 2005/06 prices	2009/10	2010/11	2011/12	2012/13	2013/14	Total
Variable track access income	228	230	232	234	236	1,161
Capacity charge income	7	7	7	7	7	37
Electric asset usage income	28	28	29	29	29	143
EC4T consumption usage income	209	210	212	214	216	1,061
Total	472	476	480	484	489	2,401

Disaggregation between Scotland and England & Wales

As with the Baseline plan, in order to be able to understand the revenue requirements in Scotland and in England & Wales we have disaggregated our expenditure and income projections. The results of this disaggregation are shown in the appendices. The methodology applied is described in Chapter 5.

Outputs

Traffic volumes

In the Base Case plan, passenger traffic is assumed to grow for two reasons.

First, there is growth in order literally to "accommodate demand" and to avoid what would otherwise be unacceptable levels of crowding. Such growth is expected to be principally on long distance and on London and South East peak services. This traffic growth has been estimated on a TOC by TOC basis, based on the expected growth in passenger demand (i.e. passenger-km travelled). The balance between providing more trains and providing longer trains varies according to the strategy for each route. It is the need to accommodate this type of traffic growth that drives the need for the bulk of the enhancement schemes that form part of the plan.

Second, there is assumed to be growth in traffic not (or not primarily) in order to reduce crowding, but rather because funders wish to run additional services for other reasons, such as reducing road congestion, or improving the accessibility of employment and other facilities. Such growth is expected to be principally on regional, Scotland and London and South East off-peak services. We expect that, as in the past five to ten years, some of this growth will be "organic", within the capacity of the existing network; and some will be associated with enhancements such as the opening (or re-opening) of new stations or lines.

We have made a blanket assumption of 0.5 per cent per year train-mile growth in the Regional and London and South East off-peak sectors. This is very roughly half to two-thirds of the rate of train-mile growth in these sectors over the last five years, and is intended primarily to reflect "organic" growth, as described above. Although we anticipate that, in practice, funders will continue to specify further enhancement schemes, with associated traffic growth, these schemes do not in general form part of the Base Case plan, as they do not form part of the strategies to respond to growth.

Putting these sources of growth together, the Base Case plan has an overall traffic increase over CP4 of circa 0.7 per cent per annum in train-miles, and circa one per cent per annum in tonne-miles.

For freight traffic, the Base Case plan accommodates unconstrained growth consistent with the Freight RUS forecasts described in Chapter 2.

Asset condition

We are not projecting any significant difference in asset stewardship measures in the Base Case compared to the Baseline. We are assuming that the impact of increased traffic is broadly offset by additional maintenance and renewal activity funded through the increase in variable charge income.

Capacity and crowding

Under the Base Case plan, the railway accommodates for forecast growth in passenger and freight as describes in Chapter 2. Current PIXC standards for crowding are expected to be met.

Performance

The improvements in asset condition and outputs, described above, will drive corresponding improvements in train performance.

We also expect continuing improvements in non-asset related sources of delay, in incident management, and in delays attributable to train operators. Our 2006 Business Plan set out some of the key initiatives that we are undertaking in these areas, such as the rollout of Integrated Control Centres and the resilient timetable programme. Through the Joint Performance Improvement Process, we are working with train operators to develop challenging but achievable whole-industry plans over a three year horizon.

The initiatives set out in our 2006 Business Plan, and the plans we have developed with operators, will in general be implemented by the end of CP3. For CP4, we have therefore taken a view as to what improvements it would be reasonable to expect, based on improvements continuing but at a progressively slower rate as the more easily achievable gains are made.

We have assumed that, over CP4 as a whole, primary delay due to all non-asset related causes reduces by an average of two per cent per year. The reduction is concentrated in the first part of CP4. In 2009/10 we assume a year on year reduction of three per cent; in 20010/11, a reduction of 2.5 per cent; and so on. We have made the same assumption in respect of primary delays attributable to train operators. In respect of incident management, we have assumed that delay per incident will reduce by an average of around 2.25 per cent per year, with the reduction again concentrated in the first part of CP4.

On this basis, for the purpose of this plan we assume that performance as measured by the Public Performance Measure (PPM) will rise from

88.9 per cent at the end of CP3 to just over 90 per cent by the end of 2011/12, and to 90.4 per cent by the end of CP4. We are, however, working with train operators to develop these plans so that further improvements can be achieved either in terms of improved reliability or additional capacity.

We also anticipate an improvement in the number of trains subject to lengthy delays. There is no established measure of this; but for purposes of this plan we have estimated the proportion of trains that are either cancelled, in whole or in part, or which arrive at their destination more than 20 minutes late. In 2005/06 approximately 3.8 per cent of trains suffered this degree of disruption. By the end of CP3 we expect this to have reduced to approximately 3.1 per cent; and by the end of CP4 to 2.7 per cent.

One factor not taken into account in these projections is the effect on performance of the enhancements contained in the Base Case plan. In the short term, there may be negative impacts on performance due to disruption while delivering the necessary work. In the longer term, we would expect there to be some performance benefits from the capacity enhancements in the plan, to the extent that not all the extra capacity would be immediately taken up by extra traffic at all times of the day.

Given the uncertainties around performance in CP4, we do not believe that it is useful to attempt to make projections of performance beyond CP4 at this stage. The plan therefore shows performance in subsequent control periods being maintained at the level reached by the end of CP4.

Safety

The ORR has indicated that it wishes to understand what additional initiatives might be possible which produce significant risk reductions but are not reasonably practicable. We will provide additional information to ORR within our further scenario analysis in September 2006.

The two most significant risk areas influenced by Network Rail are level crossings and infrastructure integrity. Infrastructure improvements are likely to be by-products of enhancement and condition led improvements, although there may be some incremental benefits to be obtained from preventing vehicle incursions or by improving platform stepping distances.

The further analysis will also focus on level crossing solutions which are not currently reasonably practicable, principally upgrades to crossing type. This will provide indicative information on a level crossing upgrade programme which would identify an order of magnitude on cost and risk reduction for a selective programme, for example ten per cent of automatic half barrier crossings.

Appraising the Base Case plan

This plan identifies the enhancements we believe are likely to be appropriate to respond to the forecasts of unconstrained growth set out in Chapter 2. The plan identifies the funding required by Network Rail in order to deliver these enhancements. However we have not identified the additional cost or revenue impacts on train operators of the extra services that would potentially use the additional capacity provided. Also we have not undertaken an appraisal of the value of the money of the Base Case plan compared to the Baseline plan.

Over the coming months, we will work with train operators, DfT, Transport Scotland and ORR to assess the full industry financial and economic impacts of the proposals in this plan using the jointly developed Network Modelling Framework as part of the process of developing the HLOS.

However, in advance of this, set out below is a commentary on the work to date by us, and others where appropriate, on the physical and economic impacts of the proposals contained in the Base Case plan.

Figure 62 Project business cases

Enhancement project	Benefit cost ratio	GRIP stage
Thameslink programme	1.7*	3
Birmingham New Street	3.64	4
Reading station	3.1	2
SWML: Train & platform lengthening	1.9 - 4.5	1
ECML projects	4.3 – 8 **	- ***
Southampton - West Coast Gauge	1.55*	0
NLL enhancements	2.6 – 9.5	0

* SRA appraisals. ** SRA appraisal of draft ECML Strategy stages. *** Projects at various stages of development.

Business cases have been developed for a number of the proposed schemes. The benefit cost ratios for these schemes are shown in the table below. These projects represent 50 per cent of the total Base Case enhancement expenditure proposed in CP4.

The remaining enhancement spend is on schemes for which formal business cases have yet to be worked up. Nevertheless, several factors give us sufficient comfort that we believe it is sensible to put them into the plan as potential schemes (while acknowledging that funding would of course not be given unless and until a full business case were to be developed).

First, some of the schemes are analogous to those that do have business cases. In London and the South East there is a generic problem of limited peak hour capacity and heavily loaded trains. The proposal to lengthen platforms and trains from the SWML RUS is likely to be justified on other parts of the network such as on Southern and in Kent. It therefore seems reasonable to adopt a similar approach and expect similar benefit cost ratios. This will be confirmed through appropriate further RUS and appraisal analysis.

Second, for schemes around London and the South East (£3,650 million in CP4, 55 per cent of the CP4 total including Thameslink) we can look at the potential benefit from avoiding the crowding levels that might be experienced in the Baseline plan.

Using industry standard values to reflect different levels of crowding in economic terms, we estimate that the disbenefit to peak passengers of current crowding levels is in the region of £130 million per year. This is based on the relative value placed by passengers on being able to sit as opposed to stand, in varying degrees of comfort, as set out in the Passenger Demand Forecasting Handbook. It is purely a measure of the physical discomfort directly caused by crowding. It does not include indirect impacts, such as the impact on punctuality of overcrowded trains, or the extent to which people shift their time of travel, or travel on slower trains, in order to avoid the worst of the crowding.

Under the Base Case plan, we assume that the cost of crowding is kept to this level. In the Baseline plan, however, increased levels of crowding would mean that the disbenefit of peak crowding would rise to circa £270 million per year (in 2005 prices) by the end of CP4.

Over a 50 year appraisal period, we estimate that the benefit of the Base Case plan, compared to the Baseline, is a NPV of benefit of the order of £9 billion.

Similarly, we can estimate the order of magnitude of extra revenue that the Base Case will generate around London and the South East. The SWML RUS estimated that, in ten years time, crowding will reduce demand by approximately four per cent in the absence of any action to accommodate it. The SWML is one of the most crowded routes around London and the South East. But even if we assume that crowding relief in the Base Case generated half this amount, i.e. an extra two per cent of peak revenue, this would generate circa £25 million per annum in extra revenue by year 10, with greater amounts in subsequent years. This would generate a NPV of the order of an additional £1 billion.

Such a calculation obviously does not prove, by itself, that the Base Case plan, or any of the individual schemes in it, constitutes value for money or is affordable and much further work is required. Even at this level of approximation, one would have to consider not only the capital costs but also the additional rolling stock and operating costs associated with the plan, and also other benefits such as reduced road congestion / usage, improved train frequencies on certain routes, and the opening up of new journey opportunities due to schemes such as Thameslink. However, this calculation does demonstrate that the order of magnitude of the money which the plan proposes to spend to accommodate growth in the London and South East peak, is commensurate with the order of magnitude of benefits that this would bring.

The appraisal of freight-related schemes is being taken forward in the Freight RUS. Business cases for specific schemes are also being developed to support applications for funding from sources such as the Transport Innovation Fund, which aims to support schemes that bring productivity benefits to the UK economy.

Supporting documents

We are providing to ORR a summary description of the proposed strategy for each route together with further information on the individual projects. We are also providing the performance model that underpins our performance projections.

7. Expenditure and financing

We have used the "building block" methodology to illustrate the potential impact of our expenditure projections for our required revenues in CP4.

This methodology involves taking our expenditure projections for operating costs, maintenance and schedule 4 and 8; calculating the expected value of the RAB in each year based on our renewal and enhancement expenditure; and working out the associated value of our regulatory return and the relevant amortisation charge.

Adding these three elements together enables us to calculate a gross revenue requirement that we would have across CP4. From this we net off the single till income that we would expect to receive. This leads us to a net revenue requirement. Finally, we have estimated the amount of variable access income that we would expect to receive from the franchised passenger operators (based on the current variable access charging mechanisms as outlined in the income section above). Taking this income away from the net revenue requirement identified above we end up with an estimate of the amount that we would need to receive in the form of fixed access income from franchised passenger operators and network grants from the Department for Transport and Transport Scotland.

