


Network Rail Project and Programme Management Capability

GRCPPM

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1 Executive Summary

1.1 Remit

1.1.1 Halcrow Group Limited (Halcrow) was instructed by the Office of Rail Regulation (ORR) to conduct a study into the Project & Programme Management (PPM) capability Network Rail (NR) on 26 October 2011.¹

1.1.2 ‘Whole System Programme Management’ was considered by the McNulty Rail Value for Money (RVM) Study² as an opportunity to reduce the cost of delivering improvements to the rail network. The RVM Study considered ‘Whole System Programme Management’ in respect of pan-industry initiatives only. In this study we have been asked to focus on NR’s capability, its contribution to the RVM savings identified and the extent to which other opportunities accrue to NR specifically. In summary the remit requires that this study provides:

- an opinion on the efficacy of NR’s PPM processes;
- an assessment NR’s PPM capability through consideration of actual practice within NR;
- an opinion on the extent of any gap between NR’s capability and best practice and on measures NR has in hand to address such a gap;
- realistic recommendations to improve NR’s delivery effectiveness and efficiency;
- the range of potential cost savings arising from PPM opportunities identified by the McNulty RVM Study and others, and to validate the extent to which such savings are properly attributable to NR.

1.1.3 This study considers PPM as defined by the RVM Study. It does not include any assessment of either Asset Management or Supply Chain Management which were also developed by the RVM Study as themes for reducing whole-industry costs. Thus ORR will need to verify that it does not double-count potential savings from other studies it has commissioned to consider other elements of the RVM savings.

1.1.4 The RVM study calculated a potential ‘Whole System Programme Management’ savings range of £40 to £100m in 2018/19. This was derived from an initial assessment by Atkins’ range of £464m to £960m which accounted for three heads of savings related to:

- **Increased Efficiency** – by focussing on output rather than by process, with the addressable cost being assessed as 40% of the total enhancements budget, viz. that spent on “not-in-the-ground-spend”;
- **Increased Early Effort** – resulting in net savings arising from better clarity of objectives, more apt option selection and lower risk exposure, with the addressable costs being assessed as the full enhancements budget; and

¹ ORR_422589-v1-ORR_CT_11-21_Statement_of_Requirement_&_ITT[1].DOC.

² Sir Roy McNulty, *Realising the potential of GB Rail: Final Independent Report of the Rail Value for Money Study, Detailed Report*, (DfT & ORR, May 2011)

- **Reduced Overspends** – by better planning and delivery, with the addressable cost being assessed as 60% of the enhancement budget.

1.1.5 We have revisited the RVM analysis and have considered NR’s potential contribution to this savings range and beyond. We have considered NR’s approach to PPM in principal and practice against the three heads of savings throughout our review.

1.1.6 This study considers NR’s PPM effort both in respect of Enhancements (infrastructure interventions which improve the capability of the railway, for example increasing capacity) and Renewals (like-for-like replacement of existing, life-expired infrastructure).

1.2 Approach

1.2.1 In order to cover the full breadth of this remit we adopted a five-stage approach to this study:

- exploratory discussions with NR executives and consideration of high-level material;
- identification of a framework for assessing PPM capability;
- collation of benchmarking data from NR and comparator organisations and case study data from NR;
- more detailed exploration of key issues with NR executives; and
- analysis and reporting.

1.2.2 Our main report provides advice in three steps:

- Consideration of NR’s PPM capability;
- Case study observations;
- Derivation of potential cost savings based on consideration of *Increased Efficiency, Increased Early Effort* and *Reduced Overruns* savings opportunities identified by the RVM Study and other opportunities to reduce costs.

1.2.3 We succeeded in engaging with three comparator organisations and their responses are considered in this study. The others we approached declined to participate, and NR declined to share almost any data with us on the grounds that to do so would compromise the trust it has developed with its correspondents over a number of years. We have also considered international research and our own experience to inform our opinion.

1.2.4 We attempted to undertake a systematic analysis of key metrics using NR data but the way the data is structured does not facilitate its collation at corporate level – or, in some cases, at lower levels of aggregation.

1.2.5 We reviewed twenty case studies by examining data presented to us by NR. We selected some of the studies, whilst NR selected others and ORR mandated us to look at a third set. We did not go behind the data presented to us to check its accuracy.

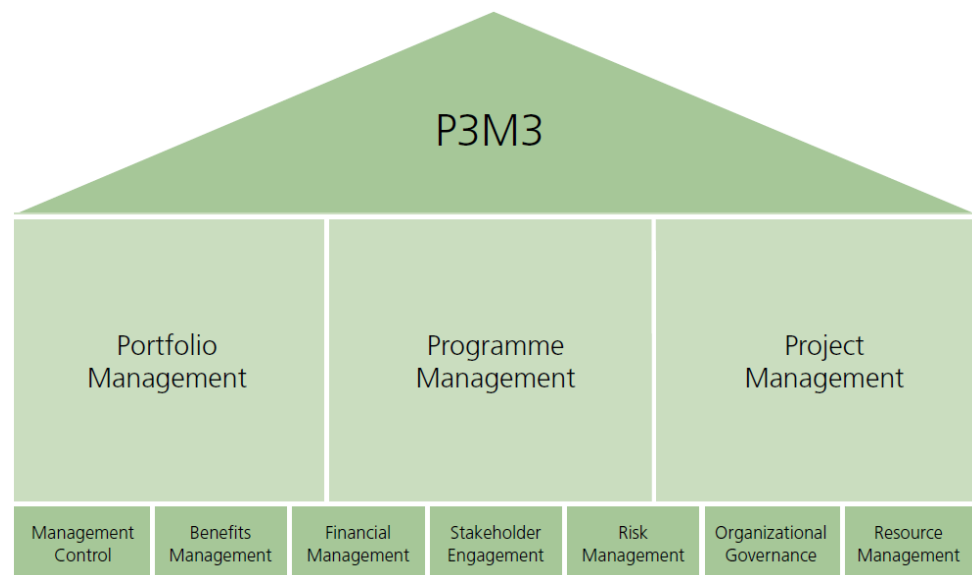
1.2.6 Throughout this report we have distinguished between critical and secondary issues and good practice observations. These are collated in full at Appendix C, and, for ease of presentation, the key themes are described in the appropriate parts of this executive summary.

1.3 NR's PPM Capability

1.3.1 We have used the Office of Government Commerce's Portfolio, Programme and Project Management Maturity Model (P3M3[®]) as a framework under which to consider NR's approach and arrangements for delivering its project and programme obligations. The P3M3[®] framework considers the full range of 'people, system and process' characteristics which provide a basis for assessing maturity over five levels (Level 5 being the highest level of maturity):

1. Awareness of process;
2. Repeatable process;
3. Defined process;
4. Managed process;
5. Optimised process.

1.3.2 P3M3[®] is founded on seven 'process perspectives' which are common to project, programme and portfolio management:



OGC P3M3 framework³

1.3.3 We have not performed a formal P3M3[®] assessment. However, on the basis of the evidence reviewed, we consider NR's current organisation to be at least at Level 3 with elements of Level 4 in respect of its ability to understand its resource capability in relation to its delivery obligations.

1.3.4 We consider that Level 4 – NR's stated P3M3[®] target – is achievable subject to certain matters being addressed. NR has postponed its own efforts to assess its organisation in view of the Devolution and DIME initiatives that it is currently implementing. NR indicated that it would undertake detailed P3M3[®] assessments once its re-organisation is complete.

³ See <http://www.p3m3-officialsite.com/P3M3Model/P3M3Model.aspx>

- 1.3.5 At the time of our review, limited information on the Devolution and DIME initiatives was available – particularly in the latter case, where only the high-level organisational structure and principles had been settled, and only key appointments had been made. We have thus been constrained in our ability to assess the capability of the new organisations.
- 1.3.6 We have used P3M3®'s seven 'process perspectives' as a framework to make observations about NR's current arrangements and potential future arrangements as follows.

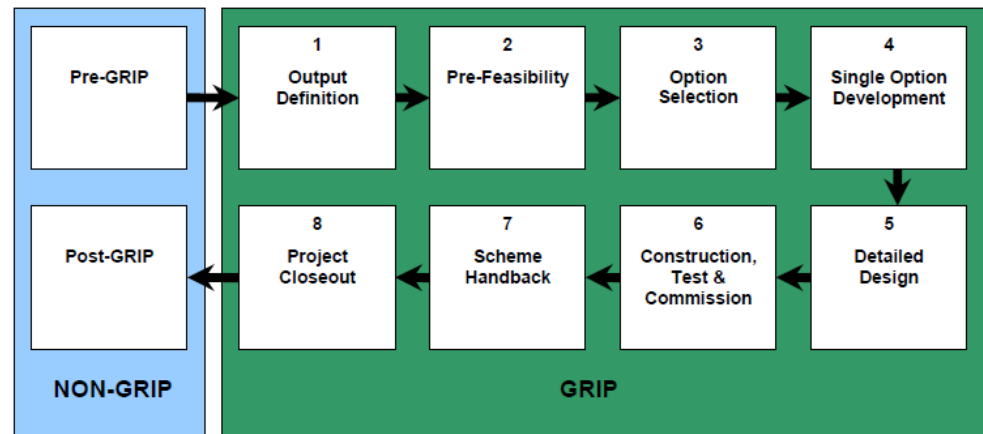
Organisational Governance

- 1.3.7 From an *Organisational Governance* (external factors which impact on NR's ability to deliver) perspective we consider that the move by NR and its customers to promote better alignment through Devolution and various forms of alliancing augur well for the *Increased Early Effort* opportunity identified by the RVM Study. This is particularly relevant to Enhancements but may also benefit Renewals in improvements to bundling of work maximising access and people resources.
- 1.3.8 The Devolution initiative may have a number of consequences which will need to be managed by NR, NR's industry partners and ORR. Increased alignment may lead to increased expectations on a Route basis that NR has not previously had to address. This should be viewed as a positive tension but if unchecked in the Periodic Review process and beyond it may lead to expectations that become difficult for NR to deliver; how NR trades-off between the demands of each Route requires consideration. This leads to the question of how the Control Period 5 Determination will be drawn; will it be one Determination or by Route? This requires industry consideration to ensure that expected outcomes are clearly defined from the outset.
- 1.3.9 We consider that a great deal of tact, diplomacy and a willingness from all industry partners (NR, ORR, funders and operators) to move on individual commercial objectives (but facilitated by clear alignment of incentives) will be required if the savings are to be achieved. NR has shown leadership in initiating alignment but the industry must complete this task together.
- 1.3.10 Under the Devolution and DIME proposals a key shift in approach is the focus now being placed on collaborative engagement of the supply chain. This follows the success of other organisations but this approach requires skilled leadership, genuine incentives for the supply change and a strong focus on attitude and culture.
- 1.3.11 Of particular importance is the ability of the new NR Client organisation to specify and procure on an output basis at an earlier stage in the project development lifecycle; NR has been in the routine of engaging its supply chain at GRIP 4 (outline design) or GRIP 5 (detailed design) but in future it is looking to procure at GRIP 2 / 3. This will increase the potential for supply chain innovation but it may expose NR if the expected outcomes are ill-defined. The capability of the new NR client organisation should therefore be considered carefully.

Management Control

- 1.3.12 We have been impressed by the variety of PPM initiatives which NR has delivered during Control Period 4 and the number which are still in hand. This bodes well for the remainder of Control Period 4 and beyond into Control Period 5, but there are further areas where improvements can be made, and NR is already acting on some of these.

- 1.3.13 We consider that NR was ahead of some of its peers in developing its Governance for Railway Investment Projects (GRIP) over eight years ago and NR's revisions should help NR delivery teams to use GRIP in more efficient ways.
- 1.3.14 We suggest that further tailoring of GRIP is considered to ensure that it focuses on *programme* and *portfolio* as well as *project* benefits. This should help aid better decision-making at the outset of delivery and appropriate levels of checking and analysing delivery performance at completion in order to verify that the benefits sought are actually achieved.



GRIP lifecycle⁴

- 1.3.15 We are particularly concerned about the means of measuring physical progress of infrastructure renewals, so that efficiency may be distinguished clearly from slippage. NR regularly under-spends annual renewals budgets but it is not clear to us how these under-spends are divided between efficiency, planned deferral of works and unplanned slippage.
- 1.3.16 We recommend that real levels of physical delivery are better understood in order to inform potential future efficiency savings. The focus should be on effective spending of the total sum of capital plus operating expenditure. Over-emphasis of targets on operational expenditure in this area maybe counter-productive until the causes of undue change are understood and driven out. Drivers for change need to be better understood and adequate resources maintained to manage those changes which cannot be avoided, at least in the short term.
- 1.3.17 NR collects a wealth of programme control data but the way it is collected does not make useful comparison of past performance readily achievable. We consider this to be a lost opportunity in the drive to identify inefficiency. NR should resolve this for the benefit of comparing the performance of its new Routes and Regions under Devolution and DIME respectively and also to demonstrate the actual improvements gained from new ways of working with the supply chain, such as alliancing.

⁴ NR/L1/INI/PM/GRIP/100 - Governance for Railway Investment Projects (GRIP), Policy Manual, Issue 1, 4 December 2010.

Stakeholder Engagement and Benefits Management

- 1.3.18 From what we have seen, NR has demonstrated different degrees of stakeholder engagement and benefits management, but those levels appear to be proportionate to the complexity of the projects in question.
- 1.3.19 From a Reliability Availability Maintenance and Safety (RAMS) and Whole Life Cycle Cost (WLCC) perspective we note NR's current effort to improve the whole-life asset management of *existing* assets.
- 1.3.20 In this study we conclude that the concept of WLCC in the creation of *new* assets is weak in comparison with the approach taken by others. In many cases the view is that WLCC requirements are either implicit or explicit in engineering standards and that alone suffices.
- 1.3.21 For *new* assets there is a need to balance competing demands: RAMS, first cost, long-term costs and access. More rigorous WLCC analysis might reveal opportunities and risks which are not contemplated today. Although NR is under a duty to provide a lowest whole-life cost railway we suspect that this requirement is superseded by the focus on reducing first-cost. We recommend that NR's assumptions – and ORR's requirements – are reviewed and adjusted as necessary for the purposes of the forthcoming Control Period 5 Determination.

Financial and Risk Management

- 1.3.22 From a Financial and Risk Management perspective we generally find that NR compares favourably with the Comparators considered during this study.
- 1.3.23 However, there is still room for improvement particularly in respect of NR's the ability to compare 'like-for-like' costs across NR; it is not possible without significant effort and assumptions to compare heads of cost (for example, the cost of project management) between NR's projects and programmes because of inconsistent cost categorisation. The US Federal Transit Authority has sought to address this issue. If this could be resolved NR would be better-placed to address ORR concerns regarding the cost of some of its activities and would also have the ability to test whether new ways of working (for example, Alliancing) actually provide the efficiency benefits sought.
- 1.3.24 Whilst NR's unit cost and similar initiatives are developing and represent an effort to drive good practice we consider that extending this – as planned – to consider the progression of forecast cost and schedule throughout the full lifecycle (from 'Original Announcement') would help NR to understand the relative benefits of different forms of engagement with its customers and its supply chain, and why some projects are more costly than others.
- 1.3.25 NR is reviewing its procedures to help it produce fully transparent estimates which delineate between base cost, estimating uncertainty and contingency for schemes where outcomes have been well-defined. Where outcomes and / or solutions are at large, a mechanism for dealing with such uncertainty should be clearly stated. We recommend that ORR should clarify its information requirements for the Control Period 5 process.

Resource Management

- 1.3.26 NR's approach to understanding the range and competence of its resources through Discipline Resource Management and resource planning tools such as the 'CITI' model and Resource Scenario Model (RSM) are strong. NR has the ability to identify and challenge the proposed resourcing of programmes now and in the future. The processes and tools at NR's disposal are at least on a par with the Comparators.
- 1.3.27 NR claim that DIME will result in a 10% leaner delivery organisation. However, it is not clear what corresponding changes will occur in the new NR client organisation. As stated above we expect that the capability of the NR Client organisation will need to be increased to ensure that it is capable of addressing customer needs on the one hand and setting credible output requirements on the other.
- 1.3.28 Alliance arrangements and DIME will require changes in approach to functional parts of NR which support programme delivery teams; the delivery team does not deliver projects in isolation. This suggests that both the NR Client and Newco must align their approach to collaborative methods of working with its supply chain. Comparators seem to be in front of NR in developing effective alliances.

1.4 Case Study Observations

Overview

- 1.4.1 Twenty case studies submitted for our examination comprise a broad range of scheme sizes and complexities in both Enhancements and Renewals across civils, track, signalling and power assets. Multi-disciplinary Enhancements were also considered. Thus the observations drawn are indicative of the types of practice and issues that might exist more widely.
- 1.4.2 As discussed above it would be highly desirable if NR could harness its programme controls datasets to provide systemic comparison of project indicators across all projects. This would reveal statistically significant data with respect to actual performance from which valuable learning could be derived.

Key Findings

Business Case

- 1.4.3 Although NR undertakes socio-economic analysis which supports the business planning process encompassing the Initial Industry Plan, Strategic Business Plan and, ultimately the ORR's Control Period Determination (the 'pre-GRIP' activities) it appears that the link between business case and delivery comes across as being less well articulated once projects enter the GRIP lifecycle. In order to drive best value NR must ensure that it invests in appropriate infrastructure interventions and that it measures what actual benefits are obtained from its completed schemes.
- 1.4.4 We consider that Comparators have a more explicit approach at gateway and investment authority reviews to monitoring both business case benefits and affordability.
- 1.4.5 This visibility is important throughout the investment lifecycle from 'pre-GRIP' right through to 'post-GRIP' close-out activities. From an *Increased Early Effort* perspective it is imperative that NR internally achieves the link between Asset policies and delivery solutions to ensure that the right investments are being made. One comparator has set output targets linked to its regulatory assessment in an attempt to

drive innovation in its supply chain and reduce first-cost whilst maintaining key asset obligations. Another comparator undertook a complete review of its standards pertaining to a major upgrade programme to contain costs within its budget and to ensure fitness-for-purpose on a whole life basis.

- 1.4.6 Given NR's intent to engage its supply chain earlier to drive innovation and reduce cost Asset polices will require challenge in order to ensure that the supply chain is not constrained. If the supply chain continues to be restrained the opportunity for cost reductions on a first and whole-life basis will be lost.
- 1.4.7 In Enhancements, *Increased Early Effort* may remain constrained if NR is held at arms-length by funding decision-makers. Thus the need for better industry governance (as proposed by the RVM study) is necessary. If this is not improved NR will be cast more as a 'programme facilitator' rather than a 'programme manager' and the proposed benefits of greater alignment between NR and its customers will be weakened.

Stakeholders

- 1.4.8 The case studies generally revealed a strong approach to stakeholder engagement but inevitably some schemes suffered due to the vagaries of stakeholder requirements.

Option Selection, Value Engineering, RAMS and WLCC

- 1.4.9 Evidence of formal option selection and value engineering was not consistent amongst the case studies. However, there was evidence that the latter has been improving through a formalised process.
- 1.4.10 In renewals the responses received were that projects followed the requirements of Line Standards and Asset Policy. In future there is a challenge for the new Directors of Route Asset Management to interpret and apply Line Standards and Asset Policy in alignment with the objectives of each Route under Devolution. Thus *Increased Early Effort* will determine the future approach, albeit this may lead to cost pressure rather than reductions depending on the requirements of NR's customers.
- 1.4.11 Enhancements demonstrated the strongest approach to option appraisal and value engineering which generally highlight the benefits of formal challenge. However, there was evidence of de-scoping projects to fit with available funding which suggests that early estimating requires improvement. *Increased Early Effort* must therefore be demonstrable and effective at the point that major investment decisions (on outcomes, scope, schedule and cost) are made. Thus the IIP / SBP / Periodic Review process must be robust to avoid loss of future benefits for the same budget or higher costs if benefit levels are to be maintained.
- 1.4.12 In all cases there was weak evidence of formal Reliability Availability Maintainability and Safety (RAMS) and, in particular, Whole Life Cycle Cost (WLCC) consideration of the solutions proposed. NR should consider improving the arrangements for WLCC and RAMS for three reasons:
- To explain the role of Asset Policy and Line Standards in order that the supply chain understands what latitude it actually has to challenge and improve value;
 - To confirm how the supply chain will actually be incentivised to improve value. If NR (and to the extent applicable ORR) are silent or vague on the point of

whole-life requirements and supply-chain contracts incentivise lower first-cost only, long-term value for money opportunities may be eroded;

- To understand better the constraints on optimising WLCC.

1.4.13 This is an issue of *Increased Early Effort* (making the right decisions about infrastructure interventions) and, in the longer-term, *Reduced Overspends* as scope decisions today will affect the cost of maintaining and renewing the railway in future.

Lessons Learned and Benefits Management

1.4.14 In Renewals the concept of ‘benefits management’ was interpreted as ‘delivering the scope on time and to budget’ which is an understandable response at project level. However, at programme or portfolio level there is a need to understand the extent to which the intended scope was actually delivered and whether or not the delivered scope has actually met the business need for the cost incurred. This concept requires development under the Devolution arrangements to demonstrate to NR’s principal customers that its investments have actually achieved the performance improvements sought.

1.4.15 In Enhancements the result of benefits analysis should be explicit but we find that the test NR applies is whether or not it has met the contractual requirements agreed with its respective funders. This is understandable from a commercial perspective but the actual benefits accruing should also be understood by NR to inform improved decision-making for future investments. The new arrangements for improved alignment between NR and its industry partners must now provide appropriate visibility of both business case and benefits evaluation (the pre- and post-GRIP activities) which in-turn will drive better *Increased Early Effort* and *Reduced Overspends* in future.

1.4.16 Generally we noted good attempts at recording lessons learned and increasingly these are taking-on a formal structure through the Value Management initiative.

1.4.17 Some of the key feedback from projects’ lessons learned exercises suggested that GRIP either added cost or, that GRIP had to be adapted to address the concurrent nature of programme deliverables (presumably because the sequential nature of GRIP and the surrounding governance makes fast-tracking of multiple programme decisions difficult if GRIP is followed rigidly).

1.4.18 Engineering was seen as a source of discretionary decision-making in some respects and there was recurring evidence of issues arising late in development either due to insufficient records or physical investigation. Design coordination and integration also repeated as an issue which meant in some cases that development continued at detailed design stage. This is an example of where *Increased Early Effort* would impact *Increased Efficiency*. These were generally drawn as examples of ‘additional scope’ but it is likely that the requirements always existed, but were just not identified early enough in the development process.

1.4.19 Positive ‘lessons learned’ were often articulated in relation to addressing key stakeholder requirements and concerns early and also working in a collaborative way with the supply chain, even if the contractual arrangements were ‘traditional’ (both examples of *Increased Early Effort*).

1.4.20 Overall, we see evidence of NR generally trying to ‘do the right things’ – and there were various examples of good practice – but we consider that NR would achieve

greater certainty of selecting appropriate solutions if the original outcomes were more clearly stated.

- 1.4.21 This will be brought into focus with NR's proposed move to engage its supply chain at an earlier stage of the GRIP lifecycle (from GRIP 3 rather than GRIP 4 or 5 currently) to deliver on output-based specifications. This places great emphasis on the NR Client organisation to establish its required outcomes and to specify accordingly.

Cost

- 1.4.22 In reviewing both cost and schedule we wished to understand the progression of both – and the reasons for variance – at the following points of comparison during the development and delivery lifecycle:
- 'Original Announcement' – for example, when the project was first cited in a business plan or workbank plan;
 - 'Full Investment Authority' – when the project *first* received its full authority to complete its obligations;
 - 'Principal Contract Award' – when the project entered into contractual agreements to deliver its obligations which then crystallised the assumptions around pre-tender estimating and investment authority (if achieved before contract award); and
 - 'Outturn' – the actual outcome once all obligations (as varied by change control) were achieved.
- 1.4.23 Overall, the sample suggests that NR has good cost control post 'Full Investment Authority' but estimating at 'Original Announcement' (with the exception of track projects) is either too high or too low. Without a wider comparison across assets it is not possible to draw firm conclusions as to whether or not NR is over or under estimating. For the purposes of Periodic Review it is essential that focus is given to the basis on which early estimates are prepared and how NR estimates the value of uncertainty.
- 1.4.24 From an efficiency perspective we also sought to understand the apparent cost of NR's project management effort against its own average costs per Asset. In instances where these costs were higher than the averages it was evident that the projects had suffered some form of delay in delivery or took an inordinate length of time to develop; this is clearly not surprising as utilisation of a standing project team for longer will obviously cost more. From an *Increased Efficiency* perspective holding forecast schedule is vital and it is encouraging that NR is measuring Indexed Performance Indicators in relation to both development and delivery schedules.

Schedule

- 1.4.25 From a schedule perspective we have similarly compared the forecast completion milestone at the four points of comparison outlined at 1.5.22 above.
- 1.4.26 The feedback from the case studies generally demonstrates that prolongation of delivery in comparison with the milestones envisaged at 'Original Announcement' generally occurs in the development phase rather than as a result of delayed work post contract. The data-set is not statistically robust but this suggests that either original estimates of delivery milestones are unrealistic or NR – and its stakeholders –

spend too long developing schemes. Although the extra time taken (often years) will contribute to a better investment decision it does mean that the solution is being implemented later than originally forecast, thus reducing the timing of benefits accruing.

- 1.4.27 Where longer development timescales are underpinned by changes to scope this suggests that outline design is being re-worked and is eroding the efficiency of NR and its suppliers. This is an instance where *Improved Early Effort* will also promote *Increased Efficiency* by incurring fewer iterations based on clear outcomes.

Opinion

- 1.4.28 The case study observations provide support to the observations of the RVM Study that *Increased Early Effort* (in particular) and *Increased Efficiency* are two key sources of potential cost savings if development and delivery problems can be identified and addressed.
- 1.4.29 The case studies suggest that NR generally has delivery control after projects are authorised (i.e. generally projects deliver schedule and cost; but not necessarily scope), delivering what it forecast to deliver. This suggests that *Reduced Overspends* is a line of improvement which is less relevant to NR once projects have been fully authorised. However, this conclusion would need to be validated with reference to a statistically meaningful sample. We recommend that NR undertakes such analysis to demonstrate if it actually has this level of control. Also the apparently low incidence of projects seeking investment re-authority raises the question of whether projects are being authorised at a level which makes overspending investment authority unlikely, albeit NR's practice of authorising on the strength of tender returns mitigates this concern.
- 1.4.30 However, we remain concerned about the *Reduced Overspends* line of saving in view of the apparent disconnect between costs and schedule expected at 'Original Announcement' and 'Outturn'. Again, we consider that NR should undertake analysis which draws the distinction between 'Original Announcement' and 'Outturn'. In this regard the Periodic Review process should seek to clarify the basis on which early estimates are made to ensure that the expected outcomes are in fact delivered.

1.5 Potential PPM Cost Savings

- 1.5.1 The RVM study calculated a potential ‘Whole System Programme Management’ savings range of £40 to £100m in 2018/19. This was derived from an initial assessment by Atkins’ range of £464m to £960m which accounted for savings related to:
- *Increased Efficiency* – by focussing on output rather than by process, with the addressable cost being assessed as 40% of the total enhancements budget, viz. that spent on “not-in-the-ground-spend”;
 - *Increased Early Effort* – resulting in net savings arising from better clarity of objectives, more apt option selection and lower risk exposure, with the addressable costs being assessed as the full enhancements budget; and
 - *Reduced Overspends* – by better planning and delivery, with the addressable cost being assessed as 60% of the enhancement budget.
- 1.5.2 The RVM Study derivation of the £40 to £100m in 2018/19 potential savings range occurred in two steps:
- Adjustments to Atkins’ range of £464m to £960m which considered potential double-counting between the Atkins analysis, the removal of the *Reduced Overspends* head of saving (reducing the range to £224m to £480m), NR initiatives and other studies; and
 - Final adjustments made by the RVM Study team.
- 1.5.3 We are not sighted on the detail of the full derivation of the £40m to £100m range in either of these two steps but note that the RVM range is approximately 20% of that derived by Atkins before any double-counting or other factors were considered.
- 1.5.4 We have reviewed the PPM savings identified by the RVM Study and support the assumptions made by Atkins, upon which the RVM Study based its figures, as being fully applicable to NR’s budget. However, we have up-dated the addressable costs in the light of the Initial Industry Plans and supporting documents published since the RVM Study.
- 1.5.5 Both Atkins and the RVM Study discounted the potential to avoid costs from *Reduced Overspends*, but we have addressed this issue from a different perspective. We consider that there are several areas where NR could, by following through to completion reviews of its procedures and practices which are already in hand, derive more effective estimates for use in setting budgets for projects at GRIP Stages 0 to 2. Our observations are that NR’s present procedures and practices in relation to base cost and contingency estimating have not yet generated sufficient, consistent data upon which potential savings in this area could reliably be predicted. However, we have observed, albeit from a statistically insignificant number of cases, that the potential does exist to avoid the over-provision of contingency in project budgets.
- 1.5.6 We have observed that there is considerable uncertainty arising from the reporting of physical progress with infrastructure renewals. Asset-led portfolios are being delivered with varying degrees of under-spend – 92% – overall – and we have recommended that NR should consider ways of improving its performance in both areas.