The remainder of this section highlights some of the key assumptions that we have used in order to calculate our revenue requirement based on the figures outlined in this document.

Expenditure requirement

Our expenditure projections for the Baseline and Base Case plans are included in the tables below.

Financial framework

RAB

We have assumed that the opening RAB in CP4 is based on our assessment of the closing RAB in CP3 (as included in our 2006 Business Plan). We have estimated the RAB additions that we expect to receive under the terns of our regulatory incentive regimes (the Asset Stewardship Incentive and the Passenger and Freight volume incentive). The result of our calculations is an opening RAB for CP4 of £27.6 billion.

Return

In this submission we have deliberately made some very broad assumptions about our funding requirements in CP4. Our funding requirements are intrinsically related to our financing costs and to the level of risk that we will be expected to bear during CP4.

We are currently considering the mix of debt instruments that we are likely to have in place for CP4. The range of options is very broad at present and we have simply assumed that our average interest payments will be approximately five per cent. This is inline with ORR's initial assessment but we will review this assumption in future submissions.

We have assumed a real rate of return on the RAB of five per cent. This is equivalent to a regulatory surplus in addition to our financing costs of approximately £500 million per year. This is line with the high end of the assumptions made by ORR in its initial assessment and is the subject of further discussion with ORR, DfT and Transport Scotland.

Figure 63 Baseline expenditure requirement

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14	CP4
Controllable opex	757	749	740	733	731	3,711
Uncontrollable opex	390	396	402	408	412	2,007
Maintenance	968	937	902	877	862	4,546
Schedules 4 & 8	97	95	91	91	88	462
Renewals	2,266	2,165	2,021	1,895	1,844	10,191
Enhancements	220	201	116	255	247	1,040
Total	**4,699**	**4,543**	**4,272**	**4,259**	**4,183**	**21,957**

Figure 64 Base case expenditure requirement

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14	CP4
Controllable opex	757	749	740	733	731	3,711
Uncontrollable opex	392	400	408	416	421	2,036
Maintenance	971	944	910	887	875	4,587
Schedules 4 & 8	126	120	109	107	106	568
Renewals	2,328	2,234	2,069	1,924	1,886	10,442
Enhancements	1,968	2,117	1,599	1,519	739	7,941
Total	**6,542**	**6,564**	**5,834**	**5,586**	**4,759**	**29,285**

Amortisation

Our amortisation calculation has been based on the assumed value of the RAB in each year. We have assumed that the amortisation principles established in the Access Charges Review 2003 remain unchanged. This means that the opening RAB at 1 April 2004 is depreciated annually by seven per cent, and that all additions since this date are amortised on a straight line basis over a 30 year period.

The effect of this is that the level of amortisation is broadly in line with renewals in CP5 and beyond. However, higher levels of spend in CP4 to address remaining backlog means that around 25 per cent of renewals in CP4 is financed through increased debt. As indicated in previous submissions on the financial framework, there may be some scope to refine these assumptions.

Charging policy and funding of enhancements

Except where specific third party funders have been identified, we have assumed that all enhancements covered by this plan will be funded through the RAB and reflected in access charges. We have also assumed that the existing structure and level of variable charges remains unchanged. In practice, however, there may be substantial scope for third party funding or for funding more enhancements through variable charges. This would clearly reduce the potential net revenue requirement.

In addition, we have made no assumption about surpluses being used to fund enhancements. Clearly such funding would need to be discretionary and conditional on achievement of our expenditure projections in other areas. However, this has the potential to further reduce the net revenue requirement.

Revenue requirement

We have used our financial model to forecast our revenue requirements for CP4. The tables below show our current projections compared to ORR's initial assessment (both upper and lower estimates and BP2005). We have also broken our calculations down between England and Wales, and Scotland. The resulting revenue requirements for the disaggregated networks are shown in the tables below.

We have assessed the financial implications of these assumptions for Network Rail and will provide a version of the financial model to ORR. In the Baseline, debt would increase from £21.1 billion to £22.1 billion over the period while in the Base Case it would rise to £29.3 billion. Interest cover ratio would be around 1.51 on average over the period for the Baseline and 1.43 for the Base Case. We are discussing these issues together with our future financing options with ORR.

These calculations are for illustrative purposes. In addition to the assumed level of expenditure and its allocation between Scotland and England and Wales, they depend on the funding and other assumptions outlined above. We are discussing these issues with ORR, DfT and Transport Scotland.

The net revenue requirement in the Base Case is higher than ORR's upper estimate. However, this is partly offset by a higher forecast variable charge income due to the extra traffic and increased electric traction charges. As noted above, there is also potential for the revenue requirement to be reduced in a number of areas.

The potential increase is largely due to the additional amortisation and return associated with the enhancements that are included in the Base Case. The other main souces of difference are:

- higher uncontrollable opex due to increase in EC4T costs and cumulo rates;
- higher maintenance costs due to the projected increase in traffic in CP3 and CP4;
- although we assume efficiencies which are much more challenging than the ORR's low efficiency assumption, this is partially offset by assumed real price inflation in some areas which was explicitly not taken into account in ORR's initial assessment;
- we have assumed a rate of return in line with the upper end of the ORR assumptions. However, ORR's upper estimate of revenue requirements was based on its low assumptions for return on the basis that risk would be reduced under its low efficiency assumption; and
- lower forecasts of single till income as ORR assumed that property income would be broadly maintained at CP3 levels. We are currently forecasting a reduction in retail income due to station developments and congestion alleviation measures, and a reduction in property sales as the land bank reduces.

For Scotland the implied net revenue requirement is nearly £0.5 billion higher than ORR's upper estimate mainly due to additional enhancements and the network issues noted above. The Scotland figure is also affected by the following issues which we wish to discuss further with ORR, Transport Scotland and DfT:

- the higher proportion of maintenance costs forecast for Scotland due to the further work which we have done on asset disaggregation through the ICM; and
- a lower share of other single till income, ORR having assumed a 7.4 per cent allocation to Scotland. Our forecasts are based on more detailed allocations but require further discussion and produce a 6.9 per cent share.

Figure 65 Revenue requirement

£m (2005/06 prices)	CP3	ORR lower estimate	ORR upper estimate	2005 Business Plan	NR baseline	NR base case
Maintenance	5,710	3,726	4,470	4,468	4,456	4,587
Opex	5,761	4,467	5,109	5,118	5,718	5,747
Schedules 4 & 8	481	517	517	491	462	568
Return	7,806	7,371	5,834	17,873	7,179	8,142
Amortisation	7,580	5,170	8,272		7,940	8,771
Gross revenue requirement	**27,339**	**21,251**	**24,202**	**27,950**	**25,845**	**27,815**
Other income	3,835	3,624	3,624	3,624	3,513	3,547
Net revenue requirement	**23,504**	**17,627**	**20,578**	**24,326**	**22,332**	**24,267**
Variable charge income	2,073	1,903	1,903	1,903	2,340	2,401
Amount to be recovered from fixed and grants	**21,431**	**15,724**	**18,675**	**22,423**	**19,991**	**21,866**

Figure 66 Scotland revenue requirement

£m (2005/06 prices)	CP3	ORR lower estimate	ORR upper estimate	NR baseline	NR base case
Maintenance	517	337	403	480	483
Opex	558	434	507	509	511
Schedules 4 & 8	52	52	52	45	56
Return	827	827	652	779	937
Amortisation	817	548	910	859	994
Gross revenue requirement	**2,771**	**2,198**	**2,523**	**2,673**	**2,981**
Other income	279	266	266	244	247
Net revenue requirement	**2,492**	**1,932**	**2,257**	**2,430**	**2,734**

Figure 67 England & Wales revenue requirement

£m (2005/06 prices)	CP3	ORR lower estimate	ORR upper estimate	NR baseline	NR base case
Maintenance	5,193	3,388	4,067	4,066	4,104
Opex	5,202	4,033	4,602	5,209	5,236
Schedules 4 & 8	430	465	465	416	512
Return	6,979	6,544	5,182	6,400	7,205
Amortisation	6,763	4,622	7,362	7,080	7,778
Gross revenue requirement	**24,568**	**19,053**	**21,679**	**23,172**	**24,834**
Other income	3,556	3,358	3,358	3,269	3,300
Net revenue requirement	**21,012**	**15,695**	**18,321**	**19,902**	**21,534**

8. Sensitivity and scenario analysis

This chapter currently describes the impact of proposed significant developments to the rail network that are under development. These developments are not yet firm commitments and Network Rail is working with its industry partners on the development of these projects. As such, the impact of the implementation of these proposals has not been included in this plan.

As we develop our plans, we will be carrying out further sensitivity and scenario analysis to understand the impact on our plans of alternative assumptions. We will work with ORR, DfT and Transport Scotland to agree the specific issues to be analysed during the review.

We will carry out sensitivity analysis to demonstrate the impact of alternative inputs including, for example, changes to:

- CP4 efficiency profile;
- unit costs;
- asset service lives.

We will also carry out scenario analysis to illustrate the impact of alternative choices for the railway, including, for example, the impact of:

- different responses to traffic growth;
- alternative possessions strategies;
- potential additional investments to address safety and environment issues;
- different rates of improvement in the key drivers of train performance.

In addition, we will work with operators and funders to refine our plans for enhancement options to accommodate growth.

As part of this programme of work, we will be providing further scenario analysis to ORR in September. We will discuss this further with ORR in July.

Implementation of ERTMS

ERTMS is the European Rail Traffic Management System, a cab based signalling and train control system promoted by the European Commission (EC) for use throughout Europe, and specified for compliance with the High Speed and Conventional Interoperability Directives. Its key characteristics are that it provides safe movement authority directly and continuously to the driver through the desk display enforcing movement authority and speed limits at all times.

Impact on the existing network

The train control strategies available to the heavy rail industry are either to continue with conventional signalling or to move to a cab-based signalling system. Metro systems have implemented cab-based signalling solutions for over 20 years, but each application is bespoke and developed to address metro specific requirements. Of the cab based signalling options for heavy rail application, ERTMS is the most supported, being a common European system with a developing world-wide user base.

ETCS has three levels of implementation. The solution identified for application for national network has been defined as “System D”; a Level 2 system with no lineside signals. The configuration offers significant life cycle cost benefits in comparison with conventional signalling, in addition to the performance/capacity benefits of a cab based signalling solution. Level 2 with lineside signals , defined as System C , will be applied to the network in selected areas to support the delivery of specific schemes and as required as part of the migration process. Level 2, System C does not offer the whole life cost benefits of System D, and hence, would be kept to a minimum.

Impacts on this plan

This plan includes the development costs for the project through CP4. Following the Cambrian Early Deployment Scheme, a number of migration schemes are being considered in Control Periods 3, 4 and 5, followed by the roll-out of ERTMS on two mainline sections in Control Periods 5 and 6.

The first migration scheme would focus on implementation of ERTMS on a two track line with a significant station, depot access and varying rolling stock. Given the re-signalling timings on the Great Eastern Line in and around the Norwich area and the low number of trains to retrofit, this section has been proposed to follow Cambrian as the first migration scheme. The Great Eastern Line migration scheme could commence in 2006/07 with the completion of Norwich Station and East Suffolk Radio Electronic Token Block (RETB) replacement in 2012, followed by Norwich – Yarmouth in 2015.

The potential second migration scheme has been prioritised due to the need to replace RETB signalling in Scotland. The Scottish Rural Network migration scheme could commence in 2008 with completion in 2013. This scheme also required the retrofit of a range of trains, providing technical proving.

Great Western Main Line (GWML) is being considered for the first mainline application of ERTMS. This route was prioritised due the re-signalling timing and the need for Automatic Train Protection (ATP) replacement. The GWML scheme would involve a mixture of “System C” and “System D”, with an incremental roll-out plan. The first System D application would be completed on Salisbury – West of England in 2015, followed by Bristol – Westbury – Bridgwater in 2018.

East Coast Main Line (ECML) is being considered for the second mainline application of ERTMS, but the first primary application of System D on a mainline, with Letchworth – Royston completed in 2015, Berwick – Musselburgh in 2016, Finsbury Park – Moorgate in 2017, followed by Kings Cross in 2020. The potential timing of the ECML scheme coincides with the signalling renewals dates and although this scheme would require a significant amount of rolling stock fitment, the whole life cost and performance/capacity benefits are believed to be substantial.

The work to Red Diamond Review in December 2006 (see below) will culminate in a benefits-optimised case for implementation of ERTMS on specific routes, as well as revised proposals for migration schemes and other risk reduction, benefits validation and preparatory works.

Current status

The ERTMS Programme's progress will be reviewed in December 2006, at the so-called "Red Diamond Review". In particular this will consider whether ERTMS is affordable.

To respond to the questions the programme team will:

- identify the cost at which ERTMS becomes affordable together with the path to its realisation;
- identify the necessary set of products that will be required by the industry in order for it to deliver the ERTMS Implementation Plan;
- identify where can ERTMS unlock capacity on the network and at what cost; and
- provide a progress report on Cambrian.

Network Rail has developed a plan which will provide evidence to enable the industry ERTMS Strategy Group to reconsider the questions above and look at the future of ERTMS in the UK. This group comprises DfT Rail, Network Rail, ORR, ATOC, Arriva Trains Wales and RSSB.

Network Rail is currently progressing the programme of works which includes:

- the first ERTMS scheme which will resignal the Cambrian lines;
- re-analysis of costs through more detailed analysis of unit costs, cost trends over system maturity and commoditisation, and value engineering opportunities;
- development of the standards, tools and process that will be required for ERTMS implementation, prioritise for first use on the Cambrian scheme;
- the analysis of a number of routes to identify detailed implementation plans, specific costs and associated benefits for each route; and
- development of a compelling case drawing on all work streams outputs.

Implementation of Crossrail

Proposals for the construction of an east-west London rail link and the introduction of associated rail services are currently under development by Cross London Rail Link (CLRL), a joint Department for Transport/Transport for London company. The Crossrail scheme is designed to reduce overcrowding on the London Underground central Line in addition to creating new journey opportunities and stimulating economic growth. Proposals put forward by CLRL Ltd are subject to continuous review by Network Rail.

As currently stated, Crossrail proposals envisage services operating from Maidenhead and Heathrow in the west to Shenfield and Abbey Wood in the east. To facilitate this, a central London tunnel will be constructed allowing the operation of up to 24 trains per hour in each direction between Paddington and Whitechapel.

The overall objectives for the Crossrail project have been set by CLRL Ltd:

- to support the continuing development of London as a World City, and its role as the key financial centre of the UK and Europe;
- to support its economic growth and its regeneration areas by tackling the lack of capacity and congestion on the existing network; and
- to improve rail access into and within London.

In transport terms, Crossrail would have four core functions:

- increasing capacity allowing more people to travel to, from and across London and remove constraints on future economic development;
- relieving crowding on the existing networks by providing an alternative route for cross-London travel. In particular, Crossrail will relieve crowding on the Victoria and Central lines and national rail services into Fenchurch Street, Liverpool Street and Paddington;
- it will be possible to improve the frequency of the existing ONE services as a result of terminal capacity released by Crossrail at Liverpool Street station; and
- reduced journey times by providing faster and more reliable services.

Impact on the existing network

Crossrail proposals would significantly interface with our network both during construction and eventual operation. The actual degree of interface would be dependant on the final service proposals put forward by the scheme promoters. The most notable points of interface during construction would be Pudding Mill Lane (west of Stratford), Airport Junction (west of Paddington) and the Paddington Station area. Additional infrastructure works on all routes served by Crossrail services

would be required and the Crossrail construction methodology is currently being assessed. Operationally, Crossrail proposals would have a major impact on a number of our routes including the North Kent Line, Great Eastern Lines into Liverpool Street and the London end of the Great Western Main Line.

We are working with CLRL and the rest of the industry to develop timetables that would accommodate Crossrail services alongside existing services (with existing services that Crossrail replaces removed) and that accommodate Crossrail when the effect of growth in freight and other passenger services is taken into account.

Impact on this plan

We are however working closely with DfT and TfL on the development of plans for Crossrail. For practical reasons, however, this document has been prepared on the assumption that Crossrail is not implemented. If Crossrail goes ahead then Network Rail would have to amend its plans for those parts of the network that interface with the project during construction and, on an ongoing basis, during operation. In developing our Route Utilisation Strategies, we consider Crossrail as a key sensitivity.

Current status

The Government completed its review of Crossrail in July 2004 and as a result, a Hybrid Bill was placed before Parliament in February 2005. It is expected that the Bill will complete its Parliamentary process by Summer 2007.

9. Summary of future developments

In support of the periodic review process we will be providing further updates to our Initial Strategic Business Plan for CP4:

- September 2006: scenario analysis in support of Initial Strategic Business Plan;
- April 2007: informal update on elements of Initial Strategic Business Plan;
- October 2007: CP4 Strategic Business Plan; and
- April 2008: update of CP4 Strategic Business Plan.

This chapter provides a summary of the activities we intend to undertake in order to improve the robustness of our plans for CP4 and to support the periodic review process. This work will inform our future submissions as part of this process and our ongoing dialogue with customers and funders about our plans for CP4.

Improved demand forecasting and appraisal

We are working with ORR, DfT and Transport Scotland on the development of the Network Modelling Framework (NMF). Version 1 of the NMF will be used over the coming months to help develop the full industry cost and business case for our Base Case plan and inform the development of the HLOS and rail strategy before their publication in July 2007. Discussions are continuing on the use of the NMF to assist Network Rail in the development of the October 2007 Strategic Business Plan.

We will also be forming more detailed views of growth, and of the business case for our plan, for example as part of the development of RUSs and of business cases for specific enhancements.

Improving asset management

A series of initiatives is currently underway to improve the effectiveness of our asset management framework, including updating our asset policies, further developments to the ICM and improving the availability of key asset information.

A high-level assessment of our asset management framework was completed by AMCL in March 2006. A more rigorous assessment is currently underway and is scheduled for completion by December 2006. This will include a detailed assessment of our asset policies. This will provide:

- a clear view of our organisational strengths and weaknesses;
- the identification of internal areas of excellence;
- an identification of applicable external best practices; and
- guidance on activities to deliver improvements.

We will use the output of this work to refine our ongoing asset management improvement plans. Priority will be given to those actions that will improve the robustness of our October 2007 Strategic Business Plan.

In addition, we are discussing with LUL, Metronet and Tubelines the development of a common assessment framework for asset management in the UK rail industry.

Improving asset information

In August 2005 we published an update of our Asset Information Strategy and our plans for the delivery of a robust asset register by September 2007. A key deliverable of this programme is the provision by September 2006 of key asset information to support our October 2007 Strategic Business Plan. This programme remains on target and the ICM and associated support tools will be updated as asset information becomes available. It is considered unlikely that this additional information will result in substantial changes to the activity and cost forecasts contained within this Initial Strategic Business Plan. It should, however, improve the robustness of this plan.

Improving standards

In our 2006 Business Plan we set out our plans to implement a new Company Standards programme that will enable standardised processes and specifications to be used managing projects. The first stage of this will be a “proof of concept” exercise carried out over summer 2006 to test the feasibility of the proposed consultative group processes within Network Rail. If this exercise is successful we will adopt the consensus based approach for the development of future standards, and would aim to have the necessary processes in place by early 2007.

In addition, working with stakeholders throughout the industry we will be reviewing the way standards drive costs on community rail lines and whether there are any opportunities to reduce the subsequent costs. A number of options are being considered including:

- a risk-based review of existing standards to identify potential opportunities to change current inspection and maintenance frequencies; and
- use of lighter vehicles. As this will mean mixing heavy and light vehicles on the network, we will be undertaking work to understand how this approach can be managed and to understand the changed risk profile.

Track policy development

There are a number of initiatives that are currently underway that target improving the management of our track asset portfolio. Our October 2007 Strategic Business Plan will provide an update on

these initiatives with the activity and cost implications clearly defined. These key initiatives include:

- the justification for existing inspection, maintenance and renewal regimes;
- the business case for cyclical renewals on primary and key L&SE routes; and
- the potential benefits of developing modular S&C units.

Other initiatives under consideration include:

- the installation of absolute track geometry on primary routes;
- the handback to traffic at linespeed after track renewal on primary routes;
- optimising the balance between high output and conventional methods for the delivery of track renewals across the network; and
- increased recovery of serviceable rail and concrete sleepers from renewals to cascade for use in lower category lines.

Signalling policy development

There are a number of particular initiatives in addition to our normal improvement processes that target improving the management of our signalling asset portfolio and some of these are highlighted below. Our October 2007 Strategic Business Plan will provide an update on these initiatives with the activity and cost implications clearly defined. In particular:

- the justification for existing inspection, maintenance and renewal regimes. The aim is to realise efficiency benefits from tailoring the inspection and maintenance of assets to the reliability and risks associated with the asset;
- we are also completing extensive pieces of work to examine the business case for whole re-signalling as opposed to partial renewals and life extension options. This is being done in conjunction with production of a long term signalling renewals plan and overall strategy taking us in to CP4 and beyond;
- the ERTMS programme's progress will be reviewed in December 2006, at the "Red Diamond Review" in order to assess the affordability of the project and the success with the Cambrian trial;
- the use of LED signals and indicators has significant financial and operational benefits and the policy of renewing life-expired signals with LEDs variants will be extended to cover all types of indication. We are also looking at the business case for the replacement of oil lamps in semaphore areas by an LED replacement;
- the potential cab signal implementation of bi-directional signalling utilising ERTMS offers the possibility of realising the benefits for a lower cost and further examination of this implementation is being considered;
- the installation of proceed on sight signals in selected locations around the country could offer a number of safety and performance benefits. We are considering their use as an addition to main signals for critical parts of the network;
- having gained considerable experience in the implementation of axle counters on the network, we are currently appraising lessons learnt in order to inform the technical policy for train detection; and
- we are currently appraising various level crossing technologies with the aim of improving the safe operation of level crossings.

Civils policy development

There are a number of initiatives that are currently underway that target improving the management of our civils asset portfolio. Our October 2007 Strategic Business Plan will provide an update on these initiatives with the activity and cost implications clearly defined. These key initiatives include:

- justification for existing inspection, maintenance and renewal regimes. We believe there are opportunities to develop further our current differentiated approach, along similar lines to that adopted by track. As a consequence we are developing a policy planning tool which will allow the policies applied to individual assets to take into account the category of route they are on (i.e. primary, L&SE etc). This tool is scheduled for completion in early 2007; and
- introduction of risk-based examination frequencies will enable us to implement an asset specific regime based on the individual asset's deterioration characteristics;.

For stations two important initiatives are currently underway:

- developing a station strategy that reflects our role as landlord for all stations and manager for all the major stations. In taking this forward we will need to work closely with all our industry partners, particularly train operators who operate the majority of these stations; and
- the development of a modular approach to station design. In developing our proposals we are working with train operators, ATOC and the DfT. We have developed a new categorisation of stations into four types based on the nature of the traffic as well as the demand at each station. We believe this provides more relevant specifications that are more easily applied. The next steps in taking these proposals forward involves gaining industry acceptance and agreement to the proposals, finalisation of the modular design proposals and development of pilot schemes.