- 1.5.7 Whilst we consider that the savings identified by Atkins, the RVM Study and our own observations are potentially applicable to infrastructure renewals as well as to enhancements, we recommend that emphasis should initially be given to improving the delivery of the present budgets rather than targeting savings from them. Our opinion is that a better understanding of what is being delivered is necessary before such steps are taken and this should be addressed as a priority ahead of the 2013 Periodic Review.
- 1.5.8 Subject to the above, we consider that there is potential for NR to save between £157m and £337m (in 2011/12 prices) per annum by 2018/19 from the *Increased Efficiency* and *Increased Early Effort* initiatives identified. We have also adopted the factorisation used by the RVM Study to predict how progress in earlier years could build up to those savings.
- 1.5.9 Applying the same aggregate 20% reduction factor to our assessment would give a comparable aggregate range of £31.4m to £67.4m. This range is lower than the £40m to £100m due to the different range of ‘addressable costs’ presented by the Initial Industry Plans.
- 1.5.10 The comparability of any assessment following McNulty must be carefully considered in respect of double-counting between studies and the relevant ‘addressable costs’. We therefore recommend that the ORR and NR carefully consider whether double-counting would result if the savings from all the current studies were simply to be accumulated and ensure that ‘addressable costs’ are the same across all assessments.
- 1.5.11 We expect that the top end of this savings range to be achievable by NR in full on the basis that:
- As noted in 1.6.7 above our range does not take account of any PPM savings pertaining to infrastructure renewals. Although the RVM Study concluded that Renewals savings were primarily achievable from Asset Management and Supply Chain Management initiatives we consider that there is some room for savings through better programming of work. The opportunity here lies in making better use of the available access to the railway. Until the effectiveness of spending existing budgets (distinguishing between efficiency and slippage) is addressed it is difficult to assess the efficiency gap in relation to renewals which might be derived from an improved approach to PPM;
 - NR has stated that the choice of portfolios for both enhancements and renewals will have an impact on making savings arising from the portfolio effect. NR’s estimate range for Control Period 5 Enhancements stated in the Initial Industry Plan suggests that there is potential to save £524m (the difference between the top-end of the range based on individual project estimates and the bottom-end portfolio estimate) but this will depend on the refined requirements of funders, ORR and a range of other factors. The process of moving towards a determination for Control Period 5 should address the necessary considerations to bring focus to the current range of estimates. This range would appear to be additive to the savings identified by the RVM study as revised by this study. If distributed evenly across Control Period 5 this might add a further £100m to the top and bottom of the savings range.
- 1.5.12 NR is demonstrating industry leadership in improving cooperation from its customers, funders and the ORR to achieve the desired savings. In our opinion

improved value for money will flow from single-point accountability for achieving the requisite savings against a clear mandate. In this regard ORR and funders should consider the arrangements for ensuring that NR is given the accountability to achieve the savings. All industry parties must also recognise that savings cannot be considered in isolation. Capacity, performance and disruption to the railway are all competing objectives with cost and a balanced view must be taken overall. Any savings range must therefore be assessed in this wider context.

1.6 Recommendations

1.6.1 A full list of critical observations and recommendations are provided at Appendix C of our main report. In summary, our principal recommendations are:

1. If NR is to succeed in procuring on a collaborative basis in Control Period 5 it must ensure that the new NR Client Organisation created out of Devolution and DIME can competently specify and procure on an outcome / output basis. Great emphasis has been placed on this approach succeeding but this is substantially a new method of engaging with the existing supply chain. Due to the independence driven by the DIME initiative the new NR Client will not have the benefit of the delivery and procurement expertise which was previously part of the Investment Projects organisation. NR will also be procuring projects and programmes at an earlier stage in the GRIP lifecycle – GRIP 2/3 instead of GRIP 4/5. Again, this is a marked departure in approach which requires competent definition of requirements and sufficient time for the supply chain to engage. These are significant challenges which presents a delivery risk;
2. In support of NR's efforts under the preceding recommendation funders must clearly articulate the outcomes that they wish to achieve and ORR must ensure that the 2013 Periodic Review Determination takes cognisance of the ten Routes that have now been created. We expect that NR's Devolution into ten Routes will create short-term challenges as each Route seeks to improve its individual position;
3. Industry processes and NR's GRIP methodology are focussed on the management of *projects* rather than *programmes*. Focus should be placed on achieving the overall outcomes and all industry partners should integrate under one approach. We consider that increased emphasis should be placed on planning business benefits and maintaining focus on these throughout the complete project lifecycle to ensure that the railway can demonstrate that it is 'investing in the right things at the right price'. The link between need, delivery and eventual outcome should be explicit and auditable;
4. NR must strengthen its approach to whole-life cost decision-making in order to justify its investment proposals. This is applicable both in the long term management of asset groups and also in respect of option-selection on individual projects; currently focus is placed on first-cost. Funders and ORR must stand ready to clarify priorities between first cost and whole-life cost;
5. Cost capture within NR does not readily facilitate comparison of cost heads between NR projects. This hampers comparison of project costs and therefore limits understanding of cost differentials and efficiency opportunities within NR. Once NR systematically understands its own cost drivers realistic benchmarking with others will become more feasible;

6. Effort is required to ensure that NR, ORR and funders agree a clear understanding of the relationship between base costs, estimating tolerance, contingency and optimism bias in the early estimating of expected outcomes. Depending on the outcomes targeted for Control Period 5 there may be opportunities to link individual projects and programmes into larger initiatives which enable integrated planning and execution. This may lead to opportunities to reduce overall contingency provision to a more appropriate level; a departure from the Control Period 4 practice of pricing each an every project individually. If the basis of cost estimating (all base costs, tolerances and contingencies) is not robustly established – particularly where expected outcomes are not well established – there is the potential that investments in Control Period 5 will be excessively under- or over-funded. We consider that NR has experienced both extremes in Control Period 4;
7. In order to pinpoint opportunities for efficiency and drive-out under-performance we consider that NR could make better use of causation analysis and the measurement of key metrics throughout the project lifecycle through the stages of ‘Original Announcement’, ‘Full Investment Authority’, ‘Principal Contract Award’ and ‘Outturn’. NR collects the data to enable this;
8. In renewals the difference between planned slippage, unplanned slippage and efficiency is not discernable. It is therefore difficult to conclude that under-spent budgets in Control Period 4 are driven only by efficiency improvements. This is an effectiveness issue which makes it difficult to identify assured opportunities for future efficiency savings. NR clarify its actual delivery performance in this regard;
9. NR is demonstrating industry leadership – through its Devolution and DIME initiatives – in improving cooperation from its customers, funders and the ORR to achieve the desired savings. All industry parties must recognise that savings cannot be considered in isolation. Capacity, performance and disruption to the railway are all competing objectives with both first- and whole-life cost. A balanced view must be taken overall. The industry must work together to define its desired outcomes and incentive arrangements should be fashioned to achieve those. This stands a better chance of success if NR is truly incentivised to drive-out first- and whole-life cost-savings whilst delivering measurable benefits against the original outcomes. Such single-point accountability would obviate from the confusion caused by complex industry governance transforming NR into a fully accountable programme manager.

2 Introduction

2.1 Study Purpose

2.1.1 Halcrow Group Limited (Halcrow) was instructed by the Office of Rail Regulation (ORR) to conduct a study into Network Rail’s Project & Programme Management (PPM) capability on 26 October 2011.⁵

2.1.2 The full study remit is reproduced at Appendix A. In summary the remit requires that this study provides:

- an assessment NR’s PPM capability through consideration of actual practice within Network Rail (NR) and comparison with other leading rail and non-rail comparators through the use of a recognised project management assessment framework;
- an opinion on the efficacy of NR’s processes and procedures pertaining to project and programme management;
- an opinion on the extent of any gap between NR’s capability and best practice and the extent to which NR has measures in place (e.g. Devolution and Project DIME) that will address this gap;
- realistic recommendations to improve NR’s delivery effectiveness and efficiency.

2.1.3 Network Rail (NR) manages a large number of significant projects at any one time and it has built up a substantial in-house capability to oversee and implement these multi-million pound investments. In the light of the Rail Value for Money (RVM) study which was recently published by Sir Roy McNulty the key findings have reinforced the importance of driving down costs and delivering efficiency savings.⁶

2.1.4 Given the scale of investment where the value of renewals and enhancements combined accounts for over £4bn per annum the ORR wishes to examine the potential for savings from the management of this programme of work over Control Period 5.

2.2 Methodology

Overview

2.2.1 Halcrow’s typical methodology in undertaking reviews of major projects and programmes involves a set of defined meetings and information requests as we are usually engaged in reviewing a single project or programme of projects.

2.2.2 ORR’s remit is wide-ranging embracing the totality of NR’s PPM activities against the backdrop of rail and wider construction industry cost reduction initiatives and the approach adopted by comparator organisations.

⁵ ORR_422589-v1-ORR_CT_11-21_Statement_of_Requirement_&_ITT[1].DOC.

⁶ Sir Roy McNulty, *Realising the potential of GB Rail: Final Independent Report of the Rail Value for Money Study, Detailed Report*, (DfT & ORR, May 2011)

2.2.3 Our approach has therefore sought to obtain an understanding on a number of fronts in order to ensure that the assessment framework described below seeks to examine key lines of inquiry before forming an opinion on the potential for efficiency and effectiveness savings. Our approach has been delivered in three stages.

Stage 1

2.2.4 Stage 1 has been exploratory in nature in order to collate an understanding of PPM best practice and to identify actual PPM practice within NR at a high-level. Stage 1 activities comprised:

- undertaking a broad range of exploratory discussions with NR and review a range of strategy documents to understand its overall approach;
- undertaking a wide-ranging literature search to identify rail and non-rail studies which have relevance to this review. Where appropriate, meetings were held with the authors of these reports to clarify our understanding;
- initial consultation with a number of external comparators to obtain an insight into their approach to developing and delivering major capital programmes and projects;
- considering lessons and best practice from Halcrow's own experience of major project and programme delivery and due diligence commissions.

Stage 2

2.2.5 On the basis of these exploratory activities we have built-up a number of key lines of inquiry on which we which we have used to form our opinion. Stage 2 activities comprised:

- a round of more in-depth discussions with NR to ascertain NR's actual delivery performance during Control Period 4 within the Investment Projects divisions of Buildings & Civils, Signalling & Electrification and Enhancements, and; the Track division of NR's Asset Management organisation;
- as far as details have permitted, NR's and formative approach for Control Period 5;
- as instructed by ORR, the examination the delivery of 20 projects that have been delivered by NR during Control Period 4. The data for the 20 case studies was obtained from NR by means of a structured questionnaire. Although this sample has no statistical significance it affords the opportunity to gain insight into actual delivery practice;
- formal engagement with external comparators to obtain specific insights into PPM best practice delivered in rail and non-rail environments.

Stage 3

2.2.6 In Stage 3 we have drawn together our investigations under the lines of inquiry stated below in order to form an opinion.

2.3 Assessment Framework

- 2.3.1 The table below presents the lines of inquiry that we have used in order to form our opinion in line with the requirements of the study scope.
- 2.3.2 In setting the lines of inquiry stated below we have considered the available excellence and maturity frameworks used by NR and comparator organisations. We have also taken account of the work of Atkins⁷ in support of the RVM Study.
- 2.3.3 For the purposes of cross-comparison with earlier and future studies we have adopted P3M3^{®8} as a guide in conducting this study. The constraints on NR's time and this study have not permitted a formal P3M3[®] assessment to be undertaken. We therefore do not offer a formal assessment against the P3M3[®] framework criteria. At any rate, the P3M3[®] and similar frameworks offer no insight into whether or not projects and programmes have in fact been delivered successfully; their strength is in identifying the factors and enablers that are likely to lead to success.
- 2.3.4 We have also sought to consider key issues emerging from the literature of previous studies including the Infrastructure UK Cost Study.
- 2.3.5 We have truncated the P3M3[®] Process perspectives as follows:

No.	Line of Inquiry	Key Challenges
1	Organisational Governance & Management Control	NR is able to address the tensions applied by its external environment, such as funder, customers and other stakeholders NR's Programme Controls arrangements provide it with the necessary visibility to control successful delivery NR's governance arrangements allow it to make the right decisions at the right time
2	Stakeholder Engagement & Benefits Management	NR engages effectively with its key funders and stakeholders to identify clear outcomes NR effectively establishes programmes which it can then effectively and efficiently deliver NR demonstrates that solution decision-making for infrastructure interventions (Enhancements and renewals) is based on a variety of factors – including RAMS and Whole Life Cycle Cost (WLCC) – and not just first-cost NR tracks benefits throughout delivery, informing decision-making up to the point of financial commitment and benefits management establishes that expected outcomes have actually been delivered
3	Financial & Risk Management	NR's approach to estimating, monitoring and controlling costs is likely to avoid overruns and demonstrably manage to the lowest possible cost Risk and Value Management processes provide the basis for identifying savings An appropriate level of contingency is held and is managed to promote efficient cost delivery

⁷ WS Atkins, *Rail Value for Money Study: Whole System Programme Management Final Report* (Issue 1.4, 25 May 2011).

⁸ See Portfolio, Programme and Project Management Maturity Model (P3M3[®]) Version 2.1, available at www.ogc.gov.uk

No.	Line of Inquiry	Key Challenges
4	Resource Management	NR has a clear understanding of the capability and capacity requirements of its own staff in relation to its delivery obligations A clear and stable workbank has been prepared which NR can use to leverage value from a sustainable supply chain.

2.3.6 Consideration of the above factors provides an insight to NR’s maturity. The case studies have been examined to provide practical insight at both project and programme level. These factors have then been taken into account in forming our opinion on the extent to which NR is responsible for delivering the benefits identified by the RVM study and whether or not further benefits might accrue from enhancing NR’s approach to PPM.

Effectiveness and Efficiency

2.3.7 Throughout our review of the literature we note the various use of ‘Effectiveness’ and ‘Efficiency’. These terms are rarely defined and may be read to be used interchangeably. In this report we have sought to align the definitions to what appears to be the most commonly accepted use in the literature reviewed:

- ‘Effective’ – can NR buy more with the same budget?
- ‘Efficient’ – can NR buy the same (or more) with lower headcount and transaction costs?

Comparators

2.3.8 During this study we have sought to support our own experience and opinion by reference to comparator organisations. Three UK organisations (referred to below as Comparators A, B and C) responded to a structured questionnaire. In accordance with an agreement with each comparator to maintain confidentiality, the identity of the participating organisations has been redacted from this report.

2.3.9 All of the comparator organisations are publicly funded and therefore face similar challenges to NR albeit only one of the three is regulated. However, the other two are obliged to provide assurance to their respective funders that its capital investment programmes related to Enhancements and Renewals (to use UK rail terminology) are robust and represent value for money.

2.3.10 Reference has also been made to relevant academic and international research as well as publicly available evidence.

2.4 Status of Issues and Recommendations in this Report

- 2.4.1 The remit requires that Halcrow “Propose a realistic set of recommendations for improvement with clear timescales and the size of the benefits that could be realised during CP4 and CP5.”
- 2.4.2 Halcrow has sought to achieve this by distinguishing between Critical and Secondary Issues and also Good Practice Observations which are defined as follows:
- **Critical Issues** – those issues which should be addressed urgently in order to underpin successful delivery of NR’s obligations under CP4 and those to be developed for CP5;
 - **Secondary Issues** – those issues which are recommended to be addressed in order to underpin successful delivery of those obligations. Secondary issues are potentially no less important than Critical Issues but are less time critical in respect of their resolution;
 - **Good Practice Observations** – observed good practice which should be considered for wider dissemination within Network Rail.
- 2.4.3 Halcrow has indicated to which party (Network Rail or others as necessary) Critical and Secondary Issues should be allocated, along with corresponding recommendations for resolution.
- 2.4.4 Where the word ‘current’ is used, this means the period from 1 November 2011 to 28 February 2012.⁹ Interviews with NR and others were undertaken between November 2011 and February 2012.
- 2.4.5 All prices are at Q3-11/12 levels except where stated otherwise.

⁹ The latest evidence for this review was received on 28 February 2012.

2.5 Report Structure

2.5.1 This report is structured as follows:

Section	Areas of Consideration
Introduction	Remit, background & context, methodology, report structure and the treatment of observations & recommendations
Study context	Relevant background to the study is discussed in order to frame the analysis and opinion expressed
PPM Process Perspectives	<p>With reference to comparators and our own experience we provide observations and opinion on NR's capability apparent at the time of the review - pre the implementation of NR's Devolution and DIME initiatives – and make observations in view of the changes that might occur. We discuss these under the following subject areas:</p> <ul style="list-style-type: none"> • Management Control and Governance • Stakeholder Engagement and Benefits Management • Financial and Risk Management • Resource Management
Case Study Observations	<p>Observations of actual PPM practice have been drawn from a desk study of twenty case studies drawn from the following Asset groups:</p> <ul style="list-style-type: none"> • IP Buildings & Civils; • IP Electrification; • IP Signalling; • IP Enhancements; • AM Track
Potential PPM Savings	<p>In this section we consider the potential savings from PPM methodologies in respect of:</p> <ul style="list-style-type: none"> • NR's contribution to the savings identified by the McNulty RVM Study; • Other savings

3 Study Context

3.1 Overview

3.1.1 This study has been initiated by ORR in order to support its preparation for making its Control Period 5 determination at Periodic Review 2013. The remit for the study is wide-ranging and understanding NR's ability to deliver its obligations requires a number of factors to be considered. We note the following in the context of this study:

- **Infrastructure UK Cost Study (IUK Study)** – HM Government published a report¹⁰ (the IUK Study) on how to reduce the cost of delivery of civil engineering works in the UK at the end of 2010. The report highlighted a number of factors which should be considered which were addressed in part in the RVM study and have prompted lines of inquiry during this study;
- **The McNulty Rail Value for Money (RVM Study)** – This examined 'Whole System Programme Management' and concluded that whole-industry savings of between £40m and £100m per annum might be achieved through 'whole system programme management'. From this study the ORR wishes to understand what component of this potential saving might be achieved in infrastructure under NR's stewardship. The RVM Study was underpinned by a number of other studies and, in particular, two prepared by Atkins;^{11,12}
- **Initial Industry Plan** – The UK railway industry has recently launched its Initial Industry Plan¹³ (IIP) which sets-out choices and options which Government is invited to consider in publishing the High Level Output Specification and Statement of Funds Available in summer 2012. This forms part of Periodic Review 2013 and will also inform the future programme of franchise re-letting. For the purposes of this study the IIP provides an important starting point in understanding the type and value of future investment envisaged in the UK rail network. In-turn, this will inform NR's thinking on how to align objectives between its customers (Train and Freight Operating Companies), its supply chain and how to (re)organise NR to deliver best value;
- **Other UK rail studies** – Various studies have considered different aspects of PPM capability in the UK railway industry. This includes the RVM Study, studies commissioned individually by NR and ORR and also the work

¹⁰ HM Treasury & Infrastructure UK, *Infrastructure Cost Review: Main Report* (HM Treasury, December 2010)

¹¹ WS Atkins, *Rail Value for Money Study: Whole System Programme Management Final Report* (Issue 1.4, 25 May 2011)

¹² WS Atkins, *Rail Value for Money Study: Asset Management & Supply Chain Management of GB Rail* (Issue 1.1, 25 May 2011)

¹³ Comprised of two documents: RFA, RIA, ATOC & NR, *Initial Industry Plan, England & Wales, Proposals for Control Period 5 and beyond*, September 2011 and RFA, RIA, ATOC & NR, *Initial Industry Plan, Scotland, Proposals for Control Period 5 and beyond*, September 2011

undertaken by Independent Reporters. We have drawn on this work to enhance the evidence base for this study;

- **Other ORR Periodic Review 2013 (PR13) Preparation** – This study has been undertaken in parallel with one carried out by Civity into NR's supply chain management capabilities, and there is a measure of overlap between the remits of the two studies. We have liaised with Civity to optimise the coverage of our respective reports but ORR must address any potential overlaps between the findings of its concurrent studies;
- **Network Rail's Delivery Challenge in Control Period 4 and 5** – NR was presented with a significant delivery challenge at the start of Control Period 4 (CP4) to deliver some £12.5bn of Enhancement projects. This represented a marked increase in NR's delivery obligations from the Renewals-focussed delivery challenge that dominated NR's activities during Control Period 3. As a result, NR underwent a significant restructure towards the end of 2009 which created the 'Process Led Organisation' (PLO) which, at the time of this study, is about to be completely re-cast under NR's Devolution and DIME initiatives. At the time of this study the full details of Devolution and DIME were either not available or could not be shared with us. We have therefore formed an opinion based on the outline principles and basic facts described to us;
- In parallel with the creation of the PLO at the end of 2009 NR embarked on a Transformation Programme which included a range of improvements under the banner of Efficient Infrastructure Delivery (EID) and other initiatives in Asset Management;
- **Network Rail's Current Project and Programme Management Arrangements** – As a consequence of the current PLO NR has adopted an Asset-led approach to its PPM activities which are in turn organised in a variety of ways depending upon the delivery challenge. In view of the decision-making evident from the RVM study it is apparent that no further effectiveness or efficiency gains - beyond those envisaged in the 2008 Periodic Review when the efficient delivery cost was determined - were contemplated by DfT or ORR in respect of some major programmes which have progressed significantly along the path of development and delivery. NR is incentivised to outperform the efficient price determination for such programmes already. Examples of these include the 'mega' programmes such as Thameslink, Crossrail, FTN and the Intercity Express Programme. These programmes are characterised by specific delivery and governance arrangements. As the focus of this study concerns the PPM activities which routinely fall under NR's standard approach we have set-aside consideration of these mega-programmes;

3.1.2 These factors have combined to shape our approach to this study as follows.

3.2 The Infrastructure UK Cost Study

3.2.1 The Infrastructure UK (IUK) Cost study focussed on civil engineering projects affecting all elements of UK infrastructure, including rail. The study identified a number of factors which affect the cost of projects and programmes (see Figure 3.1) and also concluded that fragmentation of the construction industry and the increased use of sub-contracting had led to greater transaction costs and had deterred that industry from a strategic approach to investment in skills, technology and innovation. The study also concluded that 15% of capital costs could be saved.¹⁴ Neither the main report nor the implementation plan which followed it set targets by which given percentage reductions were to be achieved, but the period considered over which the savings were to be made was ten years.

There is no single overriding factor driving higher costs. However, the investigation has identified that higher costs are mainly generated in the early project formulation and pre-construction phases and provided evidence of a number of contributing factors including:

- stop-start investment programmes and the lack of a visible and continuous pipeline of forward work;
- lack of clarity and direction, particularly in the public sector, over key decisions at inception and during design. Projects are started before the design is sufficiently complete. The roles of client, funder and delivery agent become blurred in many public sector governance structures;
- the management of large infrastructure projects and programmes within a quoted budget, rather than aiming at lowest cost for the required performance. If the budget includes contingencies, the higher total becomes the available budget;
- over-specification and the tendency, more prevalent in some sectors than others, to apply unnecessary standards, and use bespoke solutions when off-the-shelf designs would suffice;
- interpretation and use of competition processes not always being effective in producing lowest outturn costs, with public sector clients in particular being more risk averse to the cost and time implications of potential legal challenges;
- companies in the supply chain typically investing tactically for the next project, rather than strategically for the market as a whole; and
- lack of targeted investment by industry in key skills and capability limiting the drive to improve productivity performance.

Figure 3.1: Factors affecting delivery of projects (HMT & IUK)¹⁵

3.2.2 The main report identified interlinked objectives for achieving the savings, based on the factors in Figure 3.1, and the implementation plan added a sixth and slightly

¹⁴ HM Treasury & Infrastructure UK, *Infrastructure Cost Review: Main Report* (HM Treasury, December 2010), p. 5.

¹⁵ HM Treasury & Infrastructure UK, *Infrastructure Cost Review: Implementation Plan* (HM Treasury, March 2011).

amended some of the wording, so that actions were then grouped in the following components:

- a) To increase the visibility and continuity of the committed pipeline of infrastructure investment;
- b) To implement effective governance of projects and programmes, particularly in the public sector;
- c) To instil greater discipline in the commissioning of projects and programmes;
- d) To develop smarter ways to use competition;
- e) To create with industry an environment which encourages innovation and growth;
- f) To improve the quality and accessibility of infrastructure asset and cost modelling data.

3.2.3 The implementation plan referred to the RVM Study and set specific actions on NR, DfT and ORR in respect of component a), and implicitly involved NR in all the others.¹⁶ The IUK Cost Study therefore provides some key lines of inquiry for the purposes of this study.

¹⁶ HM Treasury & Infrastructure UK, *Infrastructure Cost Review: Implementation Plan* (HM Treasury, March 2011), Appendix A.

3.3 The Rail Value for Money Study and the Initial Industry Plan

RVM – Scope of ‘Whole System Programme Management’

3.3.1 ORR has guided us to concentrate on NR’s contribution to the potential savings identified by the RVM Study. The RVM Study’s scope was much greater than the scope of this exercise, but did touch upon each of the components of the IUK Study (although the designatory letters of the components or key areas in the studies were not aligned), and in particular upon the following Study Areas:

Study area	Subject	Low case	High case
A	Objectives, strategy and outputs	90	110
B & C	Leadership, structures and incentives	40	130
D	Revenue	90	90
E1 & F	Asset and supply chain management	230	580
E2	Programme management	40	100
G	Safety, standards and innovation	190	190
H	People	260	260
Less	Double counts	(200)	(410)
Net funding savings		740	1050

Figure 3.2: RVM efficiency savings (funding basis) in 2018/19 by area of study (£m 2009/10 prices)

3.3.2 The RVM Study was based upon work done by a number of organisations, the most relevant of which to this study were those of Atkins, as cited above.

3.3.3 Atkins’ study was focussed only on whole-industry enhancements projects and advised that on such projects savings in capital costs attributed to ‘Whole System Programme Management’ could amount to between 6% and 18% and overspends reduced by between 17% and 30% over the next twenty years.¹⁷ Atkins confirmed to us that the 6-18% potential savings range applies to projects where there is a need for the UK rail industry to combine its efforts, thus the savings are not realisable by NR alone.

¹⁷ WS Atkins, *Rail Value for Money Study: Whole System Programme Management Final Report* (Issue 1.4, 25 May 2011), page 7.

- 3.3.4 The Atkins / RVM Study identified three heads of potential cost savings for infrastructure enhancements:
- **Increased Efficiency** – by focussing on output rather than by process to reduce overheads;
 - **Increased Early Effort** – resulting in net savings arising from better clarity of objectives, more apt option selection and lower risk exposure; and
 - **Reduced Overspends** – by better planning and delivery.
- 3.3.5 These heads of savings have been considered throughout our review of NR’s PPM capability.
- 3.3.6 Atkins also identified wider savings in infrastructure Renewals under ‘Asset and Supply Chain Management’.¹⁸ Atkins confirmed to us¹⁹ that ‘programme management’ savings opportunities identified under ‘Whole System Programme Management’ were already covered in under similar ‘Asset and Supply Chain Management’ heads of savings and we understand that these have been addressed in the final RVM Study report. In our assessment of potential cost savings we have therefore not sought to re-consider the heads of savings already identified under Asset and Supply Change Management for infrastructure Renewals, however, we have considered some other factors which do apply to improving effectiveness and efficiency.

The Initial Industry Plan

- 3.3.7 In our opinion NR and its industry partners have responded affirmatively to the challenge set by the RVM Study final report of May 2011 with the publication of Initial Industry Plans (IIPs) for Scotland²⁰ and England and Wales²¹ in September 2011.
- 3.3.8 The IIP documents provide the start of better transparency and ‘joined-up’ thinking between all industry partners to identify what the railway needs to deliver to its end users – passengers and freight customers – and how this might be delivered in a way that provides better value for money. The IIPs extend the cross-industry work on Route Utilisation Strategies and are presented as the “starting point for discussions with government and ORR on the priorities for CP5, the programme of franchise re-letting and the necessary reform to the overall framework within which the industry operates to deliver a high performing and value for money railway.”²² The IIP documents make clear that the

¹⁸ WS Atkins, *Rail Value for Money Study: Asset Management & Supply Chain Management of GB Rail* (Issue 1.1, 25 May 2011)

¹⁹ Halcrow meeting with ORR and Atkins, 18 January 2012.

²⁰ Network Rail, Rail Freight Operators’ Association, Association of Train Operating Companies and the rail Industry Association, *Initial Industry Plan Scotland – Proposals for Control Period 5 and Beyond*, Network Rail, September 2011.

²¹ Network Rail, Rail Freight Operators’ Association, Association of Train Operating Companies and the rail Industry Association, *Initial Industry Plan Scotland – Proposals for Control Period 5 and Beyond*, Network Rail, September 2011.

²² Network Rail, Rail Freight Operators’ Association, Association of Train Operating Companies and the rail Industry Association, *Initial Industry Plan Scotland – Proposals for Control Period 5 and Beyond*, Network Rail, September 2011, page 5.

opportunities to make value for money savings are, at least in part, conditional on the decision-making of government and ORR.

3.3.9 The IIP documents set-out opportunities for improving value for money on the back of the RVM recommendations. The IIP documents for both England & Wales and Scotland identify that the total ‘efficiency gap’ for NR in relation to the RVM savings is zero in the low case and £0.5bn in the high case after removal of £0.6bn savings provisionally indicated by ORR for Control Period 5.²³

3.3.10 The IIP documents identify a number of value for money initiatives to close the ‘efficiency gap’ which we interpret may be underpinned by improved PPM:

IIP VfM Opportunity	IIP Description	Alignment with McNulty PPM Savings
Devolution	Devolved decision-making and accountability to route level to promote: improve efficiency, better cost transparency, improved benchmarking opportunities, management of small and medium sized projects focus on whole-life cost, closer co-operation with and responsiveness to customer needs.	<i>Increased Early Effort</i> - particularly in respect of early decision-making and improving the focus on benefits and outcomes at lower cost.
Alliancing	Apparently an extension of Devolution to enable co-operative agreements which appear focussed on overcoming contractual interfaces. Sharing of organisation structures and disciplines, improved behaviour and multi-lateral decision-making. These partnerships will require DfT and ORR support. Potential award of concessions to manage infrastructure at route level to introduce competition and benchmarking opportunities but, cognisant of the need to optimise network-wide, a ‘system operator’ role may be instituted.	<i>Increased Early Effort</i> (as per Devolution above) and <i>Increased Efficiency</i> (in reducing the delivery overhead and improved decision-making)
Improved management and contestability in projects	Through the ‘DIME’ initiative NR’s current project delivery organisation – Investment Projects (IP) – will be separated from NR’s client organisation (IP becoming ‘Newco’) and exposed to ‘contestability’ in the delivery of project services. This is comprised of three key components: <ul style="list-style-type: none"> • Partnering – NR will join forces with its supply chain to reduce management overhead costs by instituting a one-team approach, innovate earlier in project development and bolster risk management to improve project execution; • Development of client capability – the new NR client will need to attain the capability to set realistic output specifications and procure project delivery services from the market; • The creation of Newco – the successor organisation to Investment Projects which will be required to compete and win UK regulated and unregulated rail business. 	This is aligned predominantly to the ‘Supply Chain’ theme identified by the RVM Study, but will influence PPM savings through <i>Increased Efficiency</i> and <i>Increased Early Effort</i>

²³ See Tables 7 and 8, page 49 of the IIP for England & Wales and Tables 21 and 22 of the IIP for Scotland.

IIP VfM Opportunity	IIP Description	Alignment with McNulty PPM Savings
Improving contractual relationships	A range of initiatives to improve introduce supply chain efficiencies through a less prescriptive approach.	No, this is aligned predominantly to the 'Supply Chain' theme identified by the RVM Study.
Providing better defined, stable work banks	Improved visibility of future work banks to provide confidence to the supply chain to invest on the basis of stable future workloads. Particular emphasis is placed on smoothing workload between Control Period boundaries allowing better resource planning and lower supply chain costs.	Saving swill emerge under the 'Supply Chain' theme identified by the RVM Study but will be enabled by better PPM.
Scope and asset management savings	Development of NR's asset management capability to plan the right interventions at the right time.	Aligned predominantly to the 'Asset Management' theme of the RVM Study, but will be enabled by better PPM.
Revising standards and operating rules	Potentially, different approaches to safety management and a proposed move to out-put based specifications where appropriate.	Aligned to the 'Asset Management' theme of the RVM Study, but will be enabled by better PPM.
Multi-skilling and delivery	Improving the flexibility and skills of the workforce labour.	Aligned to the 'Supply Chain' theme identified by the RVM Study.
Reducing support costs	People, process and systems efficiencies in human resources, information management and finance support.	No, these are corporate overheads.

Figure 3.3: IIP VfM opportunities and their relationship to RVM heads of saving

- 3.3.11 NR state that due to the early GRIP stage development of schemes currently proposed for Control Period 5 (typically GRIP 1-2 level) a range of forecast costs has been calculated both at *project* level and also at *portfolio* level. The cost range of the latter is stated to be lower than the sum of the individual projects on the basis of the following risks and opportunities.

NR Description ²⁴	Alignment with McNulty PPM Savings
Uncertainty of outputs: agreement with train operators and funders of firm outputs is iterative as operational assessments and economic appraisals are refined through the development process.	<i>Increased Early Effort</i>
Scope definition: selection of a preferred single option usually occurs at GRIP stage 3. For the purpose of developing a forecast for the IIP Network Rail has selected a most likely scope of works for schemes in GRIP stage 2; this will need to be validated in due course through the option selection process.	<i>Increased Early Effort</i>
Optimism bias: there is well accepted research that reveals a systemic optimism bias in estimating the cost of projects compared to their outturn costs. A review specifically of Network Rail's projects revealed that the degree of bias can be sensitive to the type of project and asset mix. There is therefore a choice to be made as to the level of risk to be included in the overall project estimate and at early GRIP stages this is a qualitative judgement.	<i>Reduced Over-Spends</i>
Efficiency opportunities: as with other elements of cost forecasting in the IIP consideration needs to be given to the potential efficiencies that could be delivered including the impact of initiatives such as our efficient infrastructure delivery proposals, the impact of devolution, alliancing and the impact of our plans to encourage greater contestability of project delivery.	<i>Increased Efficiency</i>
Portfolio risk benefits: there are risks that are low probability but high impact that can materially impact the estimate of any single project but when delivering a portfolio of projects this risk can be spread across the portfolio such that costing the projects as a portfolio is less than the sum of the individual projects.	<i>Reduced Over-Spends</i>
Other portfolio benefits: potential sources of efficiency include the benefits of delivering a portfolio of projects providing economies of scale in the market place and synergies in how projects are packaged.	<i>Increased Early Effort</i>

Figure 3.4: IIP Enhancements – Factors affecting range of possible costs for Control Period 5 and their relationship to RVM heads of saving

- 3.3.12 We agree that these are all significant factors which will affect the range of 'efficient prices' that need to be resolved at the Periodic Review 2013 Determination. The

²⁴ PR13 Initial Industry Plan Supporting Document, Definition of proposed CP5 Enhancements, Network Rail, September 2011, p. 6.

following tables collate NR's position regarding the ranges and difference between projects and programmes priced at 'project' and 'portfolio' level'.²⁵

Proposed CP5 Enhancement Exp. England & Wales (£m. 2011/12 prices)	CP5 Forecast (Portfolio level)		CP5 Forecast (Projects level)		Delta – Low end of range	Delta – High end of range	Delta between range extremes
	Low	High	Low	High			
Committed programme	4,544	4,544	4,495	4,495	-49	-49	-49
Proposed interventions	2,067	2,342	2,197.7	2,483.5	130.7	141.5	416.5
Funds	2,514	2,514	2,514	2,514	0	0	0
Total	9,125	9,400	9,206.7	9,429.5	81.7	29.5	304.5

Figure 3.5: IIP CP5 Proposed Enhancements England & Wales– Portfolio vs. Project Funding

Proposed CP5 Enhancement Exp. Scotland (£m. 2011/12 prices)	CP5 Forecast (Portfolio level)		CP5 Forecast (Projects level)		Delta – Low end of range	Delta – High end of range	Delta between range extremes
	Low	High	Low	High			
Committed programme	396	396	396	396	0	0	0
Proposed interventions	490	542	495.4	646.9	5.4	104.9	156.9
Funds	157	157	157	157	0	0	0
Total	1,043	1,095	1,048.4	1,199.9	5.4	104.9	156.9

Figure 3.6: IIP CP5 Proposed Enhancements Scotland– Portfolio vs. Project Funding

Proposed CP5 Enhancement Exp. Eng., Scot. & Wales (£m. 2011/12 prices)	CP5 Forecast (Portfolio level)		CP5 Forecast (Projects level)		Delta – Low end of range	Delta – High end of range	Delta between range extremes
	Low	High	Low	High			
Committed programme	4,940	4,940	4,891	4,891	-49	-49	-49
Proposed interventions	2,557	2,884	2,693.2	3,130.4	136.2	246.4	573.4
Funds	2,671	2,671	2,671	2,671	0	0	0
Total	10,168	10,495	10,255	10,692	87	197	524

Figure 3.7: IIP CP5 Proposed Enhancements England, Scotland & Wales – Portfolio vs. Project Funding

²⁵ Data collated from the cost tables presented throughout *PR13 Initial Industry Plan Supporting Document, Definition of proposed CP5 Enhancements*, Network Rail, September 2011.

3.3.13 We observe the following from these tables:

- The expected cost for ‘committed programmes’ is expected to rise by £49m in Control Period 5. The RVM Study considered that no savings were possible for the committed programmes (for example, Thameslink) on top of the savings which has already been built-into the efficient price determination relating to these committed programmes;
- There is a difference of £524m²⁶ between the high end of the estimate range based on ‘individual project estimates’ and the low end of the range based on ‘portfolio estimates’. Depending on the choices made by funders NR is advising through the IIP that there is potentially £524m of savings from Enhancements alone. If the savings were to be realised at the low end of the range, NR would cover-off the £0.5bn RVM savings balance identified at 3.3.9 above;
- Based on the ‘portfolio estimate’ there is a £327m difference²⁷ between the top and bottom of its ‘portfolio estimates’ range. Thus, if funders decide to proceed with the options currently stated it appears to follow that a c. £200m saving off the high end of the ‘individual project estimates’ would be made immediately and there might be the potential to save a further £327m depending upon a range of other factors which would include the detail of scope, timing, procurement opportunities and so on;
- The £2.67bn of ‘Funds’ is not affected by any cost range uncertainty. However, Funds will be subject to the same efficiencies challenges as any other form of expenditure.

3.4 Network Rail’s Delivery Challenge in Control Periods 4 and 5

3.4.1 With the exception of the West Coast Route Modernisation (WCRM) programme Control Period 3 was focussed on renewing rather than enhancing the national rail network. Periodic Review 2008 included some £12.5bn of Enhancement project investment in Control Period 4. During Control Period 4 this level of investment has dropped to a forecast of c. £11.1bn as a result schemes that have been added, omitted, or re-phased against NR’s original Control Period 4 obligations. The Enhancements Investment in Control Period 4 represents a marked increase on the previous Control Period.

3.4.2 The scale of NR’s delivery effort in Control Period 4 is considerable:

²⁶ Figure 3.7, £10,692m minus £10,168m.

²⁷ Figure 3.7, £10,495m minus £10,168m.

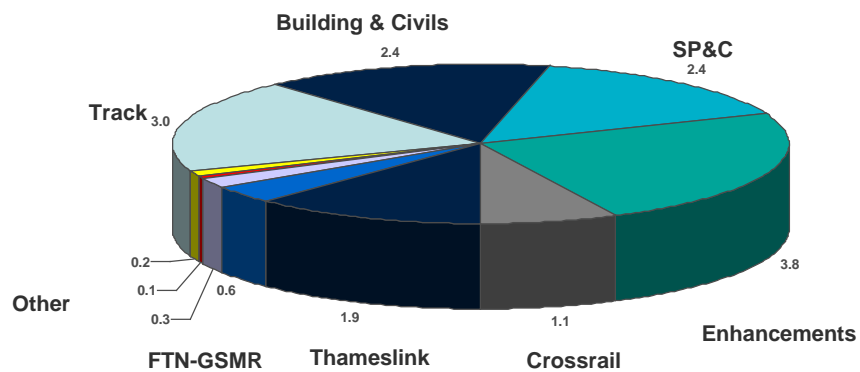


Figure 3.8: Investment Projects Expenditure Control Period 4 – Total £15.9bn (includes Enhancements and some Renewals)²⁸

3.4.3 Control Period 5 presents an ongoing delivery challenge at a similar rate to Control Period 4 however there is a marked increase in the value of ‘Funds’ which will be delivered by NR.

CP5 Expenditure	£bn (2011/12 prices)
Committed programme	4.94
Specified schemes	2.56 – 2.88
Funds	2.67
Total	10.17 – 10.49

Figure 3.9: Control Period 5 Initial Industry Plan – Enhancements in England and Wales²⁹

3.4.4 Possible Funds in Control Period 5 include:

- Level crossing safety fund (£300m);
- Strategic Freight Network (£350m);
- Station accessibility fund (£150m);
- Station improvement fund (£150m);
- NRDF (£250m);
- Passenger information fund (£200m);
- Journey time improvement fund (£200m);
- East Coast improvement fund (£500m);
- Innovation fund (£150m);

²⁸ Presentation to Halcrow from Stephen Blakey, NR Head of Claims & Estimating, SB slides for Halcrow Nov11(part 1).ppt

²⁹ IIP England and Wales launch event presentation available at: <http://www.networkrail.co.uk/IIP.aspx> accessed 8 December 2011.

- CP6 development fund (£100m);
- Performance fund (£160m).

- 3.4.5 Some of the above Funds already form key components of NR's Control Period 4 obligations. Although NR has been responsible for the rump of the delivery of the physical work under these Funds the governance arrangements differ in terms of NR's control over what the funding is spent on. For example, under the National Stations Improvement Programme (NSIP) NR actively participates in the Programme Board but many schemes are actually delivered by Train Operating Companies under industry-wide governance arrangements which allocate funding to Local Delivery Groups. Access for All is similarly governed but NR deliver most schemes in accordance with industry-wide selection and prioritisation criteria. The Network Rail Discretionary Fund (NRDF) provides scope for NR to invest in schemes up to £5m in value should certain benefit-cost criteria be met.
- 3.4.6 The advantage of Funds is that they provide a good basis to foster closer links between NR and its industry partners to make good investment decisions for the benefit of the railway. However, disciplined governance, stakeholder and benefits management are fundamental to ensuring that Funds actually deliver value.
- 3.4.7 In Renewals there are some marked increases and decreases between the different Asset disciplines between Control Periods 4 and 5, but the bottom-line expenditure is essentially static.

£bn 2011/12 prices	CP4	CP5	Change
Track	3.88	3.36	- 13%
Signalling	2.32	3.58	54%
Civils	1.86	2.19	17%
Buildings	1.43	1.21	- 15%
Electrical power and fixed plant	0.87	0.99	13%
Telecoms	1.18	0.39	- 67%
Wheeled plant and machinery	0.30	0.48	64%
IT	0.44	0.27	- 40%
Corporate offices	0.31	0.09	- 70%
Other renewals	0.20	0.28	38%
Total	12.78	12.84	

Figure 3.10: Control Period 5 Initial industry Plan – Renewals in England and Wales³⁰

³⁰ IIP England and Wales launch event presentation available at:

- 3.4.8 Overall we consider that the NR's obligations over Control Periods 4 and 5 need to be considered together. The key challenge for NR over both Control Periods 4 and 5 is to accommodate the growth demands on the network through the delivery of significant infrastructure interventions to largely Victorian infrastructure. Accommodating both steady state renewal works whilst simultaneously upgrading the railway presents a programme management challenge for all industry partners and not NR alone.
- 3.4.9 Below, we consider NR's approach to tackling this sustained challenge.

<http://www.networkrail.co.uk/IIP.aspx> accessed 8 December 2011.

4 PPM Process Perspectives

4.1 Overview

4.1.1 In order to obtain a wide-view of NR's approach to PPM we have used the P3M3® 'process perspectives' framework as our general lines of inquiry.³¹ The following does not provide a formal P3M3® assessment, but does provide the basis for our opinion. We have also made reference to the OGC's supporting guidance including Managing Successful Programmes, industry literature and to the three comparators that we have engaged with during this study. Throughout, we have sought to focus on the issues which affect NR's ability to deliver successful projects and programmes; some of these matters are within NR's control and others not.

4.2 Network Rail's PPM Maturity Assessments

4.2.1 NR has variously employed Project and Programme Management maturity assessment frameworks to understand its development as an organisation. NR explained that it had at one time used the Capability Maturity Model (CMM)³² framework which suggested that NR was significantly mature as a project delivery organisation.

4.2.2 OGC's P3M3® maturity model was then used by NR and an initial project management assessment was undertaken in May 2011. The P3M3® maturity assessment marks the organisation on a scale of zero to five with the latter representing absolute maturity. NR's 2011 assessment rated it at level three and NR stated its objective to achieve level four.

4.2.3 NR's assessment of P3M3® – and we agree – is that:

- P3M3 has the potential to offer benchmarking opportunities with other organisations, but that potential is currently limited. NR will seek benchmarking opportunities through P3M3 but have also approached another railway which is understood to have undertaken a P3M3 assessment ;
- The opportunity to undertake self and formal assessment is desirable albeit the assessment score derived by P3M3 assessments does not tell the assessed organisation a great deal; the value is in the interpretative assessment that accompanies the assessed score;
- NR considered the questionnaire underpinning P3M3 could be expanded to provide clearer insights into areas of NR's business which are not fully covered by P3M3. We concur with this particularly in respect on the basis that P3M3 could be developed in view of the major effort that the likes of NR must invest in option development and selection.

4.2.4 We would also add that P3M3® offers no insight into the delivery 'success' of the organisation i.e. it offers no view on whether outcomes have been achieved in respect of time, cost, quality, safety or any other measureable metric. It is process oriented only. Maturity assessments have their place and that is to inform any business of

³¹ See <http://www.p3m3-officialsite.com/P3M3Model/P3M3Model.aspx>

³² CMM Update 2009/10 (presentation).

potential knowledge, systems or process gaps which is valuable particularly where under-performance is identified or if step-changes in performance are required.

- 4.2.5 NR advised that its maturity assessment efforts will be put on-hold until the completion of the Devolution and DIME re-organisations expected to be complete in April 2012. This is understandable and we would recommend that NR makes a sustained effort at the appropriate timing post re-organisation to assess the capability of the new organisations that are formed.
- 4.2.6 We note from several public sources that NR and other industry partners will be seeking to form alliances on a route basis. This augurs well for potential cost savings but will require a significant shift in approach and attitude from all parts of the industry. Alliance organisations – and the people within them – must be built and sustained which requires aligning the partners and building relationships which are genuinely integrated, open and honest.³³ NR should invest in both individuals and teams to ensure that the opportunities of future alliances are embraced.
- 4.2.7 Poorly handled, alliancing presents serious risks which ORR should consider in its regulation of NR. ORR has publicly welcomed the principle of alliancing between NR and operators but must consider the regulatory impact of such arrangements.

³³ *Partnering in Europe – Incentive based alliancing for projects*, European Construction Institute, Thomas Telford Publishing, 2001 explains the principles, opportunities and pitfalls of Alliancing in project scenarios. These principles are equally applicable to attempts to re-integrate across the contractual boundaries between infrastructure and operations.

4.3 Organisational Governance and Management Control

Overview

- 4.3.1 Organisational Governance and Management Control as defined by P3M3®³⁴ are important facets for NR in delivering its obligations.
- 4.3.2 Organisational Governance is concerned with how the delivery of obligations aligns to the strategy of the organisation which is in turn influenced by external factors. External factors require control in order to enable NR to deliver its obligations. The principal factors presented to NR for control include the way it is funded, regulated and its relationship with its customers – TOCs and FOCs – which also have obligations to meet.
- 4.3.3 Management Control relates to the internal organisation, governance, control and leadership implemented to achieve the strategy and obligations imposed.
- 4.3.4 We consider Organisational Governance and Management Control together in view of the way that the former drives the latter. This is clearly seen in the way that NR is presently undergoing significant re-focusing – and re-structuring in the form of the Devolution and DIME initiatives – to meet the challenges laid-down by the concurrent challenges of the Control Period 4 determination, the RVM Study findings and the challenge anticipated by the Control Period 5 determination.

Organisation Today – The Process Led Organisation

- 4.3.5 In order to drive the next efficiency frontier in Control Period 4 NR re-structured in November 2009 to form the ‘Process Led Organisation’ (PLO) which is comprised of five core functions:
- **Planning** to develop medium and long-term company strategies and plans, including and beyond the current Control Period;
 - **Network Development** to generate options for enhancing the railway and act as internal sponsor and be accountable to the client for delivery;
 - **Investment Projects** to deliver enhancements and renewals;
 - **Asset Management** to optimise the whole life of infrastructure asset by bringing together renewals and maintenance; and
 - **Operations & Customer Services** to deliver customer needs.

- 4.3.6 The above functions were structured as follows upon re-organisation in November 2009:

³⁴ Portfolio, Programme and Project Management Maturity Model (P3M3®), Introduction and Guide to P3M3®, Office of Government Commerce, Version 2.1, 2010, p.15.

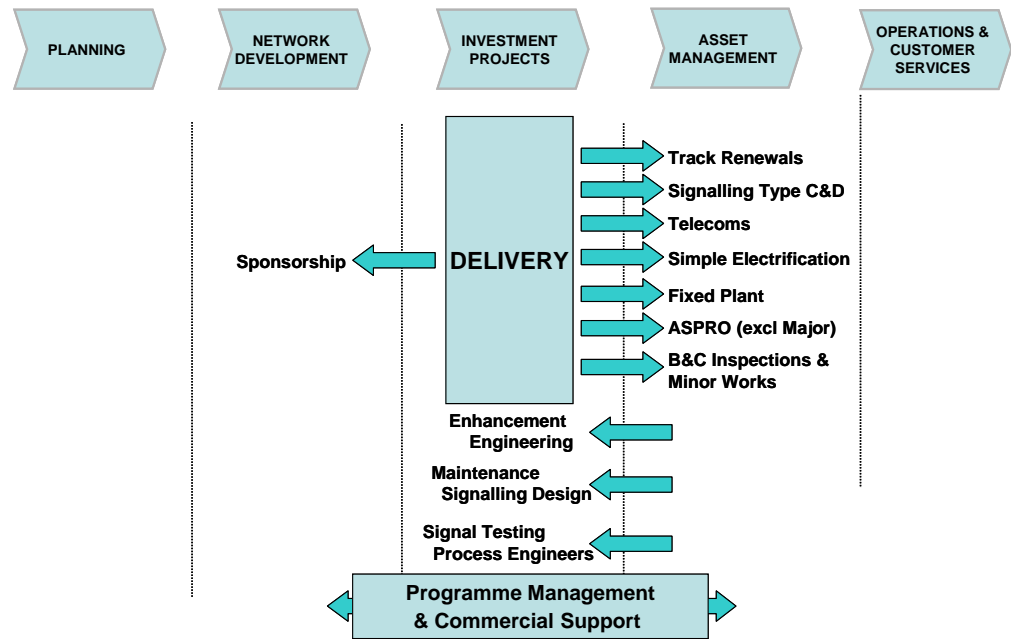


Figure 4.1: November 2009 'Process Led Organisation'³⁵

4.3.7

Our understanding is that the above structure has been largely unchanged during Control Period 4. With the exception of Track, Signalling Power and Communications (SP&C) and minor Civils renewals, NR's PPM capability is concentrated with the Investment Projects division of NR. The following diagram explains the interfaces of Investment Projects:

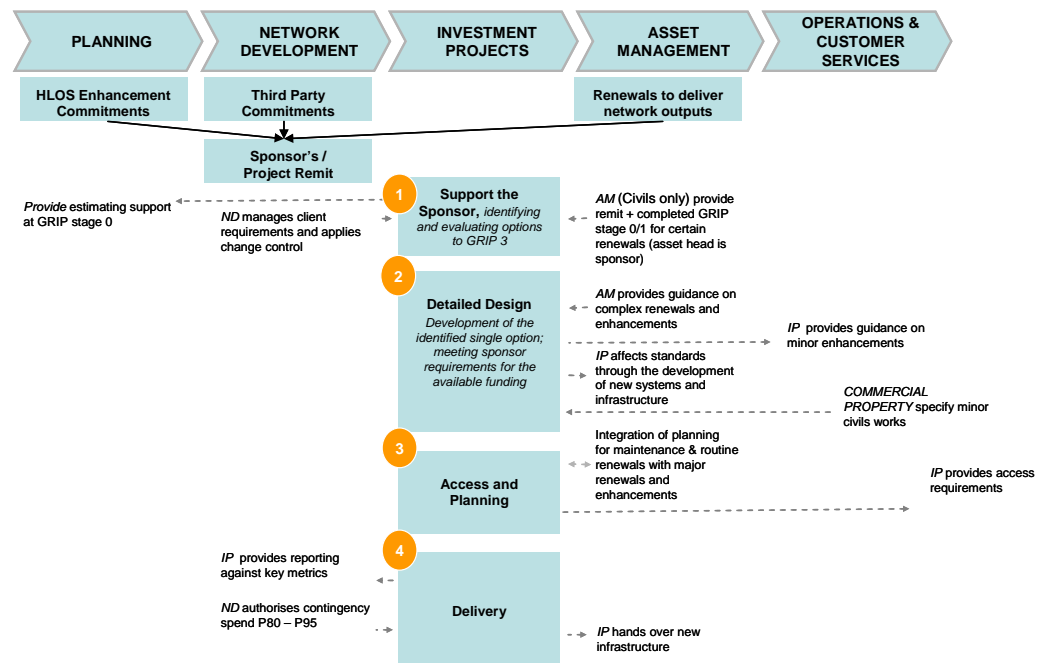


Figure 4.2: Investment Projects – Interfaces with the wider organisation³⁶

³⁵ Network Rail Investment Projects New Organisation, November 2009, slide 8.

³⁶ Network Rail Investment Projects New Organisation, November 2009, slide 10.