Telecoms policy development

There are a number of initiatives that are currently underway that target improving the management of our Telecom asset portfolio. Our October 2007 Strategic Business Plan will provide an update on these initiatives with the activity and cost implications clearly defined. In particular:

- the justification for existing inspection, maintenance and renewal regimes. A Decision Support Tool (DST) for telecom assets is being developed to provide a consistent approach. The functionality of the DST is currently being validated and will be completed by mid 2006;
- the deployment of a national IP based network will require the new FTN infrastructure to be enhanced as a key enabler for this initiative. Work has just commenced to engage with stakeholders to understand the potential benefits of convergence to the business. A convergence strategy and business case is being developed; and
- a study is underway to review the requirements for line side communications with the advent of GSM-R. On completion of this study in 2007 we will have produced an assessment of the feasibility of GSM-R as a realistic alternative to line side phones, firmed up on a single option and developed an implementation plan. If the decision is taken to reduce the number of line side phones, this will require considerable stakeholder review within the railway community.

Electrification & plant policy development

There are a number of initiatives that are currently underway that target improving the management of our E&P asset portfolio. Our October 2007 Strategic Business Plan will provide an update on these initiatives with the activity and cost implications clearly defined. In particular:

- justification for existing inspection, maintenance and renewal regimes. We will be examining opportunities to use a differentiated approach; and
- our Initial Strategic Business Plan includes OM&R provision to make the AC electrification infrastructure "regeneration" capable. We are assessing the cost and benefits of making the DC system "regeneration" capable. The output of this analysis will be documented in our October 2007 Strategic Business Plan.

The Infrastructure Cost Model

The development of the ICM is a long-term activity and the completion of version 1 is only the first step. We are developing a plan for further refinement of the model, with the production of version 2 targeted for the end of 2006 and further developments to be completed to support our October 2007 Strategic Business Plan. This plan will take account of our experience in developing and using version 1 of the model, improvements in asset information, feedback from the AMCL review and the views of stakeholders.

While the ICM has been reviewed and calibrated at network level, we have not yet completed a detailed review of results at lower levels of disaggregation, e.g. by route classification, area or for specific route segments. We anticipate that this more detailed analysis of the outputs, together with extensive testing of alternative scenarios and sensitivities, will highlight aspects of the model that could be refined.

We will therefore be working closely with ORR to develop the functionality to support the development of the structure of access charges, ensuring alignment with the principles of the charging regime. For example, this could involve the application of avoidable cost principles to underpin the allocation of fixed track charges, refinement of the capability to estimate usage costs and the translation of forecast costs into charges in line with agreed principles.

The precise scope and timing of improvements to the ICM will be influenced by industry priorities for PR2008 but is likely to include:

- development of functionality to support the calculation and allocation of access charges;
- more accurate modelling of the interaction between maintenance and renewal activities;
- improvements in the modelling of relationships between activity and network outputs;
- incorporation of developments in the understanding of cost causation and improvements in availability of asset condition data;
- more detailed modelling of activity costs, e.g. addressing resource input requirements and regional variations in cost rates; and
- capability to incorporate enhancement cost estimates.

We will also work to improve our understanding of likely performance over CP4, and of the trade-offs between performance, other outputs and cost. As part of this we will seek to work with train operators to develop a shared understanding of the potential for performance improvements at a more local level.

Efficiencies and input prices

Chapter 4 has described the work we are doing partly to reach a view on the potential for efficiency improvements in CP4. More fundamentally these initiatives are central to our efforts to drive efficiency improvements throughout the business. Both these issues are being taken forward in conjunction with the development of our vision for a world class organisation.

Our aim to be a world class organisation is a key part of our long-term strategy, but, it will not be achieved easily or quickly. We are starting to develop our plans now, in line with the following key stages:

- aims and priorities: it is essential that this phase of design is thorough but rapid in order to build early momentum and we expect to have it completed during Autumn 2006;
- core workstreams: these will be developed at functional and company level to deliver the key priorities for world class performance. Work has already commenced to begin defining what the key workstreams should be and we expect to have specific actions with delivery timescales and resources incorporated within the 2007 Business Plan;
- outputs: development of the core workstreams will implicitly include definition of outcomes and benefits from the change activities. These will be further developed and integrated with all other aspects of the regulatory review so that the projections for CP4 in the 2008 Business Plan are as credible and robust as possible, reflecting the step change to be delivered by the world class programme; and
- deliverables: we expect to be able to demonstrate clear progress in delivery of the key enablers for world class performance by the start of 2008/09, with some areas of the business demonstrating world class performance by the start of CP4 in April 2009.

Chapter 4 provides further detail on our work programme. This will be kept under review in the light of further discussions with ORR and the development of our world class programme.

Development of route plans

The programme of Route Utilisation Strategies are key to developing a more detailed and robust view of the appropriate route strategies and projects to respond to the growth in demand forecast and to ensure performance improves. The consultation process within the RUS process is key to gaining industry and wider stakeholder acceptance to the options necessary to accommodate growth and improve performance. The map below sets out the programme of RUSs across the network.

In addition, we will be taking forward work on a number of potential major projects, such as Thameslink, which could be funded through the review. Where we are not engaged in RUSs at an advanced stage, we will work with operators and funders to refine our route plans aiming to optimise outputs and efficiency. In developing these route plans, it will be important to integrate our plans for renewal and enhancement to improve overall deliverability and affordability while minimising disruption to passengers and freight users. This is particularly important on parts of the network which are very congested or where major works are planned.

Figure 68 RUS programme

Commercial development

Our commercial property function has just completed a significant re-organisation in order to provide greater focus and alignment with the rest of Network Rail as well as industry partners and other external bodies. Our commercial property is evolving around the concept of a three tier approach:

- separate projects for main London terminals;
- important large stations;
- route clusters.

A number of significant proposals are being developed for major London termini such as Cannon Street, Euston, Victoria, Waterloo, London Bridge and Paddington. The proposals are in various stages of development. It is hoped that we will have identified our preferred development partners for Victoria and Euston by the end of 2006 and be at a similar stage for waterloo and London Bridge by March 2008.

There are a number of important larger regional stations where we are also developing proposals which involve third party developers. The most important of these for the provision of pedestrian capacity is Birmingham New Street.

Besides New Street, the most advanced proposal is Guildford station where we have a preferred development partner. Other stations with less developed proposals include Peterborough, Cambridge, Stevenage, Watford Junction, St Albans City, Redhill, Manchester Victoria and Aberdeen. In developing these proposals we will be examining the opportunities to exploit commercial and operational synergies by bundling stations into packages.

We are also examining the concept of route clusters. The ambition is to establish commercial development vehicles that combine our land holding interests with external finance and development expertise. We will explore these opportunities in partnership with train operators to identify station capacity and other issues which can be resolved by maximising the commercial opportunity. We are currently developing a pilot study for this approach in order to understand better the commercial feasibility of this approach.

Planning for the Olympics

Further work is required to understand in detail the impact of the Olympics on our plans. This includes understanding how our operational plans need to respond to the event itself, how we ensure the network is renewed and enhanced to support the event and also what impact the activity supporting the Olympics has on the resources available and costs to deliver our plan.

We will be working closely with the Olympic Delivery Authority and TfL to take these issues forward.

Safety

For the next submission in October 2007 we are planning to develop a costed plan to deliver safety improvements, measured by improvement in the HLOS safety output measure, as follows:

- for each area of safety risk, identify specific costed safety initiatives, across the industry, and the related reduction in risk;
- identify within each risk area, the improvements which will be obtained as secondary benefits of other output improvements, for example the reduction in broken rails; and
- for each risk area, project the additional continuous improvement in risk which might be extrapolated from recent improvements across the industry and project costs based on standard industry methodologies.

These factors will be aggregated and sense checked in order to provide an industry based projection of safety risk improvement, in line with the anticipated HLOS requirement.

In addition consideration will be given to any emerging legislative requirements which might give rise to additional capital expenditure without significantly reducing the safety risk profile.

Appendices

Key assumptions

This chapter sets out the key assumptions adopted in the preparation of this plan. The key assumptions are set out in the following sections:

- Strategic context
- Demand factors
- Infrastructure cost model
- Performance Model
- Financial model

Key assumptions: strategic context	
Government policy	No change in existing Government policies. No introduction of national road pricing.

Key assumptions: passenger demand	
Socio - economic factors	GDP: forecasts produced by Oxford Economic Forecasting (June 2005) for Government regions have been scaled so as to match the national GDP forecast of HM Treasury. Population: forecasts from TEMPRO 4.3 at government region level. Employment: regional forecasts from TEMPRO 4.3 at government region level except for in London where more focussed predictions have been utilised – these are again from TEMPRO 4.3.
Competition factors	Car ownership: regional forecasts from TEMPRO 4.3 Car journey time: regional forecasts from TEMPRO 4.3 We assume that real fuel prices remain constant. We assume the levels of vehicle efficiency gains are those published in Transport Analysis Guidance, December 2004.
Fares	Real fares (regulated and unregulated) increase by RPI+1% a year.
Flow types	The three flow types for which we have presented predictions are aggregated thus: London and South East • London Travel Card Area • Rest of South East to London Travel Card Area • London Travel Card Area to Rest of South East • Other flows in South East Long Distance • Rest of Country to London Travel Card Area • London Travel Card Area to Rest of Country Regional • Non-London inter-urban • Urban areas

Key assumptions: passenger demand continued	
Elasticities	Elasticity parameters from Passenger Demand Forecasting Handbook (PDFH) version 4.1 have been used for each demand drivers except for season tickets to/within the London Travel Card area for which we assume the population elasticity is zero.
Performance	An overlay was applied to the exogenous passenger growth forecasts to reflect improved train performance based on the relationship between revenue and lateness assumed by Schedule 8. We assume that out-turn delay minutes are those predicted in our 2005 Business Plan.

Key assumptions: freight demand	
Economic factors	Channel Tunnel access charges to decline with ending of the minimum usage guarantee. Company neutral revenue support grants remain. Predictions generated by the GB Freight Model use the draft amended rates which were published by the Department for Transport (2006). Maritime container imports to continue increasing at 3.75 to 5 per cent a year. Additional port capacity to be built at Felixstowe South (2009) and Bathside Bay (2010). No significant new electricity generating capability. Power stations demand for coal increases by approx 0.1 per cent a year reflecting increased energy demand, competition from other electricity generating methods and the impact of emissions quotas. The output of English deep-mined coal that is hauled by rail is assumed to decline by 3.5 to 4.0 million tonnes by 2014. The shortfall is assumed to be made up with imported coal and coal mined in Ayrshire. Imports at English and Welsh ports are assumed to increase by one per cent a year; imports through Hunterston are presumed to increase by two per cent a year. The output of the Ayrshire open-cast coal mines is assumed to increase by one per cent a year. Elasticities (that vary by commodity) were estimated and applied to GDP to derive demand growth rates for commodities for which specific market drivers could not be predicted. The Treasury GDP five year deflator was used and projected forward.
Competition factors	No change in maximum weights of Heavy Goods Vehicles. Lorry road user charging is not implemented. Rail mode share of maritime container haulage market to increase at a similar rate as experienced since privatisation (approximately 0.8 per cent a year gain).
Rail productivity	No change in productivity (e.g. train lengthening).

Key assumptions: ICM input prices and efficiencies

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14
All M&R categories and all other opex costs					
Input prices change over previous year	2.5%	2.5%	0.75%	0.75%	0.75%
Efficiency change over previous year	-5.0%	-5.0%	-4.0%	-3.0%	-2.0%
Overall change	-2.6%	-2.6%	-3.3%	-2.3%	-1.3%

Note: these efficiency assumptions have not been applied to rostered staff costs, insurance, pensions or uncontrollable opex

Key assumptions: ICM traffic growth (% change over previous year)

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Basecase								
Passenger train km	0.6%	0.8%	0.1%	0.8%	0.7%	0.9%	0.7%	0.7%
Passenger EMGT km	0.6%	1.0%	0.0%	1.4%	1.2%	1.8%	1.3%	1.3%
Freight train km	4.7%	2.6%	2.6%	2.5%	2.4%	2.4%	2.3%	2.3%
Freight EMGT km	7.0%	2.2%	2.1%	2.1%	2.0%	2.0%	2.0%	1.9%
Total train km	1.0%	1.0%	0.4%	1.0%	0.9%	1.1%	0.9%	0.9%
Total EMGT km	2.8%	1.4%	0.8%	1.6%	1.5%	1.9%	1.5%	1.5%
Baseline								
Passenger train km	0.6%	0.8%	0.1%	0.2%	0.0%	0.3%	0.1%	0.0%
Passenger EMGT km	0.6%	1.0%	0.0%	0.1%	0.0%	0.6%	0.0%	0.0%
Freight train km	4.7%	2.6%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%
Freight EMGT km	7.0%	2.2%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Total train km	1.0%	1.0%	0.4%	0.1%	0.0%	0.2%	0.1%	0.0%
Total EMGT km	2.8%	1.4%	0.8%	0.1%	0.0%	0.4%	0.0%	0.0%

Key assumptions : ICM track service life assumptions (EMGT)

EMGTPA	Rail		Ballast	Sleepers		
	CWR	Jointed		Concrete	Hardwood	Softwood
5	210	200	200	230	240	185
10	400	390	370	410	420	350
15	570	560	510	570	590	350
20	720	700	630	720	740	350
25	840	700	720	880	870	350
30	930	700	780	1000	990	350

Notes:
1. EMGTPA is equivalent million gross tones per annum
2. Service lives used as above for Primary, Secondary, and London & South East route categories
3. 20% increase applied for Rural and Freight only route categories

Key assumptions: ICM civils

Civils Asset Policy by Route Classification

Primary	A
Secondary	B
London and South East	B
Rural	C
Freight	C

Key assumptions: ICM asset lives

Assumed asset lives

Asset Type	Years
Electrification	
High Voltage Switchgear - Various Oil Filled	40-60
High Voltage Switchgear - SF6 / Gas Insulated	50
Structure Mounted Outdoor Switchgear	15
Vacuum Switchgear	55
Low Voltage Switchgear (DC systems)	60
Transformer Rectifiers	60
Booster Transformers	35
Conductor Rail	80
Telecoms	
Concentrators	10
Driver only operation CCTV	10
Public emergency telephone systems	10
Voice recorders	7
FTN sites	30
GSM-R core sites	30
FTN/GSM-R co-located sites	30
Cabling	25-30

Key assumption : performance model	
Performance Model	Performance to the end of CP3 is as set out in the 2006 Business Plan. During CP4, the following assumptions apply. Each 1% reduction in asset failure rates, as estimated by the ICM, is assumed to lead to a 1% reduction in primary delay minutes per train-mile attributed to the relevant delay categories Delay per train-mile associated with possessions (e.g. possession overruns) is assumed to vary pro rata to the volume of track renewal work, as measured by the average of the km of rail, sleepers and ballast renewed. Primary delay per train-mile in all non-asset related NR delay categories (e.g. operational, train planning, weather-related and external delays) is assumed to reduce by 3% in year 1 of CP4, then by 2.5% in year 2, 2% in year 3, 1.5% in year 4 and 1% in year 5. Primary delay per train-mile in all TOC delay categories is assumed to reduce by the same amount. Improvements in incident management and response are modelled as follows: - average reduction of 1% per year in primary delay in asset-related NR delay categories, reflecting improved response to incidents; - average reduction of 2% per year in the ratio of congestion-related reactionary delay to primary delay, reflecting improved incident management; - average reduction of 2% per year in the ratio of turn-round delay to other delay, also reflecting improved incident management. In each case the improvement profile over CP4 is 150% of the average annual

Key assumptions: financial model	
Financial Framework	5.0% real return on RAB applied to CP4. Average interest payments assumed to be 5% nominal per year, applied to average net debt to give interest expense in the year. Indexations for inflation as supplied by Oxford Economic Forecasting. Amortisation applied as per ACR2003 (7% reducing balance on opening RAB and additions over 30 years)

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Appendix 2.1.1 - Total operating expenditure, maintenance and renewal projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Operating expenditure															
Controllable opex	812	795	765	757	749	740	733	731	720	710	699	689	680	680	680
Uncontrollable opex	367	394	390	390	396	402	408	412	415	419	419	419	419	419	419
Total operating expenditure	**1,179**	**1,188**	**1,154**	**1,147**	**1,145**	**1,141**	**1,141**	**1,143**	**1,136**	**1,129**	**1,118**	**1,108**	**1,098**	**1,098**	**1,098**
Maintenance	**1,138**	**1,068**	**1,000**	**968**	**937**	**902**	**877**	**862**	**841**	**824**	**807**	**790**	**774**	**772**	**771**
Renewals (non-WCRM)															
Track	827	762	719	712	691	663	646	621	580	539	484	461	475	463	417
Signalling	445	495	568	474	453	485	450	425	470	457	433	369	394	441	465
Civils	364	403	385	371	363	350	345	344	340	336	305	303	301	317	355
Operational property	216	207	201	308	269	234	215	204	186	180	182	176	174	172	172
Telecoms	191	229	241	168	144	82	43	53	36	31	51	50	52	42	50
Electrification	82	118	120	92	101	113	103	105	74	47	40	48	59	60	51
Plant and machinery	76	80	73	67	79	33	34	37	39	33	40	43	77	41	53
Other renewals (IT, etc.)	82	172	132	73	66	60	58	56	51	51	51	51	51	51	51
Total	**2,284**	**2,467**	**2,440**	**2,266**	**2,165**	**2,021**	**1,895**	**1,844**	**1,777**	**1,675**	**1,586**	**1,502**	**1,581**	**1,585**	**1,614**
Renewals (WCRM)															
Total	**474**	**384**	**78**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total renewals	**2,759**	**2,851**	**2,518**	**2,266**	**2,165**	**2,021**	**1,895**	**1,844**	**1,777**	**1,675**	**1,586**	**1,502**	**1,581**	**1,585**	**1,614**
Total O,M and R	**5,076**	**5,107**	**4,672**	**4,381**	**4,247**	**4,065**	**3,913**	**3,849**	**3,754**	**3,627**	**3,512**	**3,400**	**3,454**	**3,456**	**3,484**

Appendix 2.1.2 - Total enhancement projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Enhancements															
Safety schemes	92	107	90	0	0	0	0	0	0	0	0	0	0	0	0
Transition projects	75	7	105	0	0	0	0	0	0	0	0	0	0	0	0
Network Rail Discretionary Fund	32	79	89	0	0	0	0	0	0	0	0	0	0	0	0
Outperformance fund	-	50	150	0	0	0	0	0	0	0	0	0	0	0	0
Access for All	28	35	37	36	36	36	36	36	35	0	0	0	0	0	0
Projects (England&Wales)	345	334	165	184	165	80	219	211	197	33	55	0	0	0	0
Projects (Scotland)	65	183	136	0	0	0	0	0	0	0	0	0	0	0	0
Total Enhancements	**636**	**795**	**771**	**220**	**201**	**116**	**255**	**247**	**232**	**33**	**55**	**0**	**0**	**0**	**0**
England & Wales															
Projects	345	334	165	184	165	80	219	211	197	33	55	0	0	0	0
Safety schemes	83	97	81	0	0	0	0	0	0	0	0	0	0	0	0
Transition projects	68	6	95	0	0	0	0	0	0	0	0	0	0	0	0
Network Rail Discretionary Fund	27	69	86	0	0	0	0	0	0	0	0	0	0	0	0
Outperformance fund	-	45	135	0	0	0	0	0	0	0	0	0	0	0	0
Access for All	25	32	33	33	32	32	32	32	32	0	0	0	0	0	0
Total England & Wales	**547**	**583**	**594**	**217**	**198**	**113**	**252**	**243**	**228**	**33**	**55**	**0**	**0**	**0**	**0**
Scotland															
Projects	65	183	136	0	0	0	0	0	0	0	0	0	0	0	0
Safety schemes	9	10	9	0	0	0	0	0	0	0	0	0	0	0	0
Transition projects	7	1	10	0	0	0	0	0	0	0	0	0	0	0	0
Network Rail Discretionary Fund	5	10	3	0	0	0	0	0	0	0	0	0	0	0	0
Outperformance fund	-	5	15	0	0	0	0	0	0	0	0	0	0	0	0
Access for All	3	3	4	4	4	4	4	4	4	0	0	0	0	0	0
Total Scotland	**89**	**212**	**177**	**4**	**4**	**4**	**4**	**4**	**4**	**0**	**0**	**0**	**0**	**0**	**0**
Total Enhancements	**636**	**795**	**771**	**220**	**201**	**116**	**255**	**247**	**232**	**33**	**55**	**0**	**0**	**0**	**0**

Appendix 2.1.3 - Total income projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Income															
Schedule 8	65	63	56	-	-	-	-	-	-	-	-	-	-	-	-
Access charge supplement – Schedule 8	10	10	10	-	-	-	-	-	-	-	-	-	-	-	-
Schedule 4	(110)	(113)	(113)	(97)	(95)	(91)	(91)	(88)	(84)	(77)	(72)	(60)	(62)	(63)	(60)
Access charge supplement – Schedule 4	85	88	89	97	95	91	91	88	84	77	72	60	62	63	60
Variable track access	223	226	227	227	227	227	227	227	227	227	227	227	227	227	227
Electric asset usage	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
EC4T consumption usage	130	214	248	207	207	207	207	207	207	207	207	207	207	207	207
Capacity charge	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Stations (incl QX)	296	296	296	295	295	295	295	295	295	295	295	295	295	295	295
Depots	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47
Freight income	94	97	101	101	101	101	101	101	101	101	101	101	101	101	101
Property income	202	212	216	218	224	227	216	216	223	230	239	244	258	276	293
Property sales	51	76	89	26	22	12	14	10	13	12	12	12	12	12	12
Open access income	59	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Other	15	15	15	6	6	6	6	6	6	6	6	6	6	6	6
Total income	**1,202**	**1,282**	**1,332**	**1,177**	**1,180**	**1,173**	**1,164**	**1,160**	**1,170**	**1,176**	**1,184**	**1,190**	**1,203**	**1,222**	**1,239**

Appendix 2.1.4 - Total key performance indicators

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
KPIs															
Cumulative passenger train miles growth	0.6%	1.3%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%
Cumulative freight train tonne miles growth	7.1%	9.3%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%
Number of broken rails	290	285	280	274	269	264	258	253	253	253	253	253	253	253	253
L2 exceedences	0.81	0.79	0.77	0.76	0.74	0.73	0.71	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Number of signaling failures > 10 mins delay	22,500	21,200	20,140	19,133	18,176	17,268	16,404	15,584	15,584	15,584	15,584	15,584	15,584	15,584	15,584
Points and track circuit failures	16,189	14,867	14,124	13,417	12,747	12,109	11,504	10,929	10,929	10,929	10,929	10,929	10,929	10,929	10,929
Number of structures and earthworks TSRs	50	47	46	46	46	46	46	46	46	46	46	46	46	46	46
Traction power supply failures	58	55	53	53	52	52	51	51	51	51	51	51	51	51	51