4.3.8 Investment Projects itself was organised on a discipline (Assets and major programmes) basis with a cross-cutting national programme management support function which supports Investment Projects, Asset Management and Network Development:

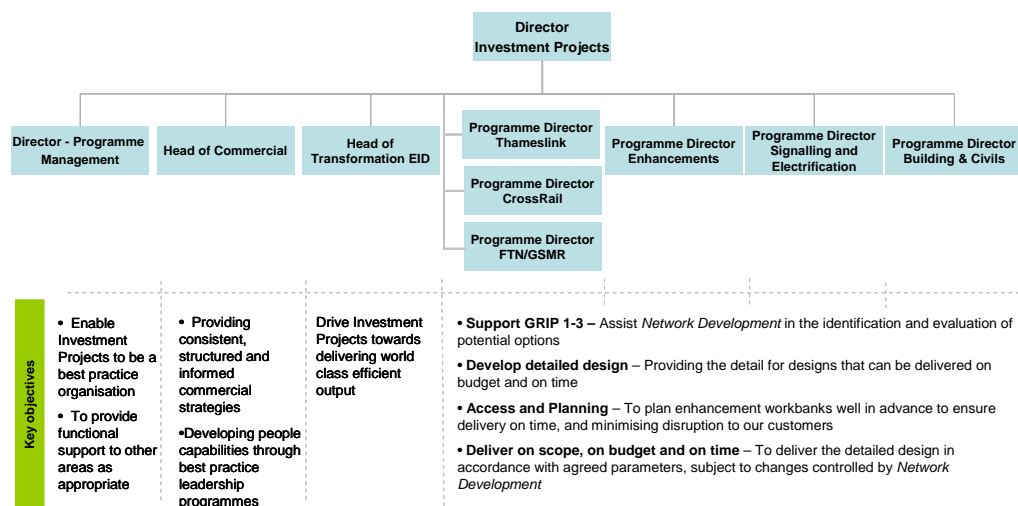


Figure 4.3: Investment Projects³⁷

4.3.9 During this review we have interviewed senior NR executives from all Investment Projects teams with the exception of the three major programmes – Thameslink, Crossrail and FTN. Our impression of the organisation is that:

- As the organisation is 'Asset' focussed, NR has had the opportunity in Control Period 4 to address asset-specific processes and delivery models. Although there is evidence of at least one further re-structure within Asset-specific functions (for example the Buildings and Civils and Track have both re-organised since November 2009) we consider that there has been sufficient stability to build-up delivery capability. Delivery capability has had to expand rapidly within this structure in view of the marked increase in investment;
- The separation of the three major programmes was appropriate as these either have a very specific delivery focus with their own specific governance (Thameslink and Crossrail) or have network-wide significance (FTN);
- The creation of the central Programme Management function was an appropriate step at the start of Control Period 4 in order to drive-through 'system, process and people' changes under the Project Management Framework which required a stable base organisation to implement and embed;
- Although the Programme Management function has the objective of instilling a common 'one way' approach across the organisation it is evident from our discussions with NR that specific discipline-led processes and approaches are followed. We consider this inevitable in view of the structure of the organisation which requires each Asset to perform within the boundaries of its Delivery Plan obligations overlaid by stretch targets set by NR's senior

³⁷ Network Rail Investment Projects New Organisation, November 2009, slide 9.

leadership. For example, each Asset appears to have devised different methods for identifying and monitoring efficiency opportunities which the Programme Management function collates for top-management reporting;

- A key role of all Investment Project functions during Control Period 4 has been to provide support to NR's client organisation 'Network Development'. Although Network Development currently contains NR's sponsorship function it is clear that it does not contain the requisite capability to fully define and procure requirements. This issue is discussed further below in respect of the DIME / Devolution re-organisations;
- Other than major or mega programmes (such as Birmingham New Street, Reading and Crossrail) where NR has procured project / programme management services, NR has not integrated closely with its supply chain during Control Period 4. Comparator C is similar to NR in this regard but is looking – as NR is – to involve its supply chain earlier in decision-making in order to take advantage of innovation. Comparators A and B have deeper collaborative relationships with their supply chain:
 - Comparator A has a lean programme management organisation supplemented by designers and contractors which are integrated into one team with the client and are incentivised under their contracts to meet the overall settlement from HM Government;
 - Comparator B awarded a contract for approximately half of its obligations to a delivery partner that organised itself as a fully-integrated programme manager, contractor and designer. The delivery partner was incentivised to deliver the obligations within the regulated settlement;
 - Both Comparators A and B have identified the need to set very clear output requirements and tangible targets from which their supply chain are genuinely incentivised against. Comparators A and B noted that there was a need to be integrated and choose the 'right person for the job' – regardless of organisation – in order to obtain the benefits and that culture and attitude of joint delivery organisations were paramount to success. These are challenges that NR must face in its future re-shaping of the organisation.

Ref.	Critical Issue	Organisation
1	<p>In Control Period 4 NR has already appointed several delivery partners to assist with the deliver of major projects and programmes, but the Alliance arrangements proposed for Control Period 5 suggest new territory for both NR and its supply chain which will have to be handled well if efficiency improvements are to be achieved.</p> <p>Comparator organisations have made significant strides in closer integration with their supply chains to produce good results. Precursors for success have been to achieve commercial incentives aligned to regulated outputs; the ability to set outcome-based specification requirements which give the supply chain room to innovate within without overburdening assurance requirements (which have the potential to reduce innovation); and, fostering the right culture and attitude.</p>	
	Recommended Action	Responsible – Network Rail
	<p>NR must prepare for this future approach adequately by creating clear output specification requirements and genuinely engaging with and incentivising its supply chain. If these requirements are not met alliancing / partnering approaches can increase risk of non-delivery.</p>	

Organisation from 16 April 2012 – Devolution and DIME

- 4.3.10 NR was only able to share limited details of its Devolution and DIME initiatives with us as at the time of this study NR’s proposals were either still under development or staff consultation had not yet been undertaken. Our opinion is therefore qualified in view of the emerging position.
- 4.3.11 The Devolution proposals involve improving NR’s alignment with its principal customers – train and freight operating companies – across ten Routes. Outside of the ten Routes, special organisations will be established where cross-Route programmes require implementation. For example, Thameslink will form such ‘Route’ for the purposes of its delivery.
- 4.3.12 NR is appointing a Route Managing Director (RMD) for each of the ten Routes and we are advised that the typical management structure under each will be as follows:

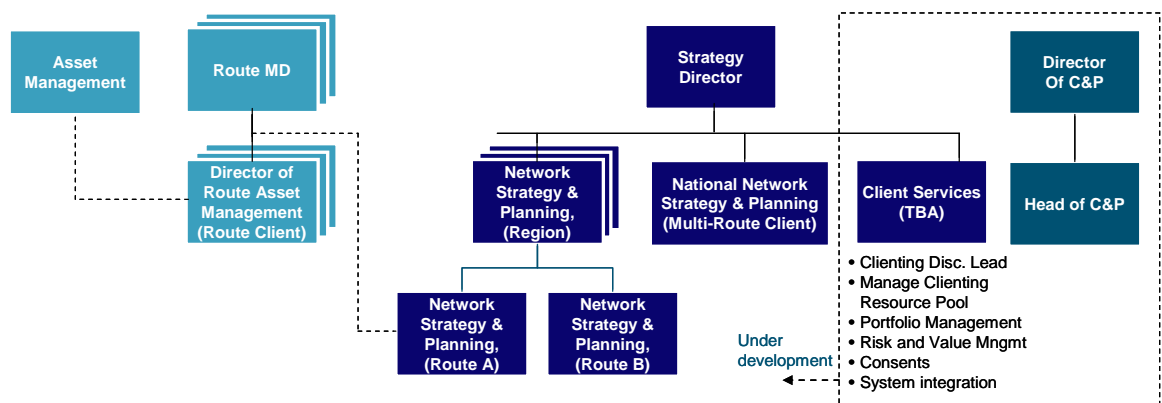


Figure 4.4: Draft ‘Client Model’ under Devolution³⁸

³⁸ Presentation - *Project DIME Update*, Network Rail, 11 October 2011, p. 10.

4.3.13 NR's 'Client Process' under Devolution and DIME is set-out as follows:

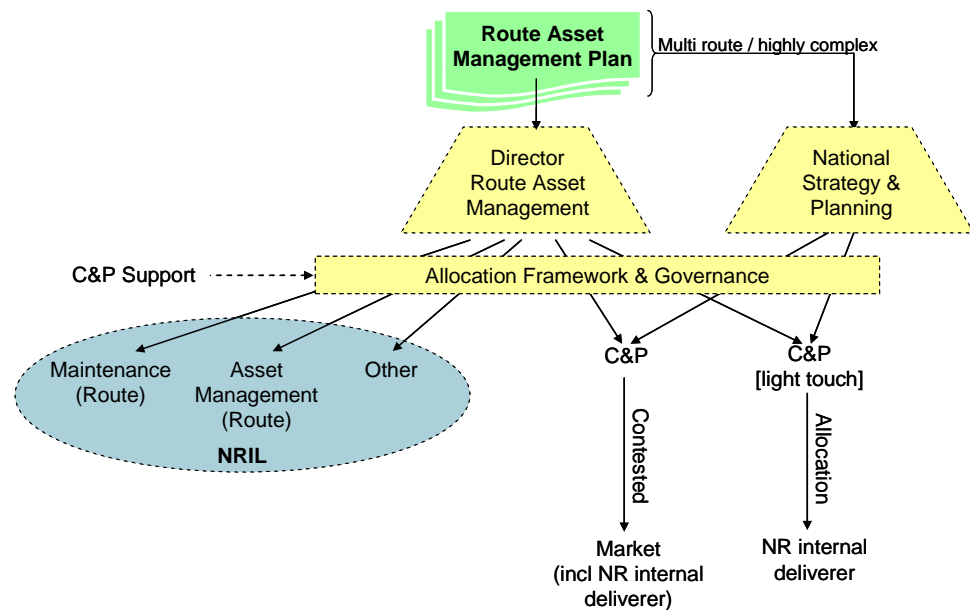


Figure 4.5: Draft 'Client Process' under Devolution³⁹

- 4.3.14 We understand that each RMD will hold accountability for safety, all performance metrics and the profit and loss of running each Route. This should significantly clarify the question of who is accountable for delivery success.
- 4.3.15 We are given to understand that the Director of Route Asset Management (DRAM) for each Route will effectively act as the 'Sponsor' (which appears to be re-termed 'Client') for the definition and instruction of all future Enhancements and Renewals works.
- 4.3.16 The concept of closer alignment between all industry partners and between NR and its customers in particular was promoted by the RVM Study and has also been endorsed by ORR.⁴⁰
- 4.3.17 We consider that NR has taken affirmative action in relation to the RVM recommendations in order to deliver a better value for money railway. Thus, from an Organisational Governance perspective we consider that NR has been responsive but as recognised by the RVM Study, a whole-industry response is required to derive benefit from new ways of working.
- 4.3.18 From a Management Control perspective – the aspect that NR can control – there appear to us to be a number of practical issues of execution which must be worked-through and resolved. Some of these are within NR's control and others are not:
- As each Route will be more closely aligned to its principal customers we would expect TOCs to increase their direct demands on each NR RMD who will in-turn strive to obtain the best deal for each Route. This implies that there will

³⁹ Presentation - *Project DIME Update*, Network Rail, 11 October 2011, p. 9.

⁴⁰ *Collaboration is key to meeting the challenges ahead* – Richard Price, ORR, 28 February 2012. Accessed at <http://www.rail-reg.gov.uk/server/show/ConWebDoc.10846> on 5 March 2012.

be internal competition between NR for maintenance, renewal, enhancement funding, including the prospect of increased access to 'Funds' in Control Period 5. Although such competition might be viewed as healthy we consider that there must be a means of taking a total view across all Routes to ensure that obligations are achieved in a balanced way;

- NR's success in these more aligned relationships with TOCs will depend on the commercial attitude of each TOC which will in-turn be driven by factors such as their Franchise arrangements and public perception of the service provided. This is important from a programme management perspective as 'value for money' will only be truly achieved if all parties are incentivised. Thus, although NR and some of its principal customers appear to be re-positioning to improve alignment, these new relationships (which appear to have varying degrees of formality) require monitoring any ORR and DfT to ensure that the right behaviours are adopted and incentivised. The concept of 'value for money' needs to be clearly drawn to ensure that all industry partners are engaged in positive action towards that target;
- The role of the DRAM is critical as it appears that this individual will be required to interpret and apply asset policy on a Route basis. An expected outcome of devolved decision-making is that standards and existing approaches will be challenged in order to better meet the requirements of NR's customers. Whilst this aligns with the 'value for money drive' we consider that any divergence of approach regarding asset policy must be justified with reference to a range of factors; the current focus is on cutting the cost of the railway but such decisions must take appropriate account of the whole-life aspects of delivering a sustainable railway. We expect – but have no confirmation – that NR will continue to develop and publish asset management policy centrally and will require assurance from DRAM's that where deviation from policies are adopted, the business case for doing so is demonstrable and acceptable to NR – and ORR;
- Under DIME the DRAM also appears to hold the key role of determining which work will be delivered directly by 'Newco' and that which will be 'contested' to the open market. Although the DRAM will have access to procurement and commercial support functions we observe that both contested and non-contested works will be transferred to delivery organisations at GRIP 2 or 3. This is in contrast with the current point of specification by NR to its supply chain at either GRIP 4 or 5. Thus, NR's new client organisation will have to perfect the production of output-based specifications and be very clear about what targets they require the supply chain to achieve. If this is not achieved – and NR has not been in the practice of doing so – there is potential for projects to cost more and not less until the art of output specification is perfected. In respect of management control, inviting the supply chain into early decision-making will certainly encourage innovation and opportunities but it also requires trust and a willingness on NR's part to 'let go' under the commercial arrangements agreed;
- Finally, the re-organisation into ten principal Routes poses the question of whether or not ORR should approach Control Period 5 on the basis of 'one Determination' or 'ten separate Determinations'. This is of crucial importance from a programme management perspective as the alternative approaches will presumably affect NR's appetite and approach to the pricing of risk.

Regardless of which approach is taken we would strongly encourage that the expected outcomes for each Route are developed in detail to ensure that solutions and their pricing reflect them as closely as possible. This will both help and incentivise all industry partners (ORR, DfT, NR, TOCs, FOCs and others) to properly engage in outcomes which align to a defined level of ‘value for money’ and all other considerations which sit alongside that. If the ORR resolved to make a single Determination for Control Period 5 we strongly recommend that this is derived from a specific build-up for each Route so that the outcome for each Route can be monitored throughout future Control Periods.

Ref.	Good Practice	Devolution
2	NR is taking affirmative action to re-align its client and project delivery capability with the needs of its principal customers.	
	Recommended Action	Responsible – Network Rail
	Although the success of this will depend on details of execution the principle is appropriate in the absence of any significant industry restructuring.	

Ref.	Critical Issue	Devolution / DIME
3	Details of Devolution and DIME will emerge when NR’s development has progressed and have been the subject of safety validation and staff consultation. Doubtless NR is working-through the risks and opportunities of re-aligning on a Route rather than an asset basis. A number of matters will require attention to ensure that the transition is assured and does not lead to a drop in performance in the short-term and potential cost escalation on the medium term. As NR is aligning itself to the needs of its customers it may open itself to internal decision-making tensions which do not currently exist.	
	Recommended Action	Responsible – Network Rail
	Key issues which require careful consideration by NR in its details Devolution / DIME proposals include: <ul style="list-style-type: none"> • The ability of the new NR Route Client organisation to specify on an output basis at an early stage in the GRIP process (GRIP 2/3 instead of GRIP 4/5). The new NR Client organisation should have its own capability to specify and procure if ‘Newco’ is to be truly separated for the purposes of contestable works; • Tension between NR Routes for available funding as they come under more direct customer scrutiny. A mechanism for balancing expectations and requirements across NR will be required; • In preparation for the Control Period 5 Determination NR should prepare its proposals to ORR on a Route basis to allow the alignment between Route outcomes, proposed solutions, cost and affordability to be checked. We consider that this should also take account of railway-wide whole-life asset management decision-making. 	

Ref.	Critical Issue	Control Period 5 Determination
4	<p>The restructuring of NR on a Route basis under Devolution presents the question of how the Control Period 5 Determination will be made; either as one Determination or ten separate Determinations. This is important in promoting an ‘organisational governance’ perspective as ORR’s decision will drive NR’s pricing of Control Period 5 obligations.</p> <p>The Route-based alignment might also raise questions for DfT and Transport Scotland in respect of future franchise decisions which in-turn affect NR’s ability to gain alignment with its customers. Again this is an organisational governance matter which might affect NR’s ability to scope and price solutions to expected Control Period 5 outcomes.</p>	
	Recommended Action	Responsible – ORR, DfT and Transport Scotland
	<p>ORR must consider whether it will make one Control Period 5 Determination or ten (or some other number to be agreed depending on the treatment of multi-Route programmes). Regardless of the approach we consider that Route-specific outcomes should be addressed in order that these can be appropriately funded and subsequently monitored.</p> <p>DfT might need to consider the commercial arrangements for incumbent and future TOCs in order that appropriate incentives and behaviours feed-into the Control Period 5 Determination process and its execution.</p>	

Project Management Framework

4.3.19 NR’s Project Management Framework manages all of its delivery obligations, whether these are discrete projects, major programmes or portfolios. It is comprised of the following components:

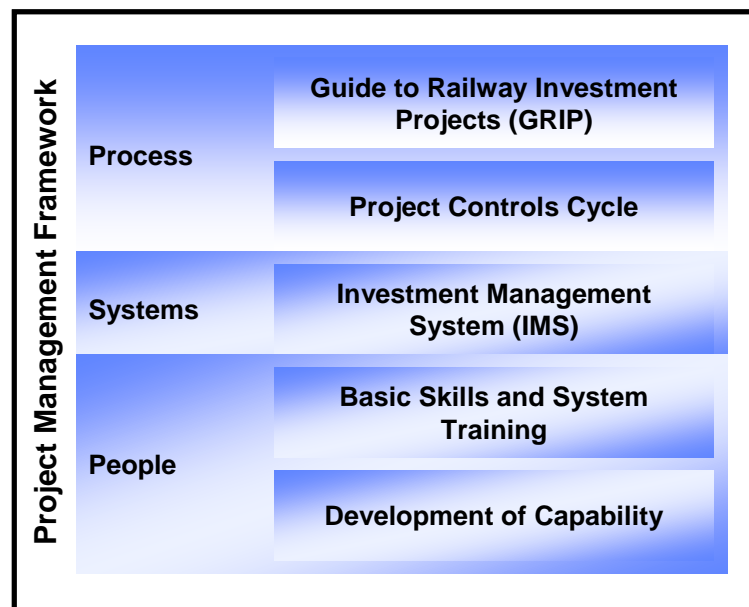


Figure 4.6: The NR Project Management Framework⁴¹

4.3.20 It is evident that NR has invested a huge amount in its ‘people, systems and processes’ during Control Period 4 and these have all received specific focus through

⁴¹ EFQM Assessment – Investment Projects, presentation, Network Rail, (undated).

the Efficient Infrastructure Delivery (EID) initiatives in order to drive-through both effectiveness (reducing capital costs) and efficiency (reducing overheads) to deliver a better value for money railway. In this section we make observations in relation to some of the key 'Process' and 'Systems' aspects. 'People' are considered below under section 4.6 which considers 'Resource Management'.

GRIP

4.3.21 GRIP was originally introduced in 2003 as the *Guide* to Railway Investment Projects at a time when NR had few Enhancement projects and programmes in comparison to its current Control Period 4 obligations and its likely Control Period 5 obligations.

4.3.22 In relation to comparator organisations we consider that NR was ahead of Comparators A, B and C in providing a reference framework within which to baseline, monitor and controls projects and programmes. However, NR itself has recognised a range of issue in its application, including:

- GRIP was promoted and implemented a *guide* and was therefore viewed as being optional rather than mandatory. This led to inconsistent application across projects and programmes with the result that NR's control was questionable. Control is a precursor to efficient delivery;
- The 6 core manuals, 42 core reference documents, 431 products and 179 templates presented a plethora of potential requirements which NR concede were not consistently updated thus perpetuating inconsistent use;
- Information Management support was not ideal;
- The volume of potential requirements suggests that, when followed rigidly. GRIP created an inordinate amount work for project teams, which was not justified.

4.3.23 In Control Period 4 NR has sought to address these issues under one of its Efficient Infrastructure Delivery (EID) initiatives entitled the GRIP re-refresh which is stated to have achieved the following:

- Re-classified GRIP as Governance of Railway Investment Projects which now makes GRIP mandatory for projects in accordance with the requirements set-out by two new NR Standards:
 - NR/L1/INI/PM/GRIP/100 - Governance for Railway Investment Projects (GRIP), Policy Manual;
 - NR/L2/INI/PM/GRIP/101 - Governance for Railway Investment Projects (GRIP), Project Management;
- These standards were introduced (available for use) on 4 December 2010 and attracted the following compliance dates:
 - Investment Project (Enhancements and Renewals) by 5 March 2011;
 - Infrastructure Maintenance by 5 March 2012;
- These standards now clarify to what extent GRIP is applicable dependent upon the complexity of the projects and programmes undertaken. This is governed by NR's Level of Control standard NR/L3/INI/PG115/PS/001;

- The 'GRIP refresh' has also sought to address the number, format and type of products produced which we understand rationalises the amount of effort required depending upon the Level of Control determined;
- Mandatory requirements are also stated ahead of Stage Gate reviews and the number of Stage Gate reviews required which again depends on the 'Level of Control' determined.
- Requirements on the conduct of Peer Reviews (a review conducted ahead of a Stage Gate review to challenge and prepare the project ahead of the relevant Stage Gate review) which are undertaken by suitably qualified and experienced individuals from other projects / programmes.

4.3.24 Overall, these changes are viewed by NR to enhance the value-adding elements of GRIP and to improve what NR refer to as the 'line of sight' from project commencement to close-out. The GRIP lifecycle is set-out below.

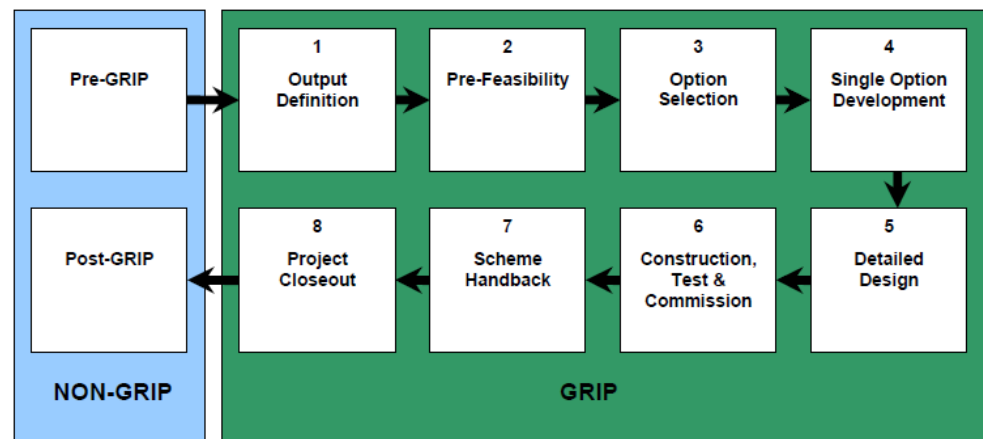


Figure 4.7: GRIP lifecycle⁴²

4.3.25 The principles GRIP are similar to approaches adopted by other infrastructure owners:

⁴² NR/L1/INI/PM/GRIP/100 - Governance for Railway Investment Projects (GRIP), Policy Manual, Issue 1, 4 December 2010.

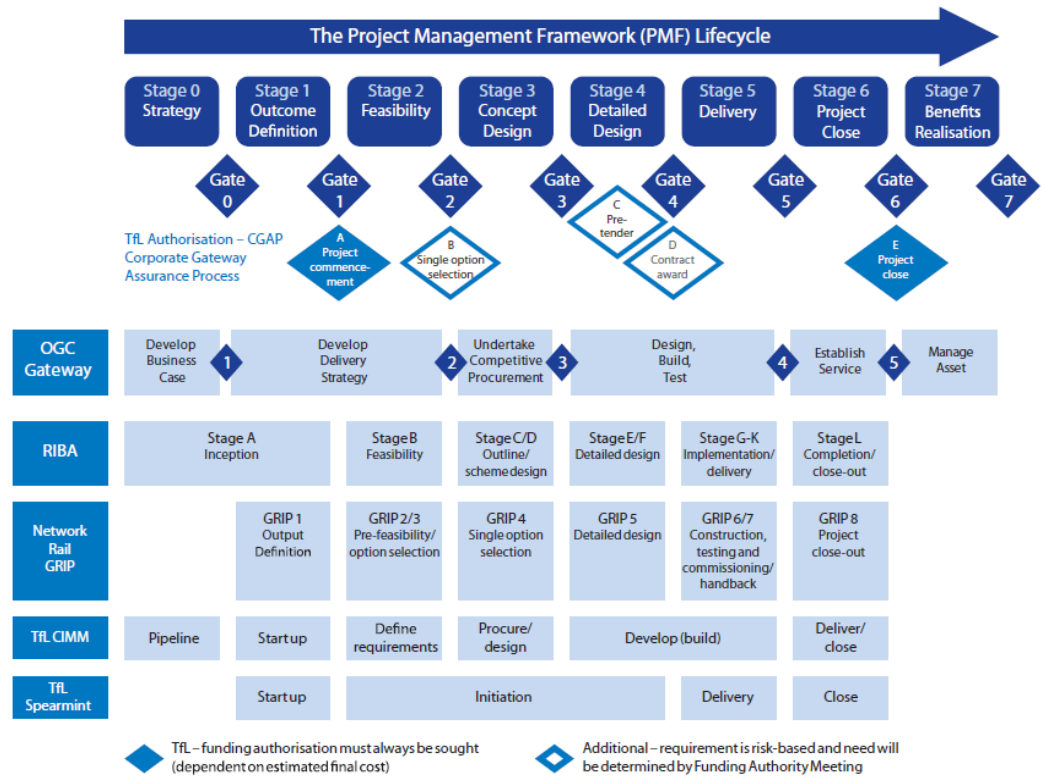


Figure 4.8: Stage Comparator RIBA vs. GRIP vs. OGC vs. TfL⁴³

4.3.26 Although NR’s approach is similar at face-value there are some key distinctions that differentiate other approaches. For example, TfL’s CGAP (Corporate Gateway Assurance Process) process sits above an equivalent ‘product based’ project management methodology. TfL’s assurance pyramid (below) seeks to provide assurance which is:

- Independent;
- Risk-based;
- Appropriate and proportionate;
- Planned and co-ordinated; and
- Has impact and leads to action.

⁴³ Infrastructure UK, *Investigation into the cost of UK civil engineering Infrastructure Cost benchmarking data Collection Forms 2A and 2B, Annex A*, accessed at http://www.hm-treasury.gov.uk/iuk_cost_review_main_report.htm on 1 February 2012.

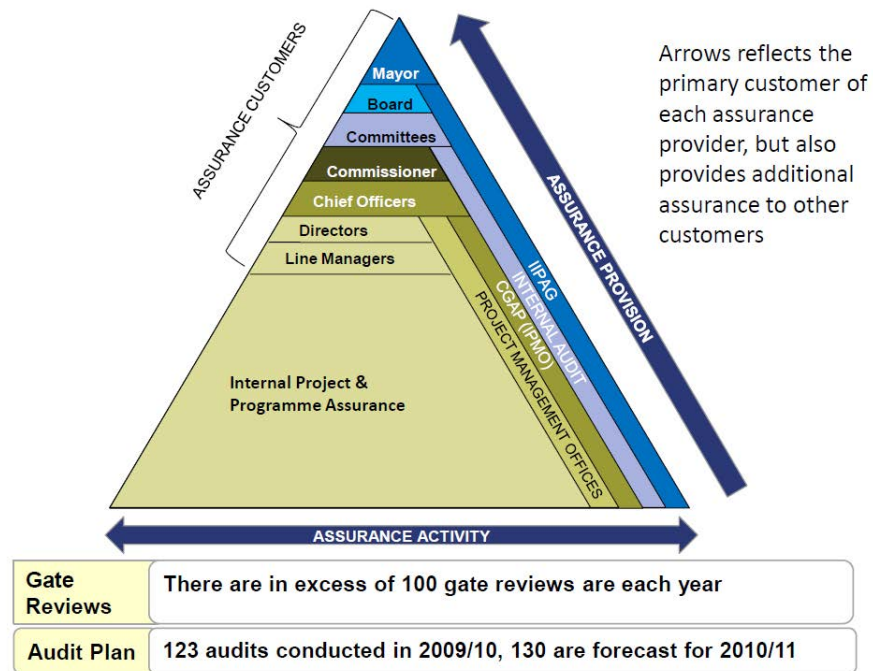


Figure 4.9: TfL Assurance Pyramid⁴⁴

4.3.27 TfL defines assurance as the “means by which a party responsible for a business activity and its stakeholders gain confidence in the appropriateness of the organisation’s decision making and the effectiveness of internal controls, these being primarily:

- Effectiveness and efficiency of operations and project delivery;
- Reliability of financial reporting;
- Compliance with laws and regulations”⁴⁵

4.3.28 GRIP is just one element of NR’s control and assurance framework and NR is of course regulated by ORR. It is at the ORR’s discretion to what extent it seeks additional assurance from NR in respect of the conduct of its capital investment programmes. On the basis that ORR adopts a ‘light touch’ approach we submit that the test of GRIP is that it delivers projects which fully align – subject to change control – the project objectives which were originally sought. This is critical in view of NR’s stated approach under Devolution and DIME to rely more on output-based requirements.

4.3.29 We consider that despite the changes to GRIP there are a number of features which require ongoing vigilance to ensure that NR’s approach remains appropriate:

- “Stage Gate Reviews are key checkpoints within a project to establish that a project has delivered products that were specified to be delivered, and if a project can proceed to the next Stage.”⁴⁶ Thus, the focus is on whether or not the documents have been

⁴⁴ Portfolio Assurance at Transport for London, APM Assurance & Portfolio Management SIG Conference, 9 February 2011.

⁴⁵ Portfolio Assurance at Transport for London, APM Assurance & Portfolio Management SIG Conference, 9 February 2011.

⁴⁶ NR/L1/INI/PM/GRIP/100 - Governance for Railway Investment Projects (GRIP), Policy Manual, Issue 1, 4 December 2010, p. 7.

prepared and whether or not this is enough to allow the project to progress one stage further. This potentially misses the strategic and full life-cycle considerations that should be asked at every project stage. We consider that NR should revise the emphasis of this to stress that the substance of the products produced should support the overall outcomes and objectives of the project, not just enough to ‘clear the hurdle’ to the next stage;

- The use of Peer Reviews is also common amongst the comparators considered under this study. TfL, as noted above, have taken a different approach which is demonstrably independent on two different levels. The potential draw-back of Peer Reviews is twofold. First, there is the question of independence; although the professional integrity of the reviewer is seen a defence to this suggestion that independence cannot be guaranteed the issue is actually more that a Peer Reviewer might be too close to company policy and the ability to challenge rigorously is weakened. Second, there is the issue of physically creating the time to undertake a Peer Review effectively;
- Finally, there is the consideration that GRIP is focussed on *projects* and not *programmes*. This issue also presents a challenge to the comparators that we have engaged with and our wider review of programme management literature suggests that most attempts to resolve this result in a scaling-up of the project-based methodology to address this perceived gap which can lead to a host of unintended consequences and lost opportunities.⁴⁷ We consider that the ‘pre’ and ‘post GRIP’ processes noted in Figure 4.7 should be articulated alongside the standard GRIP approach to illustrate end-to-end decision-making.

- 4.3.30 Further to the final point we agree with the RVM study conclusions that *programme* management as opposed to *project* management lifecycle processes should be strengthened to aid strategic-level decision making. The opportunity to achieve this appears to be improving with the move to better alignment between NR and its industry partners. For its part NR can be seen to be enabling this through its Devolution proposals on the one hand and its intent to engage earlier with its supply chain on the other.
- 4.3.31 As discussed below under ‘Programme Controls’, much of NR’s overall approach is scalable to allow discrete projects and programmes or portfolios of projects to be established, monitored and controlled. But these are just some of the facets of a programme approach.
- 4.3.32 Programme management deals with strategic management rather than the technical management of projects; it deals with organisations rather than teams and delivers outcomes and benefits rather than deliverables. Programmes are longer and more complex than projects and they deal with a greater range of stakeholders which amounts to more uncertainty, ambiguity and iteration. Programme management must also address the interrelationship between multiple projects and programmes.
- 4.3.33 These features do not sit well with the sequential expectations of GRIP and we note from the Enhancement case studies below that GRIP has either had to be modified to achieve the needs of specific programmes particularly where a time imperative

⁴⁷ M. Lycett et al. *International Journal of Project Management*, 22 (2004) 289-299.

requires that elements of the programme must move forward concurrently rather than sequentially. The *project* focussed view of GRIP assumes that a defined output will be fed-in at the beginning of a programme which then determines the overall direction which then simply requires monitoring and adjustment to maintain alignment with the strategy set.

4.3.34 Some Assets have taken the GRIP requirements and interpreted them for their own specific needs.⁴⁸ A challenge for NR moving from the Asset-specific approaches developed under the PLO structure to arrangements which befit the greater levels of alignment between NR and its customers on the one hand and NR and its supply chain on the other under the Devolution and DIME arrangements. Although the Programme Controls framework might remain the same it is important that governance and decision-making is clear and consistent and linked to a common programme management lifecycle.

4.3.35 Industry literature has been grappling with the distinction between *project* and *programme* lifecycle methodologies for some time and with the challenge created by the RVM study NR has the opportunity to shape its industry partners to achieve a better value for money railway by incorporating genuine programme management governance and approaches.⁴⁹

Ref.	Critical Issue	Programme Management Lifecycle Methodology
5	GRIP is founded in the management of <i>projects</i> rather than <i>programmes</i> and has focused attention on the sequential achievement of progressive Stage Gates. Although this control at project level is still required the RVM recommendations require the industry to take a more holistic view of programme delivery and NR – with its industry partners – must devise suitable governance arrangements and control frameworks (suitable to each case) – which will drive the efficiencies sought.	
	Recommended Action	Responsible – Network Rail
	Although much of NR’s approach is scalable and flexible to meet the demands of different projects – and programmes – we consider that the link between business benefits and front-end decision making should be made explicit in NR’s approach and this should incorporate its closer ties with its customers. By integrating industry partners into a programme management approach rather than arms-length relationships NR might encourage the alignment and improved value for money sought. NR will require the co-operation of its industry partners to achieve this and the approaches adopted will vary depending on the depth of the integration with its customers and suppliers.	

⁴⁸ For example, track has developed the ‘End to End’ process which is a specific route-map to enable compliance with GRIP and other requirements. Building and Civils has produced the ‘Building & Civils GRIP Application Manual’ which provides guidance on its application. Each Asset has developed its own approaches to programme-level management of its annual budgeted deliverables.

⁴⁹ For example, see *M. Thiry, International Journal of Project management 22 (2004) 245-252* which distinguishes between projects and programmes and proposes a programme management lifecycle.

Programme Controls

- 4.3.36 Programme controls is a key programme management activity and it is evident that NR has invested considerably in addressing people, tools, resources, systems and processes in order to bring consistency and control to its vast array of projects and programmes. NR's Planning and Programme Controls standard⁵⁰ is comprised of a suite of specific standards which address a comprehensive range of planning and programme controls activities and is applicable to both Enhancements and Renewals activities.
- 4.3.37 In relation to the comparators considered we are of the opinion that NR has a well-developed suite of management systems. We are aware that Comparator C is seeking to fully integrate similar systems with a view to creating a dashboard arrangement for its project management teams and this is also an objective for NR's future maturity development. Comparator C sees this as an opportunity to assist its drive to achieving P3M3[®] Level 4. NR's Investment Management Systems are structured as follows:

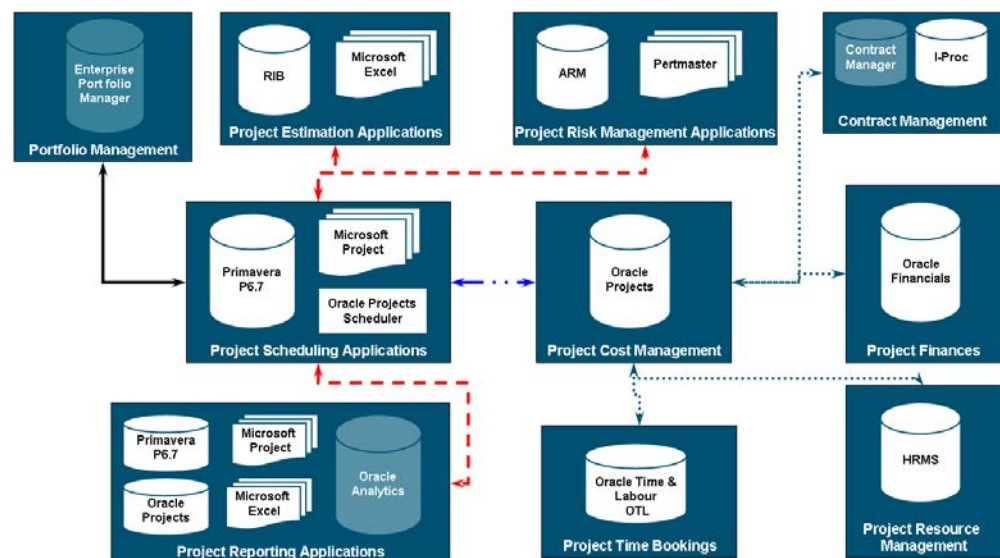


Figure 4.10: Network Rail – Investment Management Systems

- 4.3.38 The Infrastructure Investment Programme Controls Strategy⁵¹ sets-out a comprehensive Project Control Cycle (PCC) which aims to achieve effective programme control through establishing accurate schedule and budget baselines against which progress and performance can be measured. The requirements of the PCC are driven by the Level of Control (LoC) established for each project. The LoC for each project is derived from consideration of its cost, level of complexity and the reputational risk it poses. Comparator C adopted a similar approach but then reverted to using cost as a proxy for its equivalent of LoC (on the basis that higher value projects also tend to be multi-disciplinary, complex and attract a high degree of external stakeholder focus).

⁵⁰ Planning and Programme Controls standard, NR_L3_INI_PG115, Issue 4, 4 June 2011.

⁵¹ Infrastructure Investment Programme Controls Strategy, Version 4.0, 1 June 2010.

- 4.3.39 It is a matter of convenience and need as to how projects and programmes are baselined, monitored and controlled. NR's heavy investment in its systems allows it to stipulate a standard method of reporting which will soon allow NR to 'cut' the data collated into any number of standard reports. This has been achieved through the Efficient Programme Governance (EPG) initiative (part of the range of EID measures). The benefits of this should be that NR can start to make better use of the raw data collected and improve the provision of management information. We have not yet seen any live project reports using Project Automated Reporting⁵² (they were in trial at the time of this study) but NR's proposals suggest that consistent order will be brought to reporting which reduces manual effort and the lack of consistency introduced by the production of bespoke reports.⁵³ We also note that this will incorporate other EID initiatives such as categorisation of contingency through GRIP stages in accordance with the Contingency Management Principles initiative.⁵⁴ This is important as we have seen instances where the value of initiatives wane when there is no convenient means of using their output.
- 4.3.40 As NR is presently organised on an Asset basis it reports both Enhancements and Renewals activity within each suite of Period (4-weekly) reporting packs which tend to be structured on the following basis:
- Enhancements are reported by project, the first standard report being the 'Project on a Page ('PoP');
 - Projects are grouped by Senior Programme Manager under each Asset and each generally produces an MBR ('Management Board Report') pack which includes PoPs and commercial, financial, safety, progress and performance metrics. This is reviewed on a Period basis at Asset level;
 - From the common data-set NR derive an ERM pack (Executive Review Meeting) which presents progress at programme (or Asset) level. Single ERM reports are produced on a period basis for each Asset. For example an ERM pack will be produced for Buildings and Civils (an Asset) and Thameslink (a major programme);
 - Executive-level reporting. This appears to be a single page, augmented by 16 corporate KPIs.
- 4.3.41 All of this reporting would be expected to change under Devolution / DIME but in our opinion the systems should be able to cope with the revision of workbanks and reporting as necessary.
- 4.3.42 Although our overall impression of NR's project controls is that a system has been implemented which can cope with the volume and diverse range of NR's activities we have the following observations which could be considered in future improvements:

⁵² Efficient Project Governance – Project Automated Reporting, presentation, 6 March 2012.

⁵³ EID identified that an inordinate amount of time spent was spent on bespoke reporting and data handling, interview with Alistair Forbes, 15 December 2011.

⁵⁴ Contingency management Principles, Version 3, 11 May 2011.

- Although NR reports efficiency in a number of places the calculation of efficiency is not visible and we have not yet seen evidence of causation analysis which identifies the reasons for performance – both good and bad – which promotes a cycle of continuous improvement. We have been advised by each Asset that analysis and improvement is left to their discretion and whilst major underperformance is isolated and questioned a wider analysis of the trends associated is not evident. In view of the P3M3[®] maturity criteria we consider this to be an area of improvement if NR is to progress to level 4 (of 5 levels);
- We note that NR share with ORR a ‘CP4 Forecast Analysis’ on a Period basis. NR advise that ORR requests this report in the format provided but we observe that this only provides an assessment of the overall cost variance in relation to the Control Period 4 Determination. It does not include the full range of projects (TOC schemes initiated during Control Period 4 is absent from this analysis). Although the difference in overall forecast expenditure against the original baseline is calculated (the ‘CP4 variance’) it does not appear to distinguish between projects where genuine efficiency has been achieved or those that have either slipped or have been re-phased or cancelled via change control. ORR should therefore consider whether or not it is sufficiently sighted on NR’s Control Period 4 progress to understand if NR will deliver its Control Period 4 obligations (as altered by change control) will be achieved or not. In Enhancements NR states confidence that it will albeit some programmes (such as the Southern Power Upgrade) provide cause for concern;
- We note from our previous reviews as Independent Reporter that there can be disconnects in programme controls between NR and its supply chain. For example, the timescale and format stipulated under contracts can be at odds with NR’s internal governance requirements. This is a common issue amongst similar organisations and, if left unaddressed, will hamper NR’s ability to make full use of its automated reporting systems. Now that NR has invested so heavily in its own systems it must ensure that formal requirements on the timing and format of reporting deliverables are included in supply chain contracts to mandate: host systems; file format and transmission protocols; assurance regime including access to base data. This must also be underpinned by detailed guidance and training in order to drive commonality and quality through NR *and* its supply chain;
- In Renewals, the monitoring and reporting focus is substantially targeted at monitoring expenditure against annual budgets. Progress measurement is different depending upon the asset but in all assets there appears to be an issue in understanding the actual progress in totality, distinguishing between under-spend which is due to efficiency and under-spend which is caused by work that has slipped in relation to the plan. We discuss this further at section 6.4 below.

4.3.43 The successful delivery of NR’s Enhancements and Renewals obligations are not just related to time, cost and quality. Other fundamental factors such as safety – both of the workforce and customers – are an issue as is the performance of the railway. In this regard NR monitors a range of 16 corporate KPIs which are reviewed on a Period basis by the NR Board. These include:



Figure 4.11: Corporate KPIs⁵⁵

4.3.44 The two ‘process’ KPIs ‘Right First Time’ and ‘Cycle Time’ are important in that they relate to business process improvement which is seen as the foundation for improving all other aspects of delivery. NR describes these metrics as follows:

- “Right First Time” means that we have met the customer’s requirements correctly on the first attempt;
- “Cycle Time” is the total elapsed time from the start of the process to the end of the process. This can either be from the customer’s point of view, or a measure of the supply chain.

These two KPIs are made up from numerous IPI’s feeding into them from various departments. Infrastructure Investments scope for these IPI’s are;

IPI-307 - Investment Project Cost Delivery (part of KPI-300 - ‘Right 1st Time’)

IPI-316 - Investment Project Schedule Adherence (part of KPI-301 – ‘Cycle Time’)⁵⁶

4.3.45 NR diligently produces the IPI (Indexed Performance Indicator) metrics on a Period basis. Taking the Period 13 version of these annually provides an overall view of Cost Delivery and Schedule Adherence. However, the central programme controls team advise that it undertakes no detailed analysis of why performance has either deteriorated or improved. We also found very little evidence of such analysis being undertaken within each Asset, although Buildings & Civils has started to set internal

⁵⁵ Corporate KPIs – Generation of the IPI Measures for Investment Projects, NR/L3/INI/PG115/BIS/002, Issue 2, 5 June 2010.

⁵⁶ Corporate KPIs – Generation of the IPI Measures for Investment Projects, NR/L3/INI/PG115/BIS/002, Issue 2, 5 June 2010, p. 4.

targets through its Visible and Agile Work Planning (VAWP) initiative which are aimed at improving its IPI metrics. Building & Civils recognises that poor schedule performance in early GRIP stages has the unwanted impact of bunching rather than smoothing the overall delivery profile, putting both NR and supply chain resources under pressure to deliver in the remaining timescales.

- 4.3.46 The data that underpins both IPI measures is valuable as it presents the opportunity to consider the absolute difference between what NR planned to deliver and what it actually achieved. Care should be applied to the interpretation of the two IPI measures as they record the incidence of projects not achieving cost or schedule milestones. Thus, a low number of projects might overspend on a Period basis returning an apparently positive IPI and, in turn, Corporate KPI, but if the overspends are significant the actual result may be less positive than indicated.
- 4.3.47 We attempted to extract the raw data from NR from the start of Control Period 4 in order to put the absolute position to the test but this could not be readily provided for all Assets. NR should take advantage of this data to understand and categorise the reasons for good and bad performance. The collation and use of such data would aid NR's benchmarking drive against either other comparators or against existing studies. For example an Australian study provides the opportunity for comparison of cost and schedule adherence if NR could collate its data into a useable format.⁵⁷ NR would also be able to compare performance on a Route basis under Devolution and on a Regional basis under project DIME with the data collected.
- 4.3.48 That said, we discern from the IPI reports for Period 13, 2009/10, Period 13 2010/11 and Period 10 2011/12 that:
- The Schedule Adherence IPI has become more sophisticated. In 2010/11 NR started to split-out schedule performance data and started to measure GRIP 1-3 and GRIP 4-8 separately;
 - A marked improvement in Schedule Adherence is evident since the start of Control Period 4. This reveals that GRIP 1-3 schedule performance was particularly poor at the start of the Control Period. This could be driven by a number of factors which are important to understand and address. For example, it could be that NR has met issues with external stakeholders, it has had difficulty executing the initial option appraisal stages, or it could be that projects have been initiated late (through the late issue of the project manager remit) which in turn places everything else in delay;
 - The Cost Delivery IPI has always hovered around the 90% target since the start of Control Period 4; which at face value represents 'good' performance.
- 4.3.49 For both metrics the target is to achieve 90% of projects achieving their stated targets per Period. Therefore if more than 10% of projects overspend their original forecast AFC (excluding contingency), or miss their scheduled milestones, this is deemed to be sub-standard performance. In view of the apparently poor Schedule Adherence performance earlier in Control Period 4 and the reasonably good Cost Delivery IPI

⁵⁷ For example, *National PPP forum – Benchmarking Study Phase II, Report on the performance of PPP projects in Australia when compared to a representative sample of traditionally procured infrastructure projects*, University of Melbourne, 17 December 2008, provides an opportunity to compare NR's performance directly with others.

throughout appears counter-intuitive; poor schedule performance would often drive poor cost performance. We consider that the relationship between poor schedule adherence and actual expenditure should be considered; if this demonstrates that cost performance is not affected by poor schedule performance this suggests that other factors – such as efficiency or over-generous authority values are at play.

- 4.3.50 KPIs such as these are a valuable way of obtaining a ‘snapshot’ of current performance and can be analysed to provide an understanding of performance over time and their use is evident amongst Comparators A, B and C as well as the London 2012 Olympics.⁵⁸ However, care has to be taken in how the KPIs are ultimately prepared and interpreted. We do not see anything in these KPIs (or the supporting IPIs) that might drive perverse performance incentives (which can be a risk) but they should be interpreted alongside other (absolute) measures to provide assurance that reliance can be placed upon them.

Ref.	Secondary Issue	KPIs and IPIs
6	NR’s Corporate KPIs provide visibility of the broad range of metrics which are important to its success in delivering a valuable service. Such metrics provide guidance and can help to identify issues and opportunities to aid performance improvement. However, care must be applied to their derivation and use to avoid misinterpretation.	
	Recommended Action	Responsible – Network Rail
	NR appears to use its KPIs and IPIs as a guidance tool, but if more reliance is placed on them by top management they should seek other assurance that the KPIs are not providing misleading results. For example, absolute measures might be considered to understand the strength of the IPI / KPI derived. The data collected to derive the IPI / KPIs is valuable and could be used – if conveniently collated – for wider benchmark comparison. This appears to be an opportunity missed at present.	

Summary – Organisational Governance and Management Control

- 4.3.51 From an *Organisational Governance* perspective (external factors which impact on NR’s ability to deliver) we consider that the move by NR and its customers to promote better alignment through various forms of alliancing augur well for the *Increased Early Effort* opportunity identified by the RVM Study. This is particularly relevant to Enhancements but may also benefit Renewals in improvements to bundling of work maximising access and people resources.
- 4.3.52 The Devolution initiative may have a number of consequences which will need to be managed by NR, NR’s industry partners and ORR. Increased alignment may lead to increased expectations on a Route basis that NR has not previously had to address. This should be viewed as a positive tension but if unchecked in the Periodic Review process and beyond it may lead to expectations that become difficult for NR to deliver; how NR trades-off between the demands of each Route requires consideration. This leads to the question of how the Control Period 5 Determination

⁵⁸ For example, see Programme Dashboards, ODA Learning Legacy accessed at London2012.com/learninglegacy

will be drawn; will it be one Determination or by Route? This requires industry consideration to ensure that outcomes are sensibly drawn from the outset.

- 4.3.53 Similar considerations also apply in the short-term until the remainder of Control Period 4. NR's customers now have the attention of NR RMDs who will no-doubt be faced with facing immediate performance challenges. The Route structure deliberately devolves responsibility for interpreting NR asset policies which may introduce new drivers for funding to meet performance targets. The emphasis of the RVM Study and the industry in general is to reduce the cost of running the railway, but ORR should clarify its expectations with regard to the whole-life criteria that the industry is expected to align with; it may be necessary to increase capital expenditure in some respects in order to reduce the cost of the railway in the long-term. NR's role here must be to provide the options from which others may select and to positively inform policy.
- 4.3.54 From a *Management Control* perspective NR's investment in the Project Management Framework is a feature of the efficiencies already gained in Control Period 4 but should continue to provide opportunities for *Increased Efficiency* during the remainder of Control Period 4 and beyond into Control Period 5.
- 4.3.55 We consider that the revisions to GRIP should in principle help to focus the effort on process-driven requirements but we suggest that further tailoring of GRIP is considered to ensure that it focuses on *programme* as well as *project* benefits. The link between pre and post GRIP activities should be made more explicit to ensure that the fruits of *Increased Early Effort* are cemented in NR's new Client Process which requires that programmes and projects are procured from the end of GRIP 2. This is a marked change from the current approach of NR developing initiatives and engaging the market at GRIP 4 or 5 currently. This will require NR's new Client organisation to become adept at taking outcome requirements and procuring on an appropriate basis which enables the supply chain to bring innovation to drive-down costs. In the current structure NR's client / sponsor teams rely significantly on the current Investment Projects arm to develop schemes but it appears to us that the capability to draw on the Newco resource will be curtailed for contested works if the process is to be truly competitive. Equally, for non-contested works, the approach is again to release projects at the end of GRIP 2 and this too will require a change in approach which necessitates that the new NR Client organisation is capable of its task.
- 4.3.56 The creation of Newco is seen by NR to create an immediate opportunity for *Increased Efficiency* through a headcount reduction of circa 10% in comparison with the current Investment Projects division which supports the *Increased Efficiency* savings identified by the RVM study. This may well be realised but the wider headcount change (i.e. taking into account the new NR Client organisation) is not presently clear.
- 4.3.57 NR has invested significantly in its Infrastructure Management Systems with the aim of rigorously baselining, monitoring and controlling the investments under its stewardship. This should benefit *Increased Efficiency* through a reduction in the significant effort generated in the production of reporting. Specific points of improvement exist however which mainly include the resolution of measuring physical process in the renewals arena – in order that efficiency may be distinguished clearly from slippage – and better use of the data generated from its reporting systems to analyse the reasons for observed delivery performance. If achieved this should contribute to *Reduced Overspends* which may include actual overspend against

authorised budgets or the reduction of investment authority which is not actually merited.

4.4 Stakeholder Engagement and Benefits Management

- 4.4.1 MSP considers that “*best practice programme management aligns everything towards satisfying strategic objectives by realising the end benefits*” and “*the ultimate success of a programme is judged by its ability to realise these benefits and the continuing relevance of these benefits to the strategic context*”.⁵⁹ Thus, benefits management is concerned with focussing on benefits and the threats to them.
- 4.4.2 Stakeholder engagement requires leadership to manage relationships effectively to achieve positive outcomes. We consider that this element of programme management is fundamental to future success as it provides the potential to overcome the contractually driven relationships between NR and its industry partners on all sides. Together, stakeholder engagement and benefits management imply aligned objectives and a clear plan for identifying, quantifying, monitoring and achieving benefits; together they are imperative to ensuring that NR invests in the ‘right things’ as well as at ‘the right price’.
- 4.4.3 Internationally it is recognised that effective sponsorship is of central importance to providing strategic direction, providing resources, securing projects in their political or institutional setting and meeting the business objectives set. Experience worldwide suggests that sponsorship varies in terms of ‘planning rationality’ which at the extremes varies between decision-making being driven by politics and personalities on the one hand and highly technocratic approach on the other. As a whole the UK is seen as providing a balanced environment and this is seen to apply to UK rail.⁶⁰
- 4.4.4 Despite this the IUK Study found that higher costs are driven by a number of factors relating to stakeholder and benefits management:
- stop-start investment programmes and the lack of a visible and continuous pipeline of forward work;
 - lack of clarity and direction, particularly in the public sector, over key decisions at inception and during design. Projects are started before the design is sufficiently complete. The roles of client, funder and delivery agent become blurred in many public sector governance structures; and
 - over-specification and the tendency, more prevalent in some sectors than others, to apply unnecessary standards, and use bespoke solutions when off-the-shelf designs would suffice.⁶¹
- 4.4.5 To this we have considered the following:
- NR’s ability to influence early decision-making;
 - NR’s ability to establish clear and stable workbanks;

⁵⁹ Managing Successful Programmes, Office of Government Commerce, 2007, p. 15.

⁶⁰ Allport, J. Planning Major Projects, Thomas Telford, 2011.

⁶¹ HM Treasury & Infrastructure UK, *Infrastructure Cost Review: Main Report* (HM Treasury, December 2010), p. 5.

- Sponsorship within NR and the need for industry alignment;
- Whole Life Cycle Cost (WLCC) and Reliability, Availability, Maintenance and Safety (RAMS) considerations.

NR's Ability to Influence Early Decision-Making

4.4.6 In its 'Whole System Programme Management' study Atkins identified different categories of programme derived from the work of *Pellegrinelli*⁶² thus:

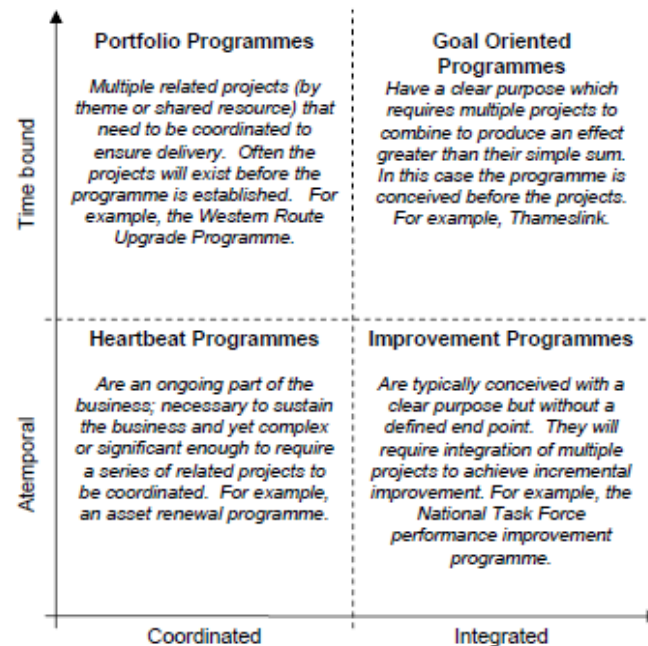


Figure 4.12: Atkins' 'Conceptual Programme Classification'⁶³

4.4.7 Atkins' study was focussed on 'goal oriented programmes' only. In respect of this study it is important to understand to what extent NR actually has control over the various programmes it is engaged with. We discuss this further below but we conclude that practically all Enhancement programmes and projects require cross-industry to some degree on the basis that all industry partners must combine their efforts to make key scope and deliverability decisions. This is primarily achieved through the Initial Industry Plan (IIP), Strategic Business Plan (SBP) and the subsequent Periodic Review determination process.

⁶² Programme management: organising project-based change, Sergio Pellegrinelli, International Journal of Project Management, Vol. 15, No.3, pp 141-149, 1997.

⁶³ WS Atkins, *Rail Value for Money Study: Whole System Programme Management Final Report* (Issue 1.4, 25 May 2011), Figure D-1, Appendix D, p. 63.