Appendix 2.1.5 – Total revenue requirements

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Revenue requirements												
Maintenance	968	937	902	877	862	841	824	807	790	774	772	771
Opex	1,147	1,145	1,141	1,141	1,143	1,136	1,129	1,118	1,108	1,098	1,098	1,098
Schedules 4 & 8	97	95	91	91	88	84	77	72	60	62	63	60
Return	1,367	1,409	1,442	1,468	1,493	1,470	1,480	1,481	1,477	1,471	1,452	1,401
Amortisation	1,563	1,576	1,585	1,600	1,616	1,634	1,644	1,656	1,666	1,682	1,746	1,892
Gross revenue requirement	**5,142**	**5,161**	**5,161**	**5,177**	**5,202**	**5,165**	**5,154**	**5,135**	**5,102**	**5,088**	**5,132**	**5,223**
Other income	709	712	705	696	691	702	708	716	722	735	771	771
Net revenue requirement	**4,433**	**4,449**	**4,457**	**4,482**	**4,511**	**4,463**	**4,446**	**4,419**	**4,380**	**4,352**	**4,360**	**4,452**
Variable charge income	468	468	468	468	468	468	468	468	468	468	468	468
Amount to be recovered from fixed and grants	**3,965**	**3,981**	**3,989**	**4,014**	**4,043**	**3,995**	**3,978**	**3,950**	**3,912**	**3,884**	**3,892**	**3,984**

Appendix 2.1.6 – Scotland operating expenditure, maintenance and renewal projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Operating expenditure															
Controllable opex	76	77	74	71	70	69	69	69	68	67	66	65	64	64	64
Uncontrollable opex	28	29	29	29	30	31	31	32	32	32	32	32	32	32	32
Total operating expenditure	**104**	**106**	**103**	**101**	**100**	**100**	**100**	**100**	**100**	**99**	**98**	**97**	**96**	**96**	**96**
Maintenance	**132**	**97**	**90**	**103**	**100**	**95**	**93**	**91**	**88**	**86**	**84**	**82**	**81**	**80**	**79**
Renewals (non-WCRM)															
Track	79	74	70	81	85	78	97	98	88	74	63	66	78	68	48
Signalling	37	65	67	55	42	33	35	46	60	55	36	18	26	51	46
Civils	70	67	61	66	62	61	66	70	68	66	59	60	60	55	68
Operational property	18	20	19	49	40	39	39	22	21	20	20	19	19	19	19
Telecoms	27	32	33	15	27	36	5	9	4	3	6	5	5	7	5
Electrification	12	9	5	3	3	6	6	6	3	3	3	3	9	8	5
Plant and machinery	8	7	7	9	11	4	4	5	5	4	5	6	10	5	7
Other renewals (IT, etc.)	8	17	13	7	7	6	6	6	5	5	5	5	5	5	5
Total	**259**	**291**	**275**	**285**	**277**	**263**	**259**	**261**	**254**	**231**	**197**	**183**	**212**	**218**	**202**
Renewals (WCRM)															
Total	**37**	**28**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total renewals	**296**	**319**	**276**	**285**	**277**	**263**	**259**	**261**	**254**	**231**	**197**	**183**	**212**	**218**	**202**
Total O,M and R	**531**	**521**	**469**	**489**	**477**	**458**	**451**	**451**	**442**	**416**	**379**	**362**	**389**	**394**	**377**

Appendix 2.1.7 – Scotland income projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Income															
Schedule 8	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
Access charge supplement – Schedule 8	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Schedule 4	(11)	(11)	(11)	(10)	(9)	(9)	(9)	(8)	(8)	(8)	(7)	(6)	(6)	(6)	(6)
Access charge supplement – Schedule 4	7	7	7	10	9	9	9	8	8	8	7	6	6	6	6
Variable track access	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Electric asset usage	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
EC4T consumption usage	7	12	14	12	12	12	12	12	12	12	12	12	12	12	12
Capacity charge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stations (incl QX)	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Depots	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Freight income	10	10	11	11	11	11	11	11	11	11	11	11	11	11	11
Property income	9	10	10	9	9	9	9	9	9	9	9	10	10	10	10
Property sales	1	6	1	1	1	1	1	1	1	1	1	1	1	1	1
Open access income	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total income	**68**	**78**	**75**	**76**	**76**	**76**	**76**	**76**	**76**	**76**	**76**	**76**	**76**	**76**	**77**

Appendix 2.1.8 – Scotland key performance indicators

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
KPIs															
Cumulative passenger train miles growth	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
Cumulative freight train tonne miles growth	25.5%	27.5%	29.5%	29.5%	29.5%	29.5%	29.5%	29.5%	29.5%	29.5%	29.5%	29.5%	29.5%	29.5%	29.5%
Number of broken rails	33	33	30	29	29	28	28	27	27	27	27	27	27	27	27
L2 exceedences	0.57	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Number of signaling failures > 10 mins delay	2,160	2,060	1,957	1,859	1,766	1,678	1,594	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514
Points and track circuit failures	1,970	1,809	1,719	1,633	1,551	1,473	1,400	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330
Number of structures and earthworks TSRs	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Traction power supply failures	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Appendix 2.1.9 – Scotland revenue requirements

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Revenue requirements												
Maintenance	103	100	95	93	91	88	86	84	82	81	80	79
Opex	102	102	102	102	102	101	100	99	98	97	97	97
Schedules 4 & 8	10	9	9	9	9	8	8	7	6	6	6	6
Return	146	152	156	161	165	168	171	172	172	172	172	167
Amortisation	168	170	172	174	177	182	185	186	187	190	202	224
Gross revenue requirement	**529**	**532**	**534**	**538**	**542**	**548**	**549**	**548**	**545**	**545**	**557**	**573**
Other income	52	52	52	51	51	52	52	53	53	54	55	57
Net revenue requirement	**477**	**480**	**482**	**486**	**492**	**496**	**497**	**496**	**492**	**491**	**502**	**516**
Variable charge income	25	25	25	25	25	25	25	25	25	25	25	25
Amount to be recovered from fixed and grants	**452**	**455**	**457**	**462**	**467**	**472**	**472**	**471**	**467**	**466**	**477**	**491**

Appendix 2.1.10 – England and Wales operating expenditure, maintenance and renewal projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Operating expenditure															
Controllable opex	737	718	691	686	679	670	665	662	653	643	634	625	616	616	616
Uncontrollable opex	339	364	360	360	366	371	377	380	383	387	387	387	387	387	387
Total operating expenditure	**1,076**	**1,082**	**1,051**	**1,047**	**1,045**	**1,041**	**1,041**	**1,042**	**1,036**	**1,030**	**1,020**	**1,011**	**1,002**	**1,002**	**1,002**
Maintenance	**1,006**	**972**	**909**	**865**	**837**	**807**	**785**	**772**	**753**	**738**	**723**	**707**	**694**	**693**	**692**
Renewals (non-WCRM)															
Track	749	688	649	631	606	586	549	523	492	465	421	395	397	395	370
Signalling	408	430	502	420	411	453	415	379	410	402	397	351	367	390	419
Civils	295	336	324	305	301	290	279	274	271	270	246	243	241	261	287
Operational property	198	188	181	259	229	195	176	182	165	160	162	156	155	153	153
Telecoms	164	197	208	153	117	47	38	44	33	28	46	46	47	35	45
Electrification	70	109	114	89	97	107	97	99	71	44	38	45	50	52	46
Plant and machinery	69	73	66	58	69	29	30	32	34	29	35	38	67	35	46
Other renewals (IT, etc.)	74	156	120	66	59	54	52	50	46	45	45	45	45	45	45
Total	**2,026**	**2,176**	**2,164**	**1,980**	**1,888**	**1,759**	**1,636**	**1,583**	**1,523**	**1,444**	**1,389**	**1,319**	**1,369**	**1,367**	**1,412**
Renewals (WCRM)															
Total	**437**	**356**	**77**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total renewals	**2,463**	**2,532**	**2,242**	**1,980**	**1,888**	**1,759**	**1,636**	**1,583**	**1,523**	**1,444**	**1,389**	**1,319**	**1,369**	**1,367**	**1,412**
Total O,M and R	**4,545**	**4,586**	**4,202**	**3,892**	**3,770**	**3,607**	**3,462**	**3,398**	**3,312**	**3,212**	**3,133**	**3,038**	**3,065**	**3,062**	**3,106**

Appendix 2.1.11 – England and Wales income projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Income															
Schedule 8	64	62	55	-	-	-	-	-	-	-	-	-	-	-	-
Access charge supplement – Schedule 8	10	9	8	-	-	-	-	-	-	-	-	-	-	-	-
Schedule 4	(99)	(102)	(102)	(88)	(85)	(82)	(82)	(80)	(76)	(69)	(65)	(54)	(56)	(56)	(54)
Access charge supplement – Schedule 4	78	80	81	88	85	82	82	80	76	69	65	54	56	56	54
Variable track access	212	215	216	216	216	216	216	216	216	216	216	216	216	216	216
Electric asset usage	26	27	26	26	26	26	26	26	26	26	26	26	26	26	26
EC4T consumption usage	124	202	234	195	195	195	195	195	195	195	195	195	195	195	195
Capacity charge	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Stations (incl QX)	271	271	271	270	270	270	270	270	270	270	270	270	270	270	270
Depots	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Freight income	84	87	90	90	90	90	90	90	90	90	90	90	90	90	90
Property income	193	202	207	209	215	218	207	206	214	221	229	235	248	266	283
Property sales	50	70	89	25	22	12	14	10	13	12	12	12	12	12	12
Open access income	59	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Other	15	15	15	6	6	6	6	6	6	6	6	6	6	6	6
Total income	**1,136**	**1,203**	**1,255**	**1,101**	**1,105**	**1,097**	**1,088**	**1,084**	**1,094**	**1,100**	**1,109**	**1,114**	**1,127**	**1,146**	**1,162**

Appendix 2.1.12 – England and Wales key performance indicators

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
KPIs															
Cumulative passenger train miles growth	0.5%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%
Cumulative freight train tonne miles growth	4.8%	7.1%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%	9.3%
Number of broken rails	257	252	250	245	240	235	231	226	226	226	226	226	226	226	226
L2 exceedences	0.84	0.84	0.83	0.81	0.80	0.78	0.77	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Number of signaling failures > 10 mins delay	20,340	19,140	18,183	17,274	16,410	15,590	14,810	14,070	14,070	14,070	14,070	14,070	14,070	14,070	14,070
Points and track circuit failures	14,219	13,058	12,405	11,785	11,196	10,636	10,104	9,599	9,599	9,599	9,599	9,599	9,599	9,599	9,599
Number of structures and earthworks TSRs	46	44	43	43	43	43	43	43	43	43	43	43	43	43	43
Traction power supply failures	53	50	49	48	48	47	47	46	46	46	46	46	46	46	46

Appendix 2.1.13 – England and Wales revenue requirements

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Revenue requirements												
Maintenance	865	837	807	785	772	753	738	723	707	694	693	692
Opex	1,045	1,043	1,040	1,040	1,041	1,035	1,029	1,020	1,011	1,002	1,002	1,002
Schedules 4 & 8	88	85	82	82	79	76	69	65	54	56	56	54
Return	1,221	1,257	1,285	1,308	1,329	1,302	1,309	1,309	1,305	1,299	1,280	1,234
Amortisation	1,395	1,406	1,414	1,426	1,440	1,451	1,460	1,470	1,479	1,492	1,544	1,669
Gross revenue requirement	**4,613**	**4,629**	**4,628**	**4,640**	**4,660**	**4,617**	**4,605**	**4,587**	**4,556**	**4,543**	**4,574**	**4,650**
Other income	657	660	653	644	641	650	656	664	669	681	716	714
Net revenue requirement	**3,956**	**3,969**	**3,975**	**3,995**	**4,019**	**3,966**	**3,949**	**3,923**	**3,887**	**3,861**	**3,859**	**3,936**
Variable charge income	443	443	443	443	443	443	443	443	443	443	443	443
Amount to be recovered from fixed and grants	**3,513**	**3,526**	**3,531**	**3,552**	**3,576**	**3,523**	**3,506**	**3,480**	**3,444**	**3,418**	**3,416**	**3,493**

1

Appendix 2.2.1 - Total operating expenditure, maintenance and renewal projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Operating expenditure															
Controllable opex	812	795	765	757	749	740	733	731	720	710	699	689	680	680	680
Uncontrollable opex	367	394	390	392	400	408	416	421	425	429	429	429	429	429	429
Total operating expenditure	**1,179**	**1,188**	**1,154**	**1,149**	**1,149**	**1,147**	**1,149**	**1,152**	**1,145**	**1,138**	**1,128**	**1,118**	**1,108**	**1,108**	**1,108**
Maintenance	**1,138**	**1,068**	**1,000**	**971**	**944**	**910**	**887**	**875**	**858**	**838**	**820**	**804**	**788**	**785**	**784**
Renewals (non-WCRM)															
Track	827	762	719	710	690	662	647	620	584	538	493	482	485	461	423
Signalling	445	495	568	474	453	485	450	425	470	457	433	369	394	441	465
Civils	364	403	385	415	412	404	378	380	379	367	337	329	324	317	355
Operational property	216	207	201	308	269	234	215	204	186	180	182	176	174	172	172
Telecoms	191	229	241	168	144	82	43	53	36	31	51	50	52	42	50
Electrification	82	118	120	112	121	109	99	111	84	57	47	56	56	60	51
Plant and machinery	76	80	73	67	79	33	34	37	39	33	40	43	77	41	53
Other renewals (IT, etc.)	82	172	132	73	66	60	58	56	51	51	51	51	51	51	51
Total	**2,284**	**2,467**	**2,440**	**2,328**	**2,234**	**2,069**	**1,924**	**1,886**	**1,830**	**1,715**	**1,635**	**1,556**	**1,612**	**1,583**	**1,620**
Renewals (WCRM)															
Total	**474**	**384**	**78**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total renewals	**2,759**	**2,851**	**2,518**	**2,328**	**2,234**	**2,069**	**1,924**	**1,886**	**1,830**	**1,715**	**1,635**	**1,556**	**1,612**	**1,583**	**1,620**
Total O,M and R	**5,076**	**5,107**	**4,672**	**4,448**	**4,327**	**4,126**	**3,961**	**3,914**	**3,833**	**3,691**	**3,583**	**3,478**	**3,508**	**3,476**	**3,512**

Appendix 2.2.2 - Total enhancement projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Enhancements															
Safety schemes	92	107	90	50	50	50	50	50	50	50	50	50	50	50	50
Transition projects	75	7	105	0	0	0	0	0	0	0	0	0	0	0	0
Network Rail Discretionary Fund	32	79	89	50	50	50	50	50	50	50	50	50	50	50	50
Outperformance fund	-	50	150	0	0	0	0	0	0	0	0	0	0	0	0
Access for All	28	35	37	36	36	36	36	36	35	0	0	0	0	0	0
Projects (England&Wales)	345	334	165	1410	1687	1361	1347	587	646	291	217	0	0	0	0
Projects (Scotland)	65	183	136	422	294	102	37	16	3	0	0	0	0	0	0
Total Enhancements	**636**	**795**	**771**	**1968**	**2117**	**1599**	**1519**	**739**	**784**	**391**	**317**	**100**	**100**	**100**	**100**
England & Wales															
Projects	345	334	165	1410	1687	1361	1347	587	646	291	217	0	0	0	0
Safety schemes	83	97	81	45	45	45	45	45	45	45	45	45	45	45	45
Transition projects	68	6	95	0	0	0	0	0	0	0	0	0	0	0	0
Network Rail Discretionary Fund	27	69	86	45	45	45	45	45	45	45	45	45	45	45	45
Outperformance fund	-	45	135	0	0	0	0	0	0	0	0	0	0	0	0
Access for All	25	32	33	33	32	32	32	32	32	0	0	0	0	0	0
Total England & Wales	**547**	**583**	**594**	**1532**	**1809**	**1484**	**1469**	**709**	**768**	**381**	**307**	**90**	**90**	**90**	**90**
Scotland															
Projects	65	183	136	422	294	102	37	16	3	0	0	0	0	0	0
Safety schemes	9	10	9	5	5	5	5	5	5	5	5	5	5	5	5
Transition projects	7	1	10	0	0	0	0	0	0	0	0	0	0	0	0
Network Rail Discretionary Fund	5	10	3	5	5	5	5	5	5	5	5	5	5	5	5
Outperformance fund	-	5	15	0	0	0	0	0	0	0	0	0	0	0	0
Access for All	3	3	4	4	4	4	4	4	4	0	0	0	0	0	0
Total Scotland	**89**	**212**	**177**	**435**	**308**	**115**	**50**	**30**	**17**	**10**	**10**	**10**	**10**	**10**	**10**
Total Enhancements	**636**	**795**	**771**	**1968**	**2117**	**1599**	**1519**	**739**	**784**	**391**	**317**	**100**	**100**	**100**	**100**

Appendix 2.2.3 - Total income projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Income															
Schedule 8	65	63	56	-	-	-	-	-	-	-	-	-	-	-	-
Access charge supplement – Schedule 8	10	10	10	-	-	-	-	-	-	-	-	-	-	-	-
Schedule 4	(110)	(113)	(113)	(126)	(120)	(109)	(107)	(106)	(94)	(83)	(77)	(72)	(72)	(65)	(69)
Access charge supplement – Schedule 4	85	88	89	126	120	109	107	106	94	83	77	72	72	65	69
Variable track access	223	226	227	228	230	232	234	236	238	238	238	238	238	238	238
Electric asset usage	28	28	28	28	28	29	29	29	29	29	29	29	29	29	29
EC4T consumption usage	130	214	248	209	210	212	214	216	218	218	218	218	218	218	218
Capacity charge	7	7	7	7	7	7	7	7	8	8	8	8	8	8	8
Stations (incl QX)	296	296	296	295	295	295	295	295	295	295	295	295	295	295	295
Depots	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47
Freight income	94	97	101	103	105	108	110	113	113	113	113	113	113	113	113
Property income	202	212	216	218	224	227	216	216	223	230	239	244	258	276	293
Property sales	51	76	89	26	22	12	14	10	13	12	12	12	12	12	12
Open access income	59	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Other	15	15	15	6	6	6	6	6	6	6	6	6	6	6	6
Total income	**1,202**	**1,282**	**1,332**	**1,183**	**1,193**	**1,192**	**1,189**	**1,192**	**1,207**	**1,212**	**1,221**	**1,227**	**1,240**	**1,258**	**1,276**

Appendix 2.2.4 - Total key performance indicators

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
KPIs															
Public performance measure	87.6%	88.3%	88.9%	89.3%	89.7%	90.0%	90.2%	90.4%	90.4%	90.4%	90.4%	90.4%	90.4%	90.4%	90.4%
Train delay minutes (000's)	9,800	9,115	8,500	8,127	7,822	7,588	7,412	7,278	7,278	7,278	7,278	7,278	7,278	7,278	7,278
Cumulative passenger train miles growth	0.6%	1.3%	1.4%	2.2%	2.9%	3.8%	4.6%	5.3%	5.9%	5.9%	5.9%	5.9%	5.9%	5.9%	5.9%
Cumulative freight train tonne miles growth	7.1%	9.3%	11.6%	13.8%	16.0%	18.3%	20.6%	22.8%	25.1%	25.1%	25.1%	25.1%	25.1%	25.1%	25.1%
Delay minutes per 100 train km (passenger)	1.77	1.63	1.53	1.45	1.37	1.32	1.27	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Delay minutes per 100 train km (freight)	3.93	3.63	3.39	3.23	3.10	2.99	2.90	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83
Number of broken rails	290	285	280	274	269	264	258	253	253	253	253	253	253	253	253
Level 2 exceedences	0.807	0.787	0.77	0.76	0.74	0.73	0.71	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Number of signaling failures > 10 mins delay	22,500	21,200	20,140	19,133	18,176	17,268	16,404	15,584	15,584	15,584	15,584	15,584	15,584	15,584	15,584
Points and track circuit failures	16,189	14,867	14,124	13,417	12,747	12,109	11,504	10,929	10,929	10,929	10,929	10,929	10,929	10,929	10,929
Number of structures and earthworks TSRs	50	47	46	46	46	46	46	46	46	46	46	46	46	46	46
Traction power supply failures	58	55	53	53	52	52	51	51	51	51	51	51	51	51	51

Appendix 2.2.5 – Total revenue requirements

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Revenue requirements												
Maintenance	971	944	910	887	875	858	838	820	804	788	785	784
Opex	1,149	1,149	1,147	1,149	1,152	1,145	1,138	1,128	1,118	1,108	1,108	1,108
Schedules 4 & 8	126	120	109	107	106	94	83	77	72	72	65	69
Return	1,412	1,542	1,653	1,739	1,797	1,659	1,679	1,682	1,675	1,663	1,618	1,524
Amortisation	1,625	1,704	1,765	1,822	1,856	1,893	1,917	1,939	1,954	1,973	2,047	2,208
Gross revenue requirement	**5,283**	**5,458**	**5,584**	**5,704**	**5,787**	**5,650**	**5,655**	**5,646**	**5,622**	**5,605**	**5,623**	**5,694**
Other income	711	717	712	705	703	714	720	728	734	747	766	783
Net revenue requirement	**4,572**	**4,741**	**4,872**	**4,999**	**5,084**	**4,936**	**4,936**	**4,918**	**4,889**	**4,858**	**4,857**	**4,911**
Variable charge income	472	476	480	484	489	493	493	493	493	493	493	493
Amount to be recovered from fixed and grants	**4,100**	**4,265**	**4,392**	**4,514**	**4,595**	**4,443**	**4,443**	**4,425**	**4,396**	**4,365**	**4,365**	**4,418**