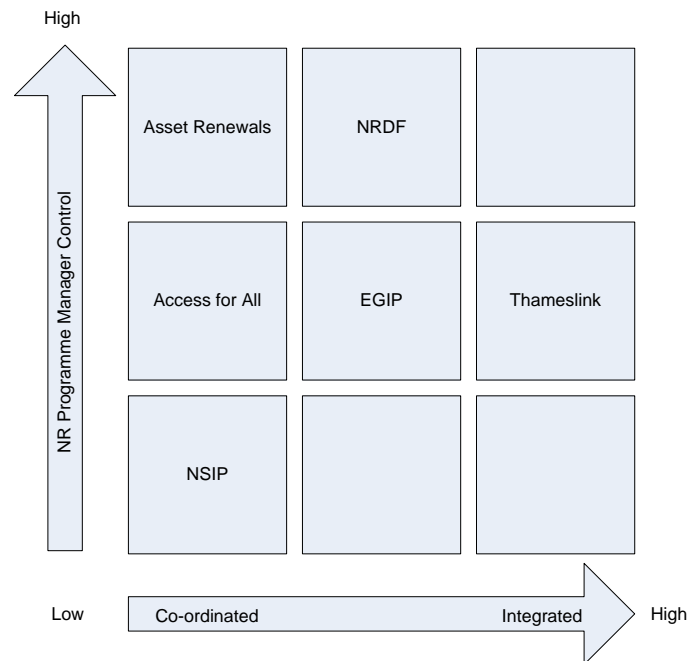


Figure 4.13: Network Rail's Influence over Programmes and Projects

4.4.8 'NR Programme Manager Control' in the above diagram considers the extent to which NR itself has autonomy in decision-making over project or programme identified either at the point of Control Period determination, or at the point where additional obligations are introduced during the currency of any Control Period. The above diagram considers that NR will have a varying degree of influence in front-end decisions. Once a project or programme has been identified in the Control Period Delivery Plan NR starts to obtain a greater level of control but is still exposed to the potential vagaries of stakeholder and funder decision-making. For example, although NR has been appointed as Programme Manager for the Edinburgh to Glasgow Improvement Programme (EGIP), the key decision-making is made by its principal sponsor and funder, Transport Scotland. Thus, whilst NR has a key and important role in front-end decision-making it does not have full control, limiting its influence as overall programme manager. Clearly funders cannot cede control totally, but in each and every case it is essential that a framework for good decision-making is in place.

4.4.9 With reference to Figure 4.13 we consider that the way NR is funded to deliver improvements to the network and its current functional structure means that it tends to manage many of its programmes in a co-ordinated rather than an integrated way, for example Access for All is managed as a programme because of the source of funding and the largely repetitive nature of the work. Whilst NR Building & Civils do seek to integrate Access for All with other workstreams – for example, the National Station Improvements Programme (NSIP) – the opportunity might be to integrate all works on a Route basis as a means of extracting the greatest value out of the access regime. NR does seek to 'piggy-back' on existing possessions but a more co-ordinated approach to this is one opportunity which an integrated programme management approach. Comparator C is utilising such an approach on one of its major programmes where major interventions to operational infrastructure alongside regular maintenance and renewal effort. In addition to improving access to operational infrastructure this has had the significant added benefit of identifying

whole-life opportunities to rationalise existing infrastructure as part of capex activities earlier in order to avoid future budgeted renewals.

NR's Ability to Establish Clear and Stable Workbanks

Enhancements

- 4.4.10 NR's Enhancement obligations in Control Period 4 have been driven by the Control Period 4 determination. There seems to be acceptance between NR and ORR that the preparation of projects and programmes in Control Period 4 would have benefitted from a greater level of development in the preparation for Periodic Review 2008 which might have reduced some of the exposure of the Control Period 4 Enhancements programme to differences between the 'initial concept' and schemes developed to single option status.
- 4.4.11 This appears to have been recognised in the funding of Control Period 4 where we understand that a c. £55m 'CP5 Development Fund' has been established to better develop schemes due for execution in Control Period 5. £55m is c. 0.5% of the total Enhancements expenditure envisaged for Control Period 5. We acknowledge that there is a balance to be struck between developing schemes that might not come to fruition on affordability and other grounds but 0.5% represents a low percentage in our opinion. NR and its customers must therefore focus on using the available funding to clarify – as far as possible – the issues to be addressed with infrastructure interventions so that the outcomes expected are as certain as they can be.
- 4.4.12 During Control Period 4 we note the Enhancements programme has experienced a range of changes including the adding and omitting of some major schemes plus the re-phasing of significant tranches of work. Whilst these decisions will have been made for the best of reasons – and some degree of change is always inevitable and indeed desirable to take advantage of opportunities – change will not help any delivery organisation to establish a stable basis on which to plan and deliver its obligations. Comparator C has a distinct advantage over NR in this regard in that its funding arrangements enable it to have a greater range of decision-making in respect of outcomes and solutions itself.
- 4.4.13 NR has provided the following graph to explain the range of changes experienced in Control Period 4 to its Enhancements programme.

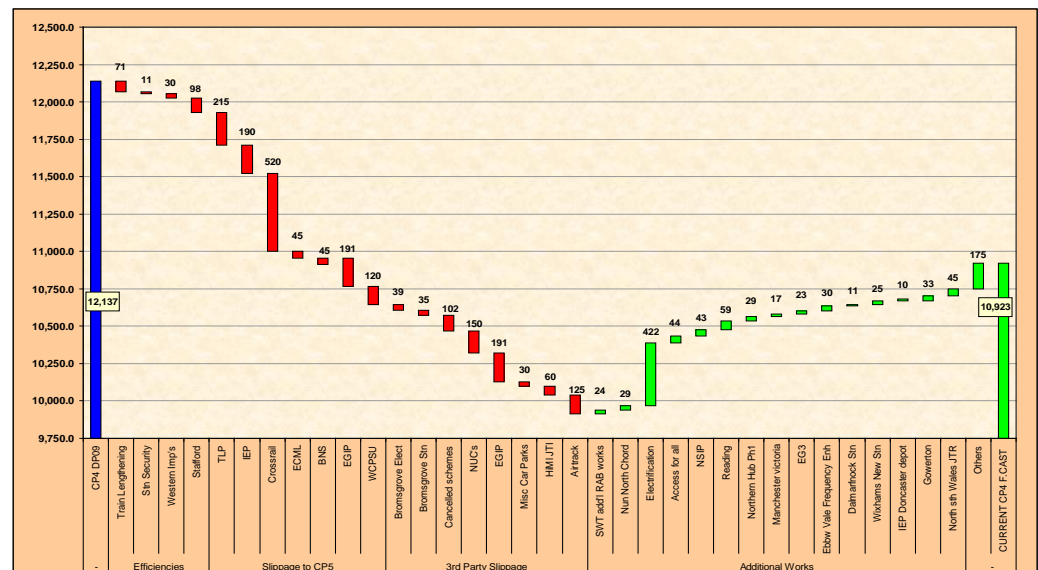


Figure 4.14: Changes to Enhancements programme from delivery Plan 2009 (2011/12 prices) to position at period 5 (2011.12)⁶⁴

- 4.4.14 Although NR will expect and plan for change during any Control Period too much uncertainty increases the potential for reduced effectiveness and non-delivery (particularly where new requirements arise) and reduced efficiency (because the organisation might retain resource capacity it then does not need). Changes to the timing of delivery also have an adverse affect on the supply chain to plan and invest.
- 4.4.15 The reasons for the changes in Figure 4.14 will have been detailed through the Control Period 4 Delivery Plan change control mechanism. However, NR advised that the causation and impact of the changes have yet to be analysed and considered as whole.⁶⁵ We consider that NR – and ORR – should seek to understand the root causes and impact (in wasted cost and resources) of the changes experienced. Opportunities will also have arisen and these should be understood too.
- 4.4.16 This exercise should be approached constructively to identify strategic risks and mitigations which might be resolved through the rail industry’s wider response to the McNulty recommendations. We note the recent moves by NR and its customers to promote an improvement in alignment across contractual boundaries.⁶⁶

⁶⁴ NR *Enhancements Capability Review*, CP4 Comparisons, June 2011, p. 6.

⁶⁵ Discussion with Ian Hodgins, 16 November 2011.

⁶⁶ *Alignment is the only way forward* [Interview with Sir David Higgins], Railway Gazette International, November 2011.

Ref.	Secondary Issue	Learning from CP4 Delivery Plan Change Control
7	The changes experienced in the CP4 Enhancements Delivery Plan may have led to reduced effectiveness and efficiency in delivery for both NR and its supply chain. However, the nature and impact of these changes have not yet been analysed as a whole.	
	Recommended Action	Responsible – Network Rail and ORR
	The changes that have occurred to the CP4 Delivery Plan outputs should be reviewed and analysed by NR and ORR to understand the causation and impact of the changes. These should be understood with a view to identifying areas of inefficiency and opportunities for improvements. Publicly, NR and its customers are stating their intention to align interests across contractual boundaries; funders and the ORR have a role in maximising opportunities as well.	

4.4.17 Change on the scale described above suggests that there will have been a marked shift in the value and timing of benefits accruing from the outputs envisaged in the Delivery Plan at the start of Control Period 4. That said the railway industry benefitted from the last comprehensive spending review which did give the industry funding stability that might not now exist; approximately half of the Control Period 5 Enhancements are secured in view of the work already committed. Whilst the current Delivery Plan mechanism accounts for the physical delivery, timing and cost of Delivery Plan outputs we see no clear articulation of the benefits that do or do not accrue from the delivery of these projects. This is complicated by the funding and sponsorship arrangements within the industry. As NR is the ‘delivery agent’ for many schemes it does not have visibility of the forecast and actual benefits accruing from the Enhancements programme as a whole.

4.4.18 We view this as a significant weakness from a programme management perspective – successful programme management delivers the right thing, at the right time and at the right price – if NR does not have full visibility of the implications of changing industry requirements it will lose the opportunity to positively influence outcomes. The NR cannot resolve this potential disconnect alone and the IIP is therefore a useful starting point in at least aligning the views of NR and its customers. Funders and the ORR must now respond to ensure that full cognisance of potential programme benefits are embraced.

Ref.	Secondary Issue	Impact on Benefits from Changes to the DP
8	Any change to the CP4 or CP5 Delivery Plan has a potentially significant impact on the forecast timing and benefits that actually accrue. Due to the structure of the industry we consider that there is a potential disconnect which does not allow NR – or ORR – to understand the full implications of ‘changing the plan’. From a programme management perspective this is a potential weakness if no other party in the industry has full oversight of the impact of change when it occurs.	
	Recommended Action	Responsible – Network Rail, ORR and Funders
	NR is limited in the extent to which it can exert a full end-to-end approach to programme management. However, the IIP at least provides a combined view from NR and its customers. Funders and ORR must now provide a framework which allows the full benefits of programme management to be embraced.	

Renewals

- 4.4.19 In Renewals we understand that NR is presently in the process of developing a range of long-term Whole Life Asset Management models which will allow it to analysis future renewal and maintenance scenarios in order to inform asset policy and to optimise the timing and nature of interventions. During Control Period 4 we also note that there has been a concerted effort to establish clearer workbank plans with the objective of providing a more stable basis on which to plan access to the railway and engage its supply chain.
- 4.4.20 NR made conscious decisions early in Control Period 4 to re-phase its renewals programme for all assets on the rationale that this would allow NR to understand its assets better, agree work-scopes, optimise work-banks and implement efficiency opportunities (for example high-output track replacement equipment).⁶⁷ In principle these are all valid reasons for re-scheduling the renewals programmes across all assets. We have viewed work-bank plans and initiatives in each of the IP Assets and also AM Track which support NR's decision-making, notably the Visible and Agile Workbank Planning (VAWP) initiative in Buildings & Civils.
- 4.4.21 Although this resulted in £860m of renewals being re-scheduled during Control Period 4 NR state that this neither affects the overall volume of renewals to be delivered or the potential to achieve the forecast efficiency savings.⁶⁸ However, as discussed below at section 6.4 we observe that it is unclear whether or not annual delivery plans are being achieved. This suggests that there is an effectiveness issue which should be addressed to confirm the efficiency savings being claimed.

Sponsorship within NR and the need for Industry Alignment

- 4.4.22 The OGC's MSP envisages clear sponsorship arrangements which authorises project / programme mandates, approves funding, resolves strategic issues, confirms strategic direction and monitors, champions and confirms the delivery of benefits of the venture at close-out.⁶⁹ For programmes, MSP sets-out clear and distinct roles between that of the Senior Responsible Owner (SRO) and the Programme Manager. The former is ultimately accountable for the programme / project, owns the business case, manages all strategic elements, is accountable for governance and of the venture and provides overall direction and leadership. The Programme Manager is the agent of the SRO and manages all aspects of delivery of the programme from appointment to closure.
- 4.4.23 MSP perhaps provides a simplified view of reality in all corporate structures and funding environments but simplicity provides clarity and alignment of expectations which we consider is need of improvement within the UK rail.
- 4.4.24 Although NR sponsors work within a common framework, the nature of sponsorship varies depending on the nature of the industry funding arrangements (particularly for enhancements) and NR's current structure.
- 4.4.25 From a funding perspective we are advised that:

⁶⁷ *Capability to deliver the CP4 renewals programme*, Network Rail, June 2011.

⁶⁸ *Capability to deliver the CP4 renewals programme*, Network Rail, June 2011, p. 5.

⁶⁹ *Managing Successful Programmes*, Office of Government Commerce, 2007, p. 29.

- For Funds, such as the NRDF, NR holds a traditional SRO role in which it determines an appropriate governance framework and investment criteria and the NR sponsor is accountable for the output delivered;
- Output-specified schemes present the NR ‘sponsor’ with a requirement and business case identified by others, but NR has the task of delivering the scheme as specified in the Control Period determination. Depending on how the output is framed this may present NR with varying levels of constraint on how the output might be achieved. NR cited the Southeast Train Lengthening Programme on several occasions throughout this study as an example of a programme where the envisaged outputs were impossible to deliver for the determined level of funding.⁷⁰ This presents the NR sponsor with the task of either finding an acceptable solution within the available funding or NR managing its overall portfolio to increase funding to address any insurmountable shortfall. Either approach might be viewed as an acceptable challenge but a real issue for NR here is that its ‘sponsor’ in these circumstances may be faced with an intransigent position from other industry stakeholders and may find itself constrained in the way that it manages its wider portfolio in order to re-prioritise funding appropriately. Here, the NR sponsor does not really have the control of an SRO envisaged by MSP;
- Specified Schemes are those where NR does not own the business case, does not specify the scheme and does not make the investment decision. Such schemes may become delivery requirements on NR outside of the Periodic Review process. An example of such a scheme is the Edinburgh to Glasgow Improvement Programme (EGIP). Although NR state that they take an active approach in developing such schemes, key decision-making is not in its gift and it must therefore take a ‘back-seat’. In this set of circumstances the actual SRO will sit in the funding organisation and therefore that organisation will have to ensure that it is capable of making appropriate specification and funding decisions. NR will doubtless have a key role in supporting decision-making but its role is arms-length. Specified schemes require the ‘whole system’ approach promoted by the RVM study.

4.4.26 From an organisational perspective NR currently distinguishes between:

- ‘Customers’ may be internal or external and will initiate change, provide funding in line with the customer’s business case, are accountable for the overall delivery of the scheme and provide the Client Remit which is developed with the NR Principal. External funders for enhancements include the DfT, Transport Scotland or third parties such as TfL or ODA;
- An NR ‘Client’ (which may also be the ‘internal customer’) agrees outputs and affordability with funders. NR advised us that this Client role was transferred into NR from the former Strategic Rail Authority but in reality funders are still viewed as the Client. NR Clients sit within NR’s Route Planning function (see Figure 4.2). NR’s Clients are stated to own the ‘pre-GRIP’ and GRIP 0-1 development phases;

⁷⁰ Interview with Anit Chandarana, 12 January 2012 and Ian Hodgins, 10 January 2012. NR stated that the envisaged scope was estimated to cost £300m more than that envisaged at the time of the Control Period 4 Determination.

- NR Sponsors currently have the role of meeting the interest of customers and stakeholders and their *reasonable* requirements; secure financial and procurement authorisation within NR's governance processes and to take full accountability for the development, delivery and close-out of the project.⁷¹ This includes the conduct of all Stage Gate reviews under GRIP;
- The Sponsor handbook is silent on the relationship between the Sponsor and project manager but this is addressed by the GRIP Policy Manual which states that for enhancement projects the Sponsor is accountable for delivery of GRIP stages 1 to 3 and 8 whilst the project manager is accountable for delivery of Stages 4 to 7.⁷²

4.4.27 The distinction between SRO / Sponsor and Programme / Project Manager is important; the former sets the outputs and makes sure they are delivered whilst the latter concentrates efforts on delivery. Comparators A, B and C have all achieved the balance between these relationships in a manner more aligned to the MSP model but do so because strategy, output specification and funding decisions are more within their own gift after they have received their funding settlements. One comparator also has the ability to independently raise finance for its schemes based on the strength of its own business case analysis.

4.4.28 As a consequence NR finds itself in the position where its Sponsor does not actually act as the SRO but more as NR's agent in agreeing customer needs and then act as an internal NR SRO in relation to NR's project delivery capability. NR Sponsors in-turn rely on NR's delivery personnel from Investment Projects to support project development activities. There is a delivery handover from the Sponsor to the responsible Programme / Project Manager.

4.4.29 MSP describes this situation as a 'cross-organisational programme' which can be controlled by bringing senior representatives into a separate entity for the purposes of coordinating and leading the programme.⁷³ One of these senior representatives would be designated as the SRO – not necessarily the representative from the principal funder – under a sponsoring group. The SRO would then deal directly with the Programme Manager in order to facilitate delivery. Either the NR Sponsor would represent NR as its senior representative on the sponsoring group or he / she might be appointed as the SRO. The efficiency for NR would be derived from enabling the NR (or another supplier under contestability) programme manager to 'step-up' to address the top-level customer relationship. This might be desirable for two key reasons:

- There is complete clarity between the roles of the SRO and Programme Manager, along the lines of MSP. Clarity should promote better early decision-making which a key tenet of the RVM findings;
- The Programme Manager would then clearly be the individual responsible for delivery from first instruction which, in our view, is imperative if full delivery accountability is to be achieved. This would avoid the potential disconnect at

⁷¹ Sponsor Handbook 2012, Version 12, Network Rail, 5 January 2012.

⁷² Governance of Railway Investment Projects (GRIP) – Policy manual, Issue 1, 4 December 2010.

⁷³ Managing Successful Programmes, Office of Government Commerce, 2007, p. 37.

the end of GRIP 3 where the current NR Sponsor hands over the delivery of a project to a Programme Manager which then proves to be undeliverable. Earlier Programme Manager attention should also encourage a delivery-focussed approach.

4.4.30 Our interpretation of how this might work is set-out in Figure 4.15 below:

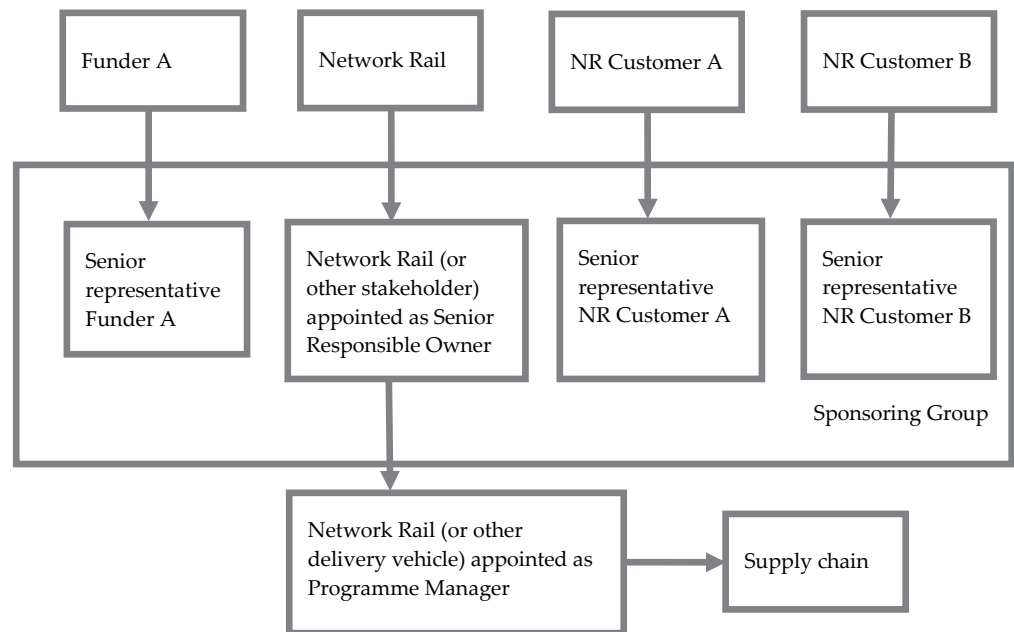


Figure 4.15: Potential application of 'Cross-Organisational' Governance

4.4.31 Our interpretation of the limited explanation of the Devolution initiative – and recent public announcements concerning alliance arrangements between NR and its customers⁷⁴ – suggest to us that something similar to the above approach might be in the thinking of NR and its industry partners to achieve better alignment whilst avoiding the need for full-scale 'vertical re-integration' of the railway. All of this implies clearer governance arrangements and better decision-making but clearly it will require trust and may be a 'leap of faith' for the industry partners to different extents. DfT may need to consider TOC re-franchising arrangements carefully and ORR will need to consider how NR's ability to deliver might be influenced by the Alliance agreements it intends to enter into.

4.4.32 The new NR Client organisation will have to be adequately resourced to ensure that programmes can be specified and procured at an earlier GRIP stage and allow the delivery organisation (NR or others) to step-up into the full programme management role.

⁷⁴ Passengers Set to Benefit From New Network Rail / Train Operator Alliances, Network Rail press release, 23 January 2012, accessed at: <http://www.networkrailmediacentre.co.uk/Press-Releases/PASSENGERS-SET-TO-BENEFIT-FROM-NEW-NETWORK-RAIL-TRAIN-OPERATOR-ALLIANCES-19a4/SearchCategoryID-2.aspx>, on 24 February 2012.

- 4.4.33 NR may have already taken some of this thinking into account. For example, we understand that for Control Period 4 projects that are currently in delivery NR has moved sponsorship duties under the relevant Programme Director for each Asset. For Control Period 5 projects that remain in development, Sponsors still reside within Network Development (see Figure 4.2) and engage with projects as set-out in the Sponsor Handbook. Under the Devolution initiative it appears that NR sponsorship will reside under each of the ten Route managing Directors for simple schemes and elsewhere within the new NR client organisation for multi-route or major programmes. Thus there will be a direct link between customer requirements and scope decision-making.

Ref.	Good Practice	Sponsorship and Alignment
9	The current arrangements for sponsorship within the industry present the opportunity for misaligned incentives and behaviour amongst industry partners. It also creates the potential within NR for lack of clarity over who is actually responsible for delivery.	
	Recommended Action	Responsible – Network Rail
	<p>NR appears to have taken positive steps to clarify roles within its organisation for projects currently in delivery, albeit the NR deliverer must be 'kept honest'. This is a particular feature that must be considered in the new Devolution / DIME structures once the detail is presented.</p> <p>At industry level NR and some of its customers have publicly announced the intent to create alliances which will seek to deliver benefits to both NR, NR's customers and, crucially, the fare-paying public. No details of these arrangements are available but in principle such arrangements offer an expedient route to achieving benefits which might not be otherwise achieved without re-structuring the industry.</p> <p>ORR must consider its role in regulating such arrangements.</p>	

Whole Life Cycle Cost and RAMS

- 4.4.34 Successful programme management is not only an exercise in delivering on-time and at the lowest capital cost. The industry – and not just NR – must take cognisance of this fact to ensure that all material requirements are met.
- 4.4.35 During this study we have been asked to consider the extent to which Whole Life Cycle Cost (WLCC) and RAMS (Reliability, Availability, Maintenance and Safety) have been taken into account in decision-making by project and programme teams. However, it is outside of the remit of this study to consider the extent to which WLCC and RAMS considerations are addressed in NR's policies and standards and doubtless there will be examples of explicit and implicit treatment of both.
- 4.4.36 We have used the twenty case studies examined below to form an opinion on this line of inquiry. The responses from NR's delivery management either 'follow the standards' or, specifically in the case of WLCC, they claim that there is no obligation on them to formally consider such requirements. Some elements of good practice were observed, but these tended to be on larger and more complex programmes.
- 4.4.37 NR's Value Management processes are valuable from a first-cost perspective but there seems to be little or no formal focus on calculating the whole-life implications between one solution and another. Such a calculation is a standard feature of any PPP / PFI deal where the private sector concessionaire takes on the risk of initial

delivery and future maintenance for the period of its concession. Whilst we understand that NR is currently addressing whole-life cost modelling for existing assets this does not immediately appear to address the decisions being made now in relation to future projects which create new assets. This is a gap.

- 4.4.38 This issue comes back to making clear – and aligned – decisions at the outset. If NR is to move to a position where it aligns more closely with its customers and brings its supply chain into early decision-making against output specifications, NR must ensure that its new NR client organisation specifies in such a way that it gets the railway that meets the needs (if not the ‘wants’) of it and its customers whilst providing enough freedom for suppliers to innovate. NR, DfT and ORR must make decisions about the relative importance of WLCC (which RAMS decisions will inform) versus reducing capital costs in the short term. The best long-term cost solution for the railway may be to increase some capital costs now to save money in the long term. This debate cannot be resolved without evidence and analysis and ORR should consider how NR is being motivated to respond. NR is tasked with achieving first-cost efficiency targets first whilst delivering the whole railway at the ‘lowest whole life cost’; in the face of the Control Period 4 settlement NR has had to focus on capital cost efficiency as its priority.
- 4.4.39 If the relative importance of WLCC versus reducing first capital cost is unclear between NR and ORR this should be resolved for the purposes of pricing Control Period 5. This is a major ‘organisational governance’ matter which will influence NR’s approach and industry costs in the long term.

Ref.	Critical Issue	WLCC and RAMS
10	NR does not explicitly address WLCC or RAMS through its project management framework. Although the latter is probably embedded within NR’s policies and standards decisions concerning whole-life costs for new assets should be explicit to ensure that the right solutions are being selected for the railway. The lack of explicit analysis may be preventing long-term cost saving opportunities to be taken at the expense of cheaper solutions which are attractive for the purpose of achieving short-term efficiency targets.	
	Recommended Action	Responsible – Network Rail and ORR
	Explicit WLCC and RAMS analysis should be undertaken for programmes (either enhancements or renewals) which attract either major capital expenditure or present potential significant risks to the operation of the railway for the creation of new assets. We understand that NR is undertaking similar analysis for existing assets, but this should be extended to ensure that long-term cost reduction and performance improvement opportunities are not lost at the expense of short-term ‘efficiency’ gains. ORR and NR should agree a mechanism for achieving this through the forthcoming Periodic Review 2013 process.	

Summary – Stakeholder Engagement and Benefits Management

- 4.4.40 Stakeholder Engagement and Benefits Management are key programme management activities which require leadership and appropriate governance frameworks within which to succeed. In order to derive the full benefits of improved alignment between NR and its industry partners in order to deliver ‘the right thing at the right price’ we note that NR’s experience in Control Period 4 – although underpinned by HM

Government's support to investing in UK rail – has still been the subject of substantial change.

- 4.4.41 Change is expected but we would expect all industry parties to learn from the experience of the change encountered to understand the impacts – both good and bad. A retrospective exercise of this nature would help to inform future opportunities to promote cost savings through *Increased Efficiency, Increased Early Effort and Reduced Overspends*.
- 4.4.42 It follows from this that the IIP must now be underpinned with decision-making which promotes efficient delivery in Control Period 5. The IPP documentation provides the first step in the decision-making process and ORR and funders must now make decisions about how to proceed – the cost of Control Period 5 will depend on what overall selection of outcomes is required and when they are required by. For its part NR has a fundamentally important role to fulfil in demonstrating the effect on the range of expected delivery costs but its effort will be improved if the whole industry works together to improve certainty.
- 4.4.43 In the absence of any significant industry re-structuring the proposals for improved alignment to overcome contractual interfaces are a positive step but they imply that all industry partners will have to be willing to shift on their current commercial positions for the greater good. Attitude, approach, tact and diplomacy will be required on all sides to make such an approach work. This may raise considerations for ORR and DfT in their respective roles in regulating NR and operators respectively. Programme management methodology provides solutions to the governance arrangements that will be required to make improved alignment work but all parties must recognise that improvement lies in simplifying decision-making which necessitates putting the right individuals in the appropriate decision-making roles. This might require changes to sponsorship arrangements.
- 4.4.44 In respect of renewals NR has much greater control over its own destiny and in Control Period 4 it has deliberately re-phased renewals expenditure for reasons of understanding its assets better, investing in new methodologies and improving workbank planning. On the face of it this is positive *Increased Early Effort* and suggests that *Increased Efficiency* and *Reduced Overspends* will result. However, as discussed further below a key issue appears to be the difficulty in differentiating between reduced expenditure due to efficiency and that due to un-planned slippage. The issue of what has been delivered must be clear before any view can be taken on expected future cost savings.
- 4.4.45 From a RAMS / WLCC perspective we note NR's current effort to improve the whole-life asset management of existing assets. In this study we conclude that the concept of WLCC in the creation of new assets is weak in comparison with the approach taken by others. In many cases the view is that WLCC requirements are either implicit or explicit in engineering standards and that alone suffices. However, in an environment where there is a need to balance a host of competing demands: RAMS, first cost, long-term costs and access, more rigorous WLCC analysis might reveal opportunities and risks which are not contemplated today. Although NR is under a duty to provide a lowest whole-life cost railway we suspect that this requirement is superseded by the focus on reducing first-cost. We submit that NR's assumptions – and ORR's requirements – are reviewed and adjusted as necessary for the purposes of the forthcoming Control Period 5 Determination.