Appendix 2.2.6 – Scotland operating expenditure, maintenance and renewal projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Operating expenditure															
Controllable opex	76	77	74	71	70	69	69	69	68	67	66	65	64	64	64
Uncontrollable opex	28	29	29	29	30	31	32	32	32	33	33	33	33	33	33
Total operating expenditure	**104**	**106**	**103**	**101**	**101**	**100**	**100**	**101**	**100**	**100**	**99**	**98**	**97**	**97**	**97**
Maintenance	**132**	**97**	**90**	**104**	**100**	**96**	**93**	**92**	**89**	**87**	**85**	**83**	**81**	**81**	**80**
Renewals (non-WCRM)															
Track	79	74	70	82	83	76	98	95	90	74	66	68	75	71	47
Signalling	37	65	67	55	42	33	35	46	60	55	36	18	26	51	46
Civils	70	67	61	75	71	70	72	76	76	72	65	65	64	55	68
Operational property	18	20	19	49	40	39	39	22	21	20	20	19	19	19	19
Telecoms	27	32	33	15	27	36	5	9	4	3	6	5	5	7	5
Electrification	12	9	5	3	3	6	6	6	3	3	3	3	9	8	5
Plant and machinery	8	7	7	9	11	4	4	5	5	4	5	6	10	5	7
Other renewals (IT, etc.)	8	17	13	7	7	6	6	6	5	5	5	5	5	5	5
Total	**259**	**291**	**275**	**295**	**284**	**271**	**265**	**264**	**263**	**237**	**206**	**189**	**214**	**221**	**201**
Renewals (WCRM)															
Total	**37**	**28**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total renewals	**296**	**319**	**276**	**295**	**284**	**271**	**265**	**264**	**263**	**237**	**206**	**189**	**214**	**221**	**201**
Total O,M and R	**531**	**521**	**469**	**499**	**484**	**467**	**459**	**456**	**452**	**424**	**390**	**370**	**392**	**398**	**378**

Appendix 2.2.7 – Scotland income projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Income															
Schedule 8	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
Access charge supplement – Schedule 8	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Schedule 4	(11)	(11)	(11)	(12)	(12)	(11)	(11)	(10)	(9)	(8)	(8)	(7)	(7)	(6)	(7)
Access charge supplement – Schedule 4	7	7	7	12	12	11	11	10	9	8	8	7	7	6	7
Variable track access	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Electric asset usage	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
EC4T consumption usage	7	12	14	12	12	12	13	13	13	13	13	13	13	13	13
Capacity charge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stations (incl QX)	25	25	25	27	27	27	27	27	27	27	27	27	27	27	27
Depots	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Freight income	10	10	11	11	11	11	12	12	12	12	12	12	12	12	12
Property income	9	10	10	9	9	9	9	9	9	9	9	10	10	10	10
Property sales	1	6	1	1	1	1	1	1	1	1	1	1	1	1	1
Open access income	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total income	**68**	**78**	**75**	**78**	**78**	**79**	**79**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**81**

Appendix 2.2.8 – Scotland key performance indicators

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
KPIs															
Public performance measure	87.3%	88.7%	90.0%	90.4%	90.8%	91.1%	91.3%	91.4%	91.4%	91.4%	91.4%	91.4%	91.4%	91.4%	91.4%
Train delay minutes	860	793	736	704	678	658	643	633	633	633	633	633	633	633	633
Cumulative passenger train miles growth	1.1%	1.1%	1.1%	1.8%	2.4%	3.1%	3.8%	4.5%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%
Cumulative freight tonne miles growth	25.5%	27.5%	29.5%	31.6%	33.6%	35.7%	37.8%	39.9%	41.9%	41.9%	41.9%	41.9%	41.9%	41.9%	41.9%
Delay minutes per 100 train km (passenger)	1.56	1.42	1.33	1.26	1.20	1.15	1.12	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Delay minutes per 100 train km (freight)	2.76	2.57	2.35	2.23	2.13	2.05	1.99	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94
Number of broken rails	33	33	30	29	29	28	28	27	27	27	27	27	27	27	27
Level 2 exceedences	0.57	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Number of signaling failures > 10 mins delay	2,160	2,060	1,957	1,859	1,766	1,678	1,594	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514
Points and track circuit failures	1,970	1,809	1,719	1,633	1,551	1,473	1,400	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330
Number of structures and earthworks TSRs	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Traction power supply failures	5	5	5	5	5	5	5	4	4	4	4	4	4	3	3

Appendix 2.2.9 – Scotland revenue requirements

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Revenue requirements												
Maintenance	104	100	96	93	92	89	87	85	83	81	81	80
Opex	102	102	102	102	102	101	100	99	98	97	97	97
Schedules 4 & 8	13	12	11	11	11	9	8	8	7	7	7	7
Return	157	180	194	201	206	209	211	212	210	209	206	195
Amortisation	183	195	201	205	209	216	219	221	223	226	239	263
Gross revenue requirement	**558**	**589**	**604**	**612**	**619**	**625**	**626**	**624**	**622**	**621**	**630**	**642**
Other income	52	53	52	52	52	55	55	55	57	57	56	58
Net revenue requirement	**506**	**537**	**552**	**561**	**568**	**570**	**571**	**569**	**565**	**564**	**574**	**584**
Variable charge income	26	26	26	26	26	26	26	26	26	26	26	26
Amount to be recovered from fixed and grants	**480**	**511**	**526**	**535**	**542**	**544**	**545**	**543**	**539**	**538**	**548**	**559**

Appendix 2.2.10 – England and Wales operating expenditure, maintenance and renewal projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Operating expenditure															
Controllable opex	737	718	691	686	679	670	665	662	653	643	634	625	616	616	616
Uncontrollable opex	339	364	360	362	369	377	384	389	393	396	396	396	396	396	396
Total operating expenditure	**1,076**	**1,082**	**1,051**	**1,048**	**1,048**	**1,047**	**1,049**	**1,052**	**1,045**	**1,039**	**1,030**	**1,020**	**1,011**	**1,011**	**1,011**
Maintenance	**1,006**	**972**	**909**	**868**	**844**	**814**	**794**	**783**	**768**	**751**	**735**	**720**	**707**	**704**	**704**
Renewals (non-WCRM)															
Track	749	688	649	627	607	586	550	526	495	464	427	414	409	390	377
Signalling	408	430	502	420	411	453	415	379	410	402	397	351	367	390	419
Civils	295	336	324	341	341	334	306	304	303	295	272	265	259	261	287
Operational property	198	188	181	259	229	195	176	182	165	160	162	156	155	153	153
Telecoms	164	197	208	153	117	47	38	44	33	28	46	46	47	35	45
Electrification	70	109	114	109	118	103	93	105	82	55	45	52	47	52	46
Plant and machinery	69	73	66	58	69	29	30	32	34	29	35	38	67	35	46
Other renewals (IT, etc.)	74	156	120	66	59	54	52	50	46	45	45	45	45	45	45
Total	**2,026**	**2,176**	**2,164**	**2,033**	**1,950**	**1,798**	**1,659**	**1,622**	**1,568**	**1,478**	**1,428**	**1,367**	**1,397**	**1,362**	**1,419**
Renewals (WCRM)															
Total	**437**	**356**	**77**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total renewals	**2,463**	**2,532**	**2,242**	**2,033**	**1,950**	**1,798**	**1,659**	**1,622**	**1,568**	**1,478**	**1,428**	**1,367**	**1,397**	**1,362**	**1,419**
Total O,M and R	**4,545**	**4,586**	**4,202**	**3,949**	**3,843**	**3,659**	**3,502**	**3,457**	**3,381**	**3,268**	**3,193**	**3,108**	**3,116**	**3,078**	**3,134**

Appendix 2.2.11 – England and Wales income projections

£m (2005/06 prices)	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Income															
Schedule 8	64	62	55	-	-	-	-	-	-	-	-	-	-	-	-
Access charge supplement – Schedule 8	10	9	8	-	-	-	-	-	-	-	-	-	-	-	-
Schedule 4	(99)	(102)	(102)	(114)	(108)	(98)	(96)	(96)	(85)	(75)	(70)	(64)	(65)	(59)	(62)
Access charge supplement – Schedule 4	78	80	81	114	108	98	96	96	85	75	70	64	65	59	62
Variable track access	212	215	216	217	219	221	223	225	227	227	227	227	227	227	227
Electric asset usage	26	27	26	26	27	27	27	27	28	28	28	28	28	28	28
EC4T consumption usage	124	202	234	196	198	200	202	203	205	205	205	205	205	205	205
Capacity charge	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Stations (incl QX)	271	271	271	268	268	268	268	268	268	268	268	268	268	268	268
Depots	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Freight income	84	87	90	92	94	96	99	101	101	101	101	101	101	101	101
Property income	193	202	207	209	215	218	207	206	214	221	229	235	248	266	283
Property sales	50	70	89	25	22	12	14	10	13	12	12	12	12	12	12
Open access income	59	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Other	15	15	15	6	6	6	6	6	6	6	6	6	6	6	6
Total income	**1,136**	**1,203**	**1,255**	**1,105**	**1,114**	**1,113**	**1,109**	**1,112**	**1,127**	**1,132**	**1,141**	**1,146**	**1,159**	**1,178**	**1,195**

Appendix 2.2.12 – England and Wales key performance indicators

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
KPIs															
Public performance measure	87.6%	88.3%	88.8%	89.2%	89.6%	89.9%	90.1%	90.3%	90.3%	90.3%	90.3%	90.3%	90.3%	90.3%	90.3%
Train delay minutes	8,940	8,322	7,764	7,538	7,366	7,253	7,189	7,162	7,162	7,162	7,162	7,162	7,162	7,162	7,162
Cumulative passenger train miles growth	0.5%	1.4%	1.4%	2.2%	2.9%	3.9%	4.6%	5.3%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Cumulative freight train tonne miles growth	4.8%	7.1%	9.3%	11.6%	13.9%	16.1%	18.4%	20.7%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%	23.0%
Delay minutes per 100 train km (passenger)	1.79	1.66	1.55	1.46	1.39	1.33	1.28	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Delay minutes per 100 train km (freight)	4.12	3.80	3.55	3.39	3.25	3.13	3.04	2.96	2.96	2.96	2.96	2.96	2.96	2.96	2.96
Number of broken rails	257	252	250	245	240	235	231	226	226	226	226	226	226	226	226
Level 2 exceedences	0.84	0.84	0.83	0.81	0.80	0.78	0.77	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Number of signaling failures > 10 mins delay	20,340	19,140	18,183	17,274	16,410	15,590	14,810	14,070	14,070	14,070	14,070	14,070	14,070	14,070	14,070
Points and track circuit failures	14,219	13,058	12,405	11,785	11,196	10,636	10,104	9,599	9,599	9,599	9,599	9,599	9,599	9,599	9,599
Number of structures and earthworks TSRs	46	44	43	43	43	43	43	43	43	43	43	43	43	43	43
Traction power supply failures	53	50	49	48	48	47	47	46	46	46	46	46	46	46	46

Appendix 2.2.13 – England and Wales revenue requirements

£m (2005/06 prices)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	CP6 annual average	CP7 annual average
Revenue requirements												
Maintenance	868	844	814	794	783	768	751	735	720	707	704	704
Opex	1,047	1,047	1,045	1,047	1,050	1,044	1,038	1,029	1,020	1,011	1,011	1,011
Schedules 4 & 8	113	108	98	96	96	84	75	69	64	65	59	62
Return	1,255	1,362	1,459	1,538	1,591	1,450	1,467	1,471	1,465	1,453	1,412	1,329
Amortisation	1,442	1,509	1,563	1,617	1,647	1,678	1,698	1,718	1,731	1,748	1,807	1,946
Gross revenue requirement	**4,725**	**4,869**	**4,980**	**5,091**	**5,167**	**5,025**	**5,030**	**5,022**	**5,001**	**4,984**	**4,993**	**5,052**
Other income	659	664	659	653	652	659	665	673	677	690	709	725
Net revenue requirement	**4,066**	**4,205**	**4,320**	**4,438**	**4,516**	**4,366**	**4,365**	**4,349**	**4,323**	**4,294**	**4,284**	**4,326**
Variable charge income	446	450	454	459	463	467	467	467	467	467	467	467
Amount to be recovered from fixed and grants	**3,620**	**3,755**	**3,866**	**3,980**	**4,053**	**3,899**	**3,898**	**3,882**	**3,856**	**3,827**	**3,817**	**3,859**