4.5 Financial and Risk Management

Overview

- 4.5.1 Much of NR's management action during Control Period 4 has been focussed on addressing the £4.1bn gap between its Periodic 2008 submission and ORR's Determination.
- 4.5.2 OGC's P3M3[®] places high importance on the roles of Financial and Risk Management:
- Financial management is concerned with having enough funding, management of the likely costs over the investment lifecycle and defining the value of the investment to the business;
 - Risk management concerns the management of threats and opportunities and the effort to minimise the former and maximise the latter.
- 4.5.3 A key element of successful project and programme management delivery is to ensure that all obligations are adequately funded, baselined and controlled. The optimal position is for the organisation to get to the point where it can demonstrate an understanding of its costs such that future obligations can be adequately priced. The pricing should be challenging but realistic.
- 4.5.4 The handling of this subject is critical to NR's success during actual delivery of its obligations but it is in many respects more critical in the process of linking together the Initial Industry Plan (IIP), High Level Output Specification (HLOS) and Statement of Funds Available (SOFA) Strategic Business Plan (SBP), NR's Period Review submission and ORR's Determination.
- 4.5.5 Whereas Section 4.4 above considered NR's role in how good decisions are made about what to invest in, this section considers aspects of how NR ensures that the outcomes are delivered for an efficient price.

Management of Cost

- 4.5.6 In general the Anticipated Final Cost (AFC) is comprised of the following principal cost elements:
- Base cost including all 'soft' costs (project management, design, advisors, TOC compensation and so on) and 'hard' costs (physical infrastructure or products);
 - Contingency (NR projects are authorised at the P80 confidence level for Enhancements and, with exception of simple ('Level of Control 4') projects, P50 for Renewals).
- 4.5.7 NR adopts a similar approach to Comparators A, B and C in respect of developing project estimates and guidance as to the form and accuracy of estimating is provided for each stage of project development.
- 4.5.8 Like all Comparators and also the 2012 Olympics programme, NR has started by setting a baseline for each Asset / programme. In Enhancements NR initially set a top-down cut in its project budgets to address the difference between its Control Period 4 submission and ORR's determination. It has also held-back funding in certain areas in order to ring-fence some 'programme-level' contingency.

- 4.5.9 In this regard it has been left to NR to fashion ‘headroom’ in order to ensure that it is able to deal with projects which do not perform to the budgets allocated. This appears to be a feature of the regulatory environment; Comparator B (which is regulated) followed a similar approach following its funding determination whereas, Comparator C and the 2012 Olympic programme have the freedom to structure their AFC’s in a fashion which is fully transparent to its funders. For example, the 2012 Olympics adopted the following approach:

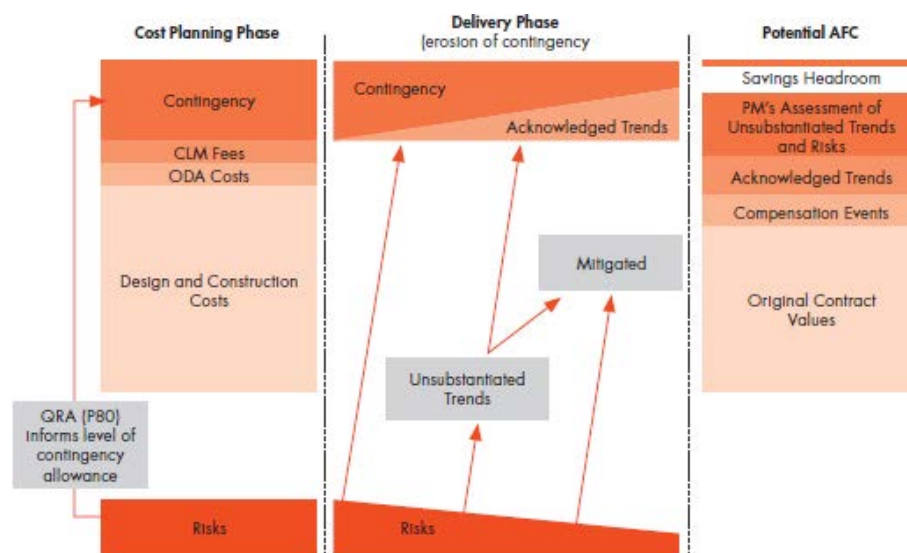


Figure 4.16: Risk, contingency and trends – London 2012 Olympic programme⁷⁵

- 4.5.10 The above approach is similar to NR’s in that it has sought to save un-spent budget from projects which then provide support for cost pressures that emerge.
- 4.5.11 In respect of base costs we note that NR has started to mandate the use of proprietary software (RIB) to capture estimates in a repeatable fashion. This will help to improve comparability of base estimates. We were also advised that NR is seeking to develop a Standard Method of Measurement for railway projects. This could prove to be a very valuable contribution to improving estimating accuracy by making comparison and challenge easier. This would serve unit cost modelling (internal comparison of costs within NR) and also benchmarking (comparing NR with others).
- 4.5.12 Both from our Independent Reporter experience and issues encountered in this study we consider that NR would benefit from re-considering and enforcing clear rules in respect of its cost breakdown structure. For example, we observed the following:

- When we requested a description of the cost breakdown structure for soft / on- / opex costs we were presented with a long list of possible descriptions of such costs. Broadly NR appears to consider anything up to and including the end of GRIP 4 as a ‘soft cost’ and everything from GRIP 5-8 a delivery cost. Ideally NR would be able to run a comparison of heads of cost from its Infrastructure Management Systems which would allow direct comparison of costs on a project basis. This would aid both internal and external comparison without resorting to significant effort that is currently required;

⁷⁵ Approach to managing AFC, ODA, October 2011

- In this study we attempted to consider project management on-costs across each Asset at project level. It would have been helpful to have correlated the range of project management costs with a variety of factors such as ‘Level of Control’, overall project value, contracting method and so on. However, NR advised that this was not possible because of the way that such costs are accounted for. For example, in some Assets, a central code is used (meaning there is no visibility at project level) and in other instances the true cost is obscured where external project management is employed on a contractual basis.

4.5.13 We note from a study in the US that other administrations have attempted to tackle this issue in order to improve the approach to estimating and understanding the rationale for apparently higher and lower costs. The diagram below illustrates an attempt to create a common framework to allow soft costs to be benchmarked:

10	Guideway & Track Elements (route miles)	
20	Stations, Stops, Terminals, Intermodal (number)	
30	Support Facilities: Yards, Shops, Admin. Bldgs	
40	Sitework & Special Conditions	
50	Systems	
60	ROW, Land, Existing Improvements	
70	Vehicles (number)	
80	Professional Services	
90	Unallocated Contingency	80.01 Preliminary Engineering
100	Finance Charges	80.02 Final Design
Total Project Cost (10–100)		80.03 Project Management for Design and Construction
		80.04 Construction Administration and Management
		80.05 Professional Liability and Other Non-Construction Insurance
		80.06 Legal; Permits; Review Fees by Other Agencies, Cities, etc.
		80.07 Surveys, Testing, Investigation, Inspection
		80.08 Start Up

Figure 4.17: Federal Transit Authority – Standard Cost Categories⁷⁶

4.5.14 From an efficiency perspective NR is placing a great emphasis on the benefit of alliancing and partnering approaches to bring down both capex and opex costs. The contracting approach can have a marked impact on the apparent cost of client project management in absolute and percentage terms against the overall investment. This needs to be thought-through so that both internal and external comparison can be achieved to demonstrate the value of post Devolution and DIME initiatives. If this is not addressed the ability to demonstrate efficiency and effectiveness savings by taking a new approach will be lost.

⁷⁶ Federal Transit Authority Report 138, Estimating Soft Costs for Major Public Transportation Fixed Guideway Projects, Transport Research Board of the National Academies, 2010, p. 9.

Ref.	Critical Issue	Cost Transparency
11	The ability to compare heads of cost both internally and externally is hampered by the way costs are presently captured. We observe that NR does not apply consistent cost categorisation for project management and design staff, ⁷⁷ and that this obscures the comparison of project team sizing across projects which are procured through alliances and those which are not.	
	Recommended Action	Responsible – Network Rail
	This should be resolved in order that NR can demonstrate the benefits of its Devolution and DIME initiatives in relation to its current performance. NR should review its cost categories and institute a more rigorous cost convention that would facilitate both internal and external benchmarking. External benchmarking is of little use if costs cannot be readily compared between administrations which apparently execute similar projects. This is obviously harder for NR to achieve itself but NR's proposed Railway Standard Method of Measurement is a sign of positive action and the US Federal transit Authority has demonstrated what can be achieved through focussed co-ordination between benchmarking partners.	

- 4.5.15** NR's efforts to improve the understanding of unit costs are still developing in relation to regulated comparators where there has been longer focus on understanding the scope and cost of repeatable work items and working to cost target curves which aim to reduce cost over time. That said, we note a marked improvement during Control Period 4 in this regard. The Cost Analysis Feedback (CAF) framework described to us collects data at CAF 4 (GRIP 4) and CAF 7 (GRIP 7) which enables comparison between what NR thought a project would cost at investment authority and what outturn was actually achieved.
- 4.5.16** Although the data-set is building NR reports that full coverage has not yet been achieved,⁷⁸ albeit it will be of use in challenging early estimates for Control Period 5 commitments. Comparator B (regulated) performs similar analysis. Comparators A and C are in our view less well developed than NR in this area.
- 4.5.17** We consider that this should be extended to 'CAF 1' in order that NR includes the earliest point of cost comparison (typically the allowance determined by ORR); this would allow changes from 'Original Announcement' of the scheme to be tracked and understood. We attempted to systematically extract data from NR's systems to compare the progression of AFC from 'Original Announcement' to 'Outturn' but this proved impossible without significant effort as the Infrastructure Management System does not register projects until they have reached a certain stage of development; this misses the 'initial thoughts' on what a proposed scheme might cost (for example, at business planning stage). An Australian Study offers a simple method of comparing the cost and schedule performance of projects throughout their lifecycle. If NR could extract the requisite data this would offer an opportunity to retrospectively analyse the progression of projects throughout their lifecycle and

⁷⁷ Meeting with Ian Hodgins, 31 October 2011.

⁷⁸ We are advised the Buildings & Civils does not collect CAF 4 data and that Track collates data on a portfolio-wide basis annually. Data in other areas is building.

compare them to other projects. Factors such as complexity, size, Route, procurement vehicle and so on might be compared.⁷⁹

Ref.	Secondary Issue	Improving Understanding of Cost and Schedule Progression
12	<p>NR's CAF framework is developing which should improve its understanding of the cost of delivery and the specific reasons why the same work attracts a different cost in different situations. Ultimately this should benefit NR in refining base cost estimates and narrow the application of estimating uncertainty ranges.</p> <p>Although CAF is an example of good practice we consider that this needs to be extended in order for NR to extract full learning from the progression of cost and schedule over the full lifecycle; the process currently omits the earliest view of cost and schedule (for example at business planning / Control Period Determination stage).</p>	
	Recommended Action	Responsible – Network Rail
	<p>The full lifecycle of forecast cost and schedule to be compared at various points of reference in the project lifecycle (i.e. the forecast cost at 'Original Announcement', 'Full Investment Authority', 'Principal Contract Award' and 'Outturn') in order to pinpoint the timing and reasons for change in order to better isolate risks and opportunities.</p>	

Risk and Value Management

- 4.5.18 It is evident that NR has invested in its approach to risk and value management and the case studies reviewed below reveal evidence of its increasing presence. It is clear that value management in particular has been promoted as a key support tool to project and programme teams tasked with finding efficiency savings throughout Control Period 4.
- 4.5.19 At Periodic Review 2008 ORR's Determination was based on authorising NR's Enhancement projects at the P80 confidence level and Renewals at P50. From the case studies reviewed below we see that this approach has been followed with the exception of the Track Asset which takes a wider 'portfolio view'. NR's major programmes (such as Thameslink) display a more sophisticated treatment of risk analysis and hold contingency at both project and programme level.
- 4.5.20 As discussed above at section 4.3 NR programme controls is implemented according to the size and complexity of the projects. Risk and value management is accordingly determined by the 'Level of Control' (LoC) established for each project. In practice, projects with a high LoC rating will attract a higher level of scrutiny and support, such as both schedule and cost Quantified Risk Assessment, strategic risk reviews and more frequent facilitated value management workshops.
- 4.5.21 Every Period NR produces a Risk Management Update for Enhancements which takes a broad view of the total value of risks and opportunities recorded in NR's corporate Active Risk Manager (ARM) system. This highlights areas of threats and

⁷⁹ National PPP forum – Benchmarking Study Phase II, Report on the performance of PPP projects in Australia when compared to a representative sample of traditionally procured infrastructure projects, University of Melbourne, 17 December 2008.

opportunity by sub-programme which provides visibility of problem areas. However, we have not seen any rolled-up correlation of the risk exposure to the available budget (including contingency) by Asset. In Enhancements this seems to be done on a specific project basis (for example, the remaining contingency is expressed as a percentage of the 'cost to go'). We do not suggest here that NR does not have control over forecasting its outturn costs against budget – it compares AFC to budget – but we submit that closer inspection of remaining risk provision versus contingency would help to challenge the quantum of contingency being held and the length of time that it is held for.

- 4.5.22 The data to achieve this certainly exists but the understanding seems to sit between Programme Controls and Financial Controls which are presently separate entities. Both the 2012 Olympics and Comparator B compare risk trends against remaining levels of contingency. The 2012 Olympics claim to have saved £470m from its forecast Anticipated Final Cost through managing-down its risk provision alone against its original baseline.⁸⁰
- 4.5.23 Comparator C operates a similar regime albeit we consider that its approach to contingency management has, until recently, been more conservative in comparison to NR in that it tended to undertake Quantified Cost Risk Assessment (QCRA) analysis and then hold a substantial amount of management contingency in reserve (something akin to optimism bias). Comparator A is in the initial stages of developing a similar approach to NR following a major review of its estimating processes.
- 4.5.24 A key element of successful risk management is generating a culture whereby risk is treated honestly and transparently. The 2012 Olympics refer to assurance being provided by a central team and review meetings being conducted in a way where executive management addressed the risks that it was responsible for in the risk hierarchy allowing project managers to concentrate on the risk that they themselves could control. Within NR the approach is similar with emphasis being placed on the independence of risk and value management specialists and the ability to collate and analyse all risks using ARM.
- 4.5.25 We also note that NR has introduced the practice of encouraging projects to report Estimated Final Cost (EFC) alongside Anticipated Final Cost (AFC). The distinction is that EFC is a completely unconstrained view from the project manager of what risks might eventuate in a 'worst case' scenario. Comparator C has also used this tool to engender more openness but we find that the potential benefits of this approach can be limited depending upon senior managements' response. In our experience we have found that the 2012 Olympic method – managing risk at the level it can be best controlled – maintains accountability and ensures that project managers concentrate on issues that they can actually control.

⁸⁰ Managing risk across the Olympic programme, 2012 Learning Legacy.

Contingency and Optimism Bias

- 4.5.26 *Flyvbjerg et al*⁸¹ consider that a lack of project success – both in delivery and operation – has two root causes: ‘optimism bias’ and ‘strategic misrepresentation’. The former is concerned with being too optimistic about the costs of a venture and the latter is defined as ‘the planned distortion or misstatement of fact usually in response to incentives in the budget process’ – or in shorthand ‘lying’ and requires clear accountability in investment decision-making.
- 4.5.27 ‘Strategic misrepresentation’ therefore requires the IIP and subsequent processes leading to the Control Period Determination to demonstrate value for money decision-making from the outset i.e. justifying investment in the right things. To this end the RVM Study promoted clear governance structures on a whole-industry basis. Above, we have considered how the proposed move to more aligned industry structures might help better decisions to be made.
- 4.5.28 Assuming that the investment decisions derived from the IIP and Strategic Business Planning processes are justified the concept of optimism bias requires consideration to ensure that:
- The value of the funding is challenging and realistic on the basis of agreed criteria (for example, on a safety, performance, affordability and whole-life cost basis); and
 - The potential for over-funding is avoided; if the overall budget is too generous at best the delivery organisation might at best return excessive ‘efficiency’ or at worst ‘spend to the budget’ rather than ‘manage down to the lowest efficient cost’. The IUK Study considered this to be one of the factors contributing to the UK construction industry being more expensive than its international comparators.
- 4.5.29 Within NR we observe initiatives to gain a greater understanding of the pricing and use of contingency to be a positive step towards mitigating both of the above requirements. NR’s Contingency Management Principles⁸² are still in their infancy with respect to practical execution but should allow NR to build on its initial work to set thresholds by Asset and GRIP stage for the projects and programmes in its delivery.⁸³ However, NR recognises that there is the potential from these initiatives to consider portfolio risk management to provide a more refined analysis of risk and the contingency held as a result. The programme (as opposed to the project risk exposure) risk exposure – and contingency subsequently held – will depend on myriad factors including the definition of the outcomes expected, the size, type and nature of projects and how they might be integrated, access to execute the works, the relationship to stakeholders and funders (we foresee a great deal of diplomacy being required in the proposed arrangements for better alignment) and the chosen procurement vehicle (which again is proposed to engender greater collaboration which suggests risk and incentive arrangements).

⁸¹ Flyvbjerg, B., Bruzelius, N. and Rothengatter, W. (2003). *Megaprojects and Risk: An Anatomy of Ambition*. Cambridge: Cambridge University Press.

⁸² Contingency Management Principles, Version 3.1, 26 April 2011.

⁸³ Implementing Cost Risk Management (GRIP 4-8*, Preparation for Investment Authority, Version 2, September 2011.

4.5.30 We understand from NR that there is an ongoing discussion between NR, ORR and DfT about the appropriate application of optimism bias to estimates produced by NR in connection with the forthcoming Periodic Review in 2013. NR's processes adopt the typical approach of trying to refine scope decision-making through the GRIP stages which in practice results in optimism bias (or NR's view of that based on its experience) being applied in early GRIP stages which is then replaced by a contingency application in later GRIP stages derived from a QCRA. The concept of optimism bias has been challenged as potentially unreliable as a remedy to over-optimistic estimating for the following reasons:

- It removes sponsor accountability for estimates;
- It takes little account of the rigour employed in building-up base estimates;
- Its statistical nature means that it takes no account of the factors driving cost and the data-sets from which optimism bias values are derived may not fully representative of the investment envisaged;
- Base estimates may be adjusted after optimism bias is applied in order to make the investment still look attractive to decision-makers (an example of 'strategic misrepresentation'); and
- Despite applying optimism bias, there have been examples of projects still over-spending.⁸⁴

4.5.31 We are unsighted on the full range of discussions regarding the application of optimism bias between the industry partners. If this is an unresolved matter we recommend that it is given careful consideration in the 2013 Periodic review Determination. In our opinion NR should prepare a full estimate – appropriate to the GRIP stage reached – which articulates the assumptions pertaining to scope, schedule, asset policy and other factors which may affect the range of costs for any one scheme. This should then be re-assessed at a programme level to consider risks and opportunities in the round. To improve accuracy it is important that the industry provides as much certainty as it reasonably can in respect of the expected outcomes and that any issues that are deemed to be 'at large' are clearly articulated. By improving the baseline NR should then be able to make better programme management decisions concerning bundling of work, integration of projects, efficient organisation and so on. The IIP is only the start of that process and sets a challenge to funders and the ORR to aid the process of refinement.

⁸⁴ Allport, J. Planning Major Projects, Thomas Telford, 2011.

Ref.	Critical Issue	Contingency and Optimism Bias
13	We are advised by NR that the application of optimism bias is being considered in relation the Control Period 5 Determination. The IIP provides a start to the industry decision-making but this must now be refined in order to confirm outputs and allow estimating to be refined. If not, there is the potential for less-well defined schemes to proceed on the basis of immature estimating. This increases the potential for increasing CP5 costs at worst and over-funding CP5 at best.	
	Recommended Action	Responsible – Network Rail, ORR and DfT
	Where there is the ability to estimate base cost and risk on a better basis this approach should be adopted to avoid a lack of robustness in early decision-making. NR has increasing ability – through better understanding of base cost and learning from the categorisation of contingency – to improve pricing for the purposes of Control Period 5. However, the price will depend on the range and definition of the projects selected to proceed. This will largely be driven by the ability of the industry to make informed investment decisions in a timely manner. In turn, NR should prepare a fully transparent estimate both at project and programme level in order to articulate the benefits of a programme approach (geographical, procurement vehicle, etc).	

4.5.32 The above approach would move away from optimism bias and focus more on base cost estimating and assessment of risk and opportunities in order to derive a more robust estimate for uncertainty. If this approach is adopted we consider that NR would be ahead of Comparators A and C and similar to Comparator B, albeit the range and diversity of NR’s investments is more complex.

4.5.33 Above, we considered NR’s initiatives in improving its understanding of unit costs and estimating processes. If reliance is to be placed on NR’s approach the relationship between base cost, estimating uncertainty (the uncertainty on unit rates and quantities when the scope is firm) and contingency (an analysis of known risks and opportunities) gains importance for the purposes of Periodic Review determination. This is considered further below at section 6.5.

Benchmarking

4.5.34 NR has started benchmarking effort but, for reasons of confidentiality to its benchmarking partners, NR was unable to share the output of any of its benchmarking effort so far.⁸⁵ We trust that NR will be able to share the output of its benchmarking with ORR in an acceptable format to its benchmarking partners at the appropriate timing. We were advised that NR’s benchmarking covers all Investment Project assets with the exception of Crossrail and Thameslink.⁸⁶ We have seen the outline of NR’s proposed benchmarking effort⁸⁷ which appears to be aimed at addressing the observations of the Nichols Independent Reporter review which raised a number of issues with respect to capture Enhancements costs for the

⁸⁵ Eliane Algaard, Network Rail, 12/12/11.

⁸⁶ Meeting with Ian Hodgins, Programme Controller, Investment Projects, 31/10/11.

⁸⁷ Benchmarking Strategy and Execution Plan, Network Rail, Version 1, September 2011.

purposes of informing the Control Period 5 determination.⁸⁸ We are not sighted on any revisit of the early Control Period 4 Independent Reporter observations or NR and ORR's progress on 'progressive assurance' which was ongoing at the time of this study, although we are given to understand that a range of actions rest with both NR and ORR to meet ORR's requirements for the Control Period 5 determination.

Summary – Financial and Risk Management

- 4.5.35 From a Financial and Risk Management perspective we generally find that NR compares favourably with the Comparators considered during this study.
- 4.5.36 However, there is still room for improvement particularly in respect of improving the ability to compare 'like-for-like' costs across NR; it is not possible without significant effort and assumptions to compare heads of cost (for example, the cost of project management) between NR's projects and programmes. If this could be resolved NR would be better-placed to address ORR concerns regarding the cost of some of its activities and would also have the ability to test whether new ways of working (for example, Alliancing) actually provide the efficiency benefits sought.
- 4.5.37 Whilst NR's unit cost and CAF initiatives are developing and represent an effort to drive good practice we consider that extending this to consider the progression of forecast cost and schedule throughout the full lifecycle (from 'Original Announcement') would help NR to pinpoint the reasons for change. This would also provide a mechanism by which NR could help to demonstrate the relative benefits of different forms of engagement with its customers and its supply chain. This might provide significant insight into avoiding *Increased Overspends*.
- 4.5.38 Arriving at a challenging but realistic estimate for NR's capital project delivery obligations in Control Period 5 is a major programme management challenge in its own right. Failure of this process will either result in NR either receiving a soft target or an unrealistic determination settlement. The more effort that can be invested in establishing outcomes will aid NR's ability to formulate refined plans for pricing the Control Period 5 programme on a programme rather than a project basis. This might provide a basis to reduce *Increased Overspends* by avoiding either too little funding for Control Period 5 (if the settlement is unrealistically low it will overspend) or too much (in which case either work may expand to fill the available funding, or 'efficiency' will be won too easily).
- 4.5.39 A good start has been made by NR and its industry partners with the publication of the IIP and the move for greater alignment between NR and its customers augurs well for improved definition of outcomes; but this is only the start of the process. Funders and the ORR must now aid the process in order that NR can set-about the next phase of iterating potential solutions and proposals for integrating discrete projects into efficient programmes of work. This will inform both base-cost and, in particular, the approach to estimating the cost of uncertainty.
- 4.5.40 For its part, NR should prepare fully transparent estimates which delineate between base cost, estimating uncertainty and contingency for schemes where outcomes have been well-defined. Where outcomes and / or solutions are at large a mechanism for dealing with such uncertainty should be clearly stated. If it has not already

⁸⁸ Independent Reporter Part C, Nichols Group Limited, Mandate CN010, Review of Network Rail's process to capture enhancements costs, Phase 1, 13 December 2010.

concluded, ORR should clarify its information requirements for the Control Period 5 process.

4.6 Resource Management

Overview

- 4.6.1 P3M3[®] considers resource management in its widest sense; people, equipment, materials, information, facilities and so on.
- 4.6.2 Beyond funding, in UK rail the principal resources are people – as projects are ultimately delivered by people – and access to the railway.
- 4.6.3 In this section we do not consider access as ORR is considering this through other means, albeit we recognise that access is a key consideration in improving cost effectiveness; poor access – and inefficient use of the access that does exist – is a significant factor in maximising the effective work delivered.
- 4.6.4 People resource to support NR's delivery obligations is derived from its own staff and its supply chain. ORR is considering supply chain through another study so again this is not considered here. Our focus is therefore on NR's own resources.
- 4.6.5 We note from the material provided by NR that it has already invested in effectiveness and efficiency studies for parts of its current organisation – principally commercial and procurement functions – but no equivalent is currently available in relation to project and programme management capability. We are advised that such considerations are being made as part of NR's DIME proposals and due to the confidentiality surrounding those workstreams no detail has been shared with us. We therefore offer observations on the general direction of NR in relation to its ability to adequately forecast its resources and the emphasis that it places on developing and maintaining the capability of its people.

People Capability

- 4.6.6 We observe that each Asset within Investment Projects and Asset Management has been given the latitude to resource its programme teams in order to meet the delivery obligation faced. There are similarities across the Investment Projects assets of Signalling & Electrification, Buildings & Civils, Enhancements and the major programmes such as Thameslink and Crossrail. These similarities span from NR's twelve defined disciplines, each of which is co-ordinated from a competence perspective by Discipline Resource Managers (DRMs). We note that after an initial slow start⁸⁹ in appointing DRM's at the start of Control Period 4 NR has achieved stability in the appointed individuals managing these resources.
- 4.6.7 We find that NR follows very similar approaches to Comparators A, B and C – and private sector organisations – in respect of developing its people in project and programme management in that it trains staff in accordance with the Association of Project Management (APM) levels of progression; NR Band 1 /2 personnel (Senior Programme Managers and Programme Managers) are required to undertake the registered Project Professional Qualification.⁹⁰ The APM qualifications are aligned to

⁸⁹ *Review of Network Rail's capability to deliver the CP4 Capital Investment Programme*, Final report, Nichols, Independent Reporter Part C, CN/005, 17 December 2009, p. 18.

⁹⁰ <http://www.apm.org.uk/APMQualifications>

the International Project Management Association grading framework which gives credence to the qualifications.

- 4.6.8 Leading authors in the development of project and programme managers argue that care must be taken in setting the competency framework for programme managers as distinct from project managers.⁹¹ This draws on the thinking that programme management is associated with implementing high-level strategy to bring about corporate renewal rather than large or complex projects. In this regard programme managers must be adept at dealing with uncertainty, change and shifting strategic objectives whereas project managers focus on the fixing objectives and scope. It does not follow that highly successful project managers automatically become successful programme managers. If it does not already do so NR might take into account the wider thinking on the progression from project to programme management in the development of its people.
- 4.6.9 NR's DRM initiative undertook a complete review of the capability of its project managers in March 2011 and identified that 20 of the 24 competencies identified required some form of development improvement. An action plan was put in place to improve basic competencies across the board but we are unsighted on the latest status of this development. That said the approach and level of investment is positive.
- 4.6.10 Comparators A, B and C all take a similar approach to NR in viewing career progression through various levels of project management to programme management as a typical career structure.
- 4.6.11 Beyond project management training we note that NR has invested heavily in the sponsor, commercial and procurement management, programme controls and risk and value management disciplines.
- 4.6.12 NR's investment in its Westwood facility is and initiatives with the University of Warwick suggest that it is ahead of most public and private comparators in staff investment.

Staff Incentives

- 4.6.13 We do not have full sight of how Comparators A, B and C incentivise their staff to deliver 'outstanding' performance albeit we understand none of them offer the potential incentives offered by NR which reflects the approach of some private organisations.
- 4.6.14 From a project delivery perspective we note that 70% of the potential 'bonus pot' for NR's staff is derived from measuring project delivery metrics with the balance being based on corporate objectives being met. The project-specific metrics relate to:
- Outperforming budgeted performance; presumably this measure aligns with the 'Financial Value Add' metric which records the under-spend of annual budgets (after change control and slippage are taken into account);
 - Meeting volume targets and / or milestones;

⁹¹ See Pellegrinelli, S., Thinking and acting as a great programme manager, Palgrave, 2008.

- A judgemental measure aimed at partnering with both customers and supply chain to improve customer service (by minimising disruption) and improving efficiency of delivery.

4.6.15 We are not sighted on the extent to which NR has rewarded its staff but note that ORR has oversight of NR's remuneration policy in accordance with Condition 16 of NR's network licence. The reward measures in project delivery rely on an accurate understanding of efficiency targets being met and this includes an understanding of the volume of work actually delivered. As discussed elsewhere the relationship between under-spend and slippage requires clarification.

Resource Modelling

4.6.16 In order to provide consistency and challenge to team structure and sizing across the Investment Project business NR has developed a Project Sizing model with CITI.⁹² The model is in a preliminary stage of development and has been applied to a sample of Investment Project schemes. The model can be used to inform the size of NR project and programme teams based on business rules validated by NR's DRMs and is stated to have been designed to take into account project complexity and some pre-determined contracting strategies which would affect the size and structure of NR's own resources. NR considers that the opportunities suggested by the modelling undertaken so far might be significant in reducing headcount in project delivery, but no overall analysis is available at this time for review.

4.6.17 We consider this to be a good initiative which should be used to challenge the emerging thinking in NR's post-DIME approach of embracing alliancing / partnering models with its supply chain which imply the NR will require fewer staff. Initial calibration of the model against 20 Investment Project schemes suggested that total headcount might be reduced by 9%.⁹³

4.6.18 NR also advised that the CITI modelling initiative has been put on-hold as a result of the DIME re-organisation under which NR state that it expects the current 4,400 headcount of Investment Projects to fall 10% by April 2012.⁹⁴ NR stated that the CITI modelling should continue to benefit major programmes not affected by DIME (for example, Thameslink and FTN) and that the new Regional Managing Directors under DIME would be expected – but would be under no obligation – to embrace the CITI modelling in future.

4.6.19 Although the CITI modelling has been superseded by the DIME initiative NR compares its actual versus planned resource profiles on a quarterly basis using a Resource Scenario Model (RSM). The model has been developed using Excel and care should therefore be taken in respect of formal validation of it, but it provides a valuable tool. The Comparators considered tend to develop for specific programmes rather than the whole organisation. The RSM gives NR a consolidated view of the overall resource profile and provides the ability to:

⁹² PCGST intro.Sept 8.SP.PPT – Project Structuring and Sizing presentation, 8 September 2011.

⁹³ Discussion with Paul Johnson, Investment Projects, 15 November 2011.

⁹⁴ *Future Delivery of Capital Programme at Network Rail, Briefing Note to Office of Rail Regulation*, Network Rail, 11 November 2011, p. 2.

- Conduct ‘what if’ analysis which has been necessary during Control Period 4 in view of the addition, cancellation and re-phasing of projects and programmes;
- Test the deliverability of Control Period 4 obligations;
- Test efficiency saving scenarios;
- Model all twelve Investment Project disciplines together (rather than the disciplines conducting their own independent analysis);
- Challenge programme directors (Asset and Major Programme level) as to their actual resourcing against the budget proposed by finance.

4.6.20 In view of the DIME proposals we foresee that the RSM will need to be revised to reflect the four new Regions (rather than Assets) but this should not present any issues.

Ref.	Good Practice	Resource Scenario Model
14	The RSM is a valuable tool which gives NR visibility of potential resource availability issues.	
	Recommended Action	Responsible – Network Rail
	The model should prove useful in the DIME restructuring. At the moment it appears to be focussed on core activities in Investment Projects only and might be extended to the new NR Client organisation also.	

DIME

4.6.21 Under DIME, NR will form four regional businesses (Scotland & North East, Southern, Central and Western & Wales are the four geographical ‘Regions’ which align to the ten operational Routes) and three major programmes (Thameslink, Signalling and FTN) as outlined in Figure 4.18 below. Each regional business and major programme is self-contained with key support functions such as HR, engineering, financial, commercial, client development and programme integration. All seven business units under Newco will continue to be supported by the existing cross-cutting national support functions of Programme Management, Finance & Commercial (although this appears to be a rationalised version of the current arrangements) and human resources.

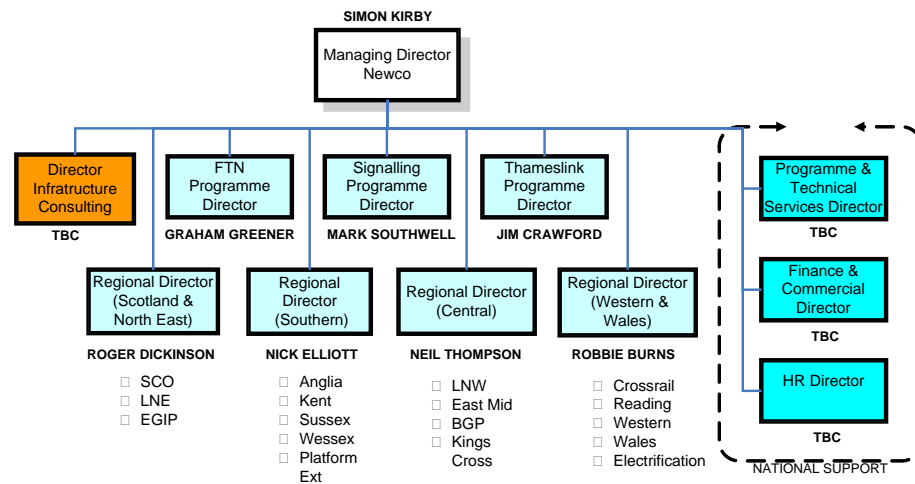


Figure 4.18: Draft Newco High Level Organisation⁹⁵

4.6.22 This replaces the current Investment Projects structure at Figure 4.3 above which includes major programmes (Thameslink, Crossrail and FTN), Assets (Buildings & Civils, Signalling & Electrification and Enhancements) and elements of the Asset Management organisation.

4.6.23 The details of the DIME headcount reductions were not available for the purposes of this review. Whilst NR states that it expects to reduce the Investment Projects Headcount by 10% it makes no statement in respect of the expected headcount in the new NR Client organisation.

Ref.	Secondary Issue	Revised Headcount
15	Although NR states its DIME proposals will achieve a reduction of 10% in its current Investment Projects business, no statement has been made concerning the overall impact of DIME and Devolution on the new Client organisation that will be created on both a route and central basis.	
	Recommended Action	Responsible – Network Rail
	NR should clarify to ORR the overall headcount and OPEX impact of its proposals under DIME and Devolution to enable the benefit of the changes to be assessed.	

⁹⁵ Comms Slides for ORR 11 Oct 2011.ppt, slide 16.

- 4.6.24 From a resource management perspective DIME will integrate multi-disciplined teams on a Region basis. For example, the arrangements for Western & Wales will allow separately funded programmes such as Crossrail, ERTMS, infrastructure changes to support the Intercity Express Programme (IEP) and electrification all to be managed by one regional business of Newco rather than separate discipline-led organisations as currently organised.
- 4.6.25 In the short-term this may introduce a delivery risk that workbanks will have to be re-cut regionally and the central control in each asset might be reduced from a delivery perspective. However, the revised arrangements should force NR to integrated delivery of all discipline activities on a Route basis which, depending on other factors such as access, may drive genuine effectiveness savings.
- 4.6.26 There is some evidence that NR does this on a discipline basis at present but the view appears to be that more might be achieved on a cross-discipline basis by considering programme integration in a variety of ways; for example geographically or by supply chain delivery vehicle. However, what can be achieved will depend on what outcomes are actually required. By making this change NR should be more attuned to the needs of the principal customers on each Route. The key to unlocking further efficiencies must lie in making better use of the existing access to the railway and potentially changing those arrangements to meet the combined objectives of both infrastructure owner and operators.
- 4.6.27 From an efficiency perspective we can see that there might be opportunities to rationalise the programme controls, commercial and finance functions as a result of integration on a Region basis as each region appears to be delivering all enhancements and renewals. This should therefore bring-together equivalent support functions that are currently replicated across the current Investment Projects and Asset Management organisations.
- 4.6.28 NR proposes to create an international consultancy business which NR may resource from its core business as required. This would be consistent with the approach taken by comparable railway organisations such as Deutsche Bahn; it also bears similarity to the British Rail Transmark business that existed before privatisation. From a resource management perspective this offers staff the opportunity to widen their experience with the benefit of returning expertise to the UK. Other railway administrations are also looking at the UK as an opportunity to export their expertise.⁹⁶
- 4.6.29 As it is intended that Newco will be a separate legal entity from 2013 NR will be able to ‘contest’ work that it would otherwise have handed directly to the current Infrastructure Projects organisation. From a resource perspective we consider that if the competition is real then NR will be forced to challenge its delivery approach and its attitude to risk. We have observed the glide-path from ‘client’ to ‘contractor’ organisations in the past and success does depend on leadership and instilling a contracting mind-set within the business.

⁹⁶ See *Hong Kong bidder says it can avoid chaos on Thameslink*, The Times, 6 February 2012, in which MTR is reported to want to run the Thameslink network in alliance with NR using MTR’s engineering expertise alongside NR’s programme team.

Alliancing

- 4.6.30 Perhaps the biggest expected impact on NR's Newco resources will be the proposed move to more collaborative methods of engaging with its supply chain. We have no sight of details from NR as to how it will re-mould its people and organisation to achieve the potential benefits of alliancing but it would seem from the experience of others that the 25-35% difference in outturn cost between investment authority and outturn is a prize worth pursuing.⁹⁷ However, we stress that the size of any efficiency gain must be tempered by what assumptions underpin the original authority estimate for any investment.
- 4.6.31 The potential benefits from Supply Chain Management are being considered by a concurrent ORR study and so are not considered here. However, alliancing – and other forms of collaborative arrangements – require a marked shift in approach and attitude from top to bottom in the owner's organisation.
- 4.6.32 Despite being a major UK client NR must not enter into alliance arrangements without carefully considering the behaviours of its senior personnel; attitude and behaviour count as much as competence and experience in successful alliance arrangements. NR must not be complacent on this point.
- 4.6.33 In addition NR need to consider the attitude and approach of individuals and functions within its business which support the project team; if support departments do not align to the approach this can frustrate the attempts to align interests and trust can be lost. In this regard we note the significant effort of Comparator C in one of its major programmes to examine the capability of its delivery organisation, but also all other directorates (engineering, human resources, commercial, procurement, legal, maintenance and operations) in ensuring that its programme would receive the requisite level of support; Comparator C authorised its programme at a significantly lower capital value on the basis that it would work as an organisation to reduce obstacles and 'clear the way' for the programme to succeed. Comparator C resolved that this approach was necessary as so many critical success factors sat within its control as an organisation, but outside the control of the responsible programme team. The approach was multi-faceted, for example:
- Engineering standards were challenged, including the approach of the owners of those standards;
 - The assurance process was tackled to drive innovation and reduce inordinate effort. This included a re-focussing of client engineers who were required to re-focus to a facilitative role to assist the design contractor rather than a reactive approach along the lines of 'send it back and let them get it right';⁹⁸
 - Engaging the right people at the right time required human resource processes to be fundamentally challenged to give the programme the authority to resource and demobilise as necessary;

⁹⁷ Scott B., Partnering in Europe – Incentive based alliancing for projects, European Construction Institute, Thomas Telford Limited, 2001, p. xv.

⁹⁸ See Scott B., Partnering in Europe – Incentive based alliancing for projects, European Construction Institute, Thomas Telford Limited, 2001, p. 45.

- The relationship with operations was reviewed in depth to improve access and minimise operational impact;
- Senior full-time maintenance representation was introduced to the core programme team to ensure that existing infrastructure could be maintained whilst coping with the overlay of new infrastructure and whole-life considerations were adequately addressed to ease the passage of completed works from the programme team to the asset owner.

4.6.34 The overriding emphasis here was on making the programme work first and foremost. This required all parties within the organisation to exercise foresight and required genuine top-leadership to lead by example.

4.6.35 It is necessary that a cold hard look at internal capabilities is taken by NR to understand real strengths and weaknesses and to address them as necessary before entering into collaborative relationships. This must be done for both Newco *and* the new NR client organisation.

Ref.	Secondary Issue	Alliancing - NR staff and organisational competency
16	NR is placing great emphasis on alliancing with both its customers and its supply chain. Alliancing – and other forms of partnering – can offer significant step-change cost savings advantages. However, success depends on many factors which NR must take cognisance of to avoid no savings at best and delivery failure at worst.	
	Recommended Action	Responsible – Network Rail
	If NR has not already done so it must critically assess the capability of its individuals and organisation to ensure that they constructively support delivery rather than continue with their traditional approaches. At the very least this will require committed, by-example leadership and appropriate direction to those who favour a traditional approach. It may also require the re-assignment of staff members who do not display appropriate behaviours.	

Summary – Resource Management

- 4.6.36 From the perspective of *Increased Efficiency* NR's approach to understanding the range and competence of its resources through Discipline Resource Management and resource planning tools such as the CITI model and RSM are strong approaches. NR has the ability to identify weaknesses in capability, to challenge the proposed resourcing of programmes now and in the future. The processes and tools at NR's disposal are at least on a par with the Comparators and should aid the transition into the post Devolution and DIME organisations where new competencies and capabilities will be required if NR is to perform in a more collaborative environment.
- 4.6.37 NR claim that DIME will result in a 10% leaner delivery organisation. However, it is not clear what corresponding changes will occur in the new NR client organisation. As stated elsewhere we expect that the capability of the NR Client organisation will require bolstering to ensure that it is capable of address customer needs on the one hand and setting credible output requirements on the other.
- 4.6.38 Under DIME, Newco is expected to bid for work against private competitors and it is also expected to work with its supply chain in a collaborative manner. NR must therefore consider the challenges placed on the capability and approach of its remaining complement of staff. Alliance arrangements also require changes in approach to functional parts of the organisation which support programme delivery teams; the delivery team does not deliver projects in isolation. This suggests that both the NR Client and Newco must align their approach to collaborative methods of working with its supply chain. If these matters are not addressed the promise of *Increased Efficiency* and *Reduced Overspends* (or lower than forecast cost) will be eroded.

4.7 PPM maturity Opinion

- 4.7.1 Due to the constraints of this study we have not performed a formal P3M3[®] assessment. However, P3M3[®]'s five levels of maturity consider that Level 3 requires organisations to demonstrate 'centrally owned processes which individual portfolios, programmes and projects can flex to their individual needs'. On the basis of the evidence viewed we consider NR's current organisation to be at least at Level 3 with elements of Level 4 maturity in respect of its ability to understand its resource capability in relation to its delivery obligations. Many of these observations will continue into the newly re-organised business from 16 April 2012 but NR is creating a number of discrete businesses which will need to be developed and assessed in due course. NR advises that its capability assessments have been placed on hold pending the new organisation.
- 4.7.2 Level 4 – NR's stated P3M3[®] target – is achievable subject to certain matters being addressed.
- 4.7.3 Whilst NR is evidently developing its programme controls to a point where it will automate reporting and unit cost comparison data is improving we consider that there is a need to improve to meet P3M3[®] Level 4 criteria which requires organisations 'obtain and retain specific measurements on its programme management performance and run a quality management organization to better predict future performance'. We consider that NR collects a wealth of data but the way it is collected does not make useful comparison of past performance readily achievable. NR should resolve this for the benefit of comparing the performance of its new Routes and Regions under Devolution and DIME respectively, and also the improvement of new ways of working with the supply chain, such as alliancing.
- 4.7.4 From a leadership and resource capability perspective we consider that NR's Devolution and DIME proposals have the potential to offer much in the medium to long term but in the short term we consider that they do introduce a degree of delivery risk at the back-end of Control Period 4 where NR must deliver work that was re-phased from the start of the Control Period.

5 Case Study Observations

5.1 Overview

5.1.1 This section of the report considers twenty case studies selected from the following Asset groups within NR:

No	ID	Project Title	Asset
1	101522	AC Switching Stations	IP Electrification
2	101527	PSU Selhurst LMD	IP Electrification
3	112004	Anglia Power Supply Upgrade	IP Electrification
4	104678	Colchester to Ardley Embankment	IP Civils
5	102726	Kirby Thore	IP Civils
6	115781-2	Glendon and Seaton Viaducts	IP Civils
7	103725	Rodbourne Embankment	IP Civils
8	100235	Glasgow Barrhead Kilmarnock	Enhancements
9	106979	Ayrshire Inverclyde Platform extensions	Enhancements
10	102266	North London Line	Enhancements
11	103113	Cotswold redoubling	Enhancements
12	GGRJ62	Hitchin Interlocking Renewal	IP Signalling
13	GGRJ47	EMSR North Erewash 1B - Tapton	IP Signalling
14	GGRJ98	Moorthorpe Resignalling	IP Signalling
15	107102	Manchester Area PP's & TD's	IP Signalling
16	DDDB03	Newport Area Signalling Renewals	IP Signalling
17	117642	SE-PL Ascot - Bagshot - 10/11	AM Track
18	112831	Wigan Station Junction	AM Track
19	118982	WES-HO Campaign BGL Up - 10/11	AM Track
20	116599	Scunthorpe Trent Junction S&C Renewal	AM Track

Figure 5.1: Case study projects reviewed

5.1.2 The case studies have been selected at random with the exception of the Enhancement case studies which were selected by ORR.

5.1.3 The case studies have been reviewed to provide insight to actual practice and project performance within NR. We issued NR with a questionnaire which sought qualitative and quantitative data as well as explanations for any recorded divergence from NR's delivery plan. Due to the constraints placed on this study our review of the case studies is desk-based only; none of the delivery teams were interviewed, although some clarifications were sought. Programme Controllers responsible for each Asset / programme were interviewed twice as part of this study.

5.2 Lines of Inquiry

5.2.1 We have reviewed the twenty case studies along the following lines of inquiry to understand key aspects of NR's approach:

No.	Line of Inquiry	Key Challenges
1	Objectives and scope	<p>We have considered the following with a view to understanding key decisions about objectives and scope were made and whether or not the benefits envisaged were realised:</p> <ul style="list-style-type: none"> • Business case • Stakeholders • Option selection and value engineering • RAMS and WLCC • Lessons learnt and benefits management
2	Schedule	<p>Schedule will drive the realisation of benefits and may also influence cost. We have therefore sought to understand the key reasons for any changes to the forecast completion milestone at various points throughout the project lifecycle.</p>
3	Cost	<p>In parallel with understanding changes to both scope and schedule we have sought to understand the impact on cost, from 'first announcement' of each scheme, through the stages of 'first full investment authority', 'contract award' and 'outturn'. The following has been considered:</p> <ul style="list-style-type: none"> • Key reasons for changes • Contingency held at full authority • Opex : Capex (the cost of NR project / programme management team)
4	Programme level observations	<p>In addition to the specific case study observations we have drawn on our programme-level discussions to consider overarching features of the management of each Asset.</p>

Figure 5.2: Case study lines of inquiry

5.3 Civils

5.3.1 Four case studies were submitted for our examination:

Project Name	Description
Colchester – Ardleigh (104678)	Earthworks
Glendon & Seaton Viaducts (115781 & 115782)	Brickwork repairs
Kirby Thore (102726)	Bridgeworks, installation of track slabs, earthworks and drainage in association with track renewals
Rodburne (103275)	Earthworks

Figure 5.3: Description of civils case studies

5.3.2 Summaries of key data for each project are given in Figure 5.4.

Objectives and scope

Business case

5.3.3 No specific evidence was tabled showing that business cases were prepared for these items, but the broad objectives, and the justification for them, can be inferred from the papers we were given. All the items, except the combined project on Glendon & Seaton Viaducts, were driven by the need to avoid or remove speed restrictions and were inserted into the business plan by the local asset manager. In the case of Kirby Thore, the paper seeking authority showed that track renewals and wider route utilisation strategies had been considered alongside the civils asset strategy in order to develop a scheme which addressed the respective objectives. The combined project on Glendon and Seaton Viaducts was driven purely by the priority assigned by the local asset manager due to asset condition.

Stakeholders

5.3.4 All three projects demonstrated an understanding of the respective key stakeholders.

Option Selection and Value Engineering

5.3.5 For Ardleigh – Colchester, we were advised that options were evaluated through a matrix process, which included consideration of cost; for Kirby Thore, the options considered were described to us; and for Glendon & Seaton Viaducts, the selection of options was not applicable owing to the nature of the necessary brickwork repairs. Otherwise, we saw no evidence of any option selection processes.

Name of project	Cost			Duration, GRIP 0 to 8			Contingency at GRIP 5, % of cost to go	Opex : Capex, %	Commentary
	Original Auth'y, £m	Authorised AFC, £m	Actual Cost, £m	Originally Planned, years	Authorised, years	Actual, years			
Ardleigh – Colchester	0.600	4.220	4.460	2.9	4.4	5.1	7	<p>Change in earthworks design saved costs, but caused delay, and cess layout had to change to install drainage.</p> <p>Temporary works greatly increased to deliver materials in available possessions and to satisfy neighbours.</p> <p>Increased safety and environmental measures required.</p>	
Glendon & Seaton Viaducts	0.902	0.902	0.873	0.6	0.9	1.6	57	Jobs combined to gain efficiencies. Contingency utilised to maximise use of scaffolding access. £28k contingency released (3%)	
Kirby Thore	3.469	6.587	6.229	2.5	2.5	5.0 *	5	Bridge and track renewals combined to achieve synergies, to meet need to raise PSR on WCML diversionary route. Land access difficulties led to inadequate early soils investigation. Late design changes. Uncertainties in NR authority jurisdiction due to combination of schemes led to delay, as did need for environmental approval. Site management achieved savings. * = Forecast	
Rodbourne	1.932	1.835	1.546	2.8	4.5	5.1	9	AFC at Contract Award = £1.443m, due to changed procurement strategy. Delay and increased cost due to unforeseen need to relocate dormice.	

Figure 5.4: Civils case study data

5.3.6 Ardleigh - Colchester was procured on a design and construct basis, in which the successful contractor chose the most cost-effective solution, and made savings by choices made regarding access to site. The works to Glendon and Seaton Viaducts were combined to achieve economies of scale and the scope was increased by flexing the contract so that the best use was made of the access scaffolding. In the absence of knowledge of other schemes competing for the use of available funds, we are unable to comment on whether the effective use of money which thereby resulted was justified by the increased efficiency. However, we accept that in general that there is seldom a shortage of areas of brickwork in such structures that would not benefit from advanced repairs. We saw indirect evidence that value engineering had taken place on Rodbourne, where a change in procurement strategy led to significant savings compared to the original plan, whilst for Kirby Thore we were told that value engineering was a common feature of progress meetings involving the NR Sponsor, the NR delivery team and the contractor's staff.

5.3.7 Changes in scope also featured at Ardleigh – Colchester, where toe drainage and a temporary access road were found to be necessary, in turn requiring changes to the cess walkway and troughing route. The scope of some parts of the Kirby Thore project was affected by changes to the design required to gain approval from the responsible NR engineer.

RAMS & WLCC

5.3.8 Apart from Kirby Thore, where we were told that WLCC issues were dealt with by the application of NR policies and Line Standards, there was no evidence that RAMS or WLCC had been considered. In the case of Rodbourne, we were advised that the work was undertaken because of the inability to maintain the track's line and level in the face of the underlying earthworks' instability.

Lessons learnt and benefit management

5.3.4 We were advised that the intended benefits were achieved, in particular that the speed restrictions involved in Ardleigh – Colchester, Kirby Thore and Rodbourne had been removed or avoided. Kirby Thore reported good performance by various contractors.

5.3.5 We were shown the output of a lessons-learnt exercise in respect of Kirby Thore, and were advised of the existence, but not the content, of a record of lessons learnt on Ardleigh – Colchester, whilst for Glendon and Seaton Viaducts and Rodbourne, we were told of lessons learnt informally. It is notable that in all four cases, effective negotiation of access to or effects on adjoining land was crucial to successful implementation. This was particularly relevant to the facilitation of surveys, soils and environmental investigations and temporary works, i.e. matters which are incidental to the scope of the permanent works themselves.

Ref.	Critical Issue	Increased Early Effort
17	<p>We observe that disruption would have been avoided in three of the cases studied if earlier effort had been made to consult adjacent landowners, facilitating surveys and investigations on site to identify factors which were incidental to the permanent works but which were significant risks to successful delivery. We also observe that NR already has an initiative in place called “Workbank Planning”, which aims to “lock down” estimates for renewals three or four years prior to the budget year in question,⁹⁹ from which £385 million (at 2009/10 prices) was planned to be saved during CP4 by building up to a level of about 70% of schemes being locked down in that way.</p>	
	Recommended Action	Responsible – Network Rail
	<p>We consider that this supports the conclusion that <i>Increased Early Effort</i> would benefit renewals works, which are not subject to whole (railway) system factors, but note that statistically such a conclusion may not be robust, given the few cases studied. We also note that NR has already made significant steps to achieving this aim in B&C.</p>	

Schedule

Key reasons for changes

5.3.6 Various delaying factors were encountered:

- Ardleigh – Colchester
 - changes to design of permanent works;
 - delivery of materials constrained by possession availability, requiring significantly greater temporary works, new fencing and double-handling;
- Glendon and Seaton Viaducts
 - difficulty negotiating access with landowner;
- Kirby Thore
 - gaining NR authority from panels with overlapping jurisdiction;
 - difficulty negotiating access with landowner;
 - consequential delays to soils investigation;
 - late option selection;
 - tendering on early design;
 - design changes;
 - gaining environmental approvals took longer than anticipated;
- Rodbourne
 - re-prioritisation;

⁹⁹ Presentation entitled “PPM Study_Supporting slides for CS”

- changes to procurement strategy (which saved cost);
- difficulty negotiating access with landowner;
- unexpected need to relocate dormice; and
- consequential winter working with more weather-related disruption.

Cost

Key reasons for changes

5.3.7 Various factors which affected costs were encountered:

- Ardleigh – Colchester
 - use of rates for feasibility estimates which were out-dated due to changes in market conditions and under-stated due to the lesser quantities on this project;
 - changes to design of permanent works which reduced costs in some regards but increased them in others;
 - delivery of materials constrained by possession availability, requiring significantly greater temporary works, new fencing and double-handling;
 - reptile relocation;
 - difficulties with the installation of the remedial works (soil-mix columns);
 - installation of badger netting;
 - installation of handrails on gabion wall;
 - prolongation;
- Glendon and Seaton Viaducts
 - savings due to combination of similar works into one contract, offset by execution of more work;
- Kirby Thore
 - difficulty negotiating access with landowner led to delays to soils investigation and to design disruption;
 - late option selection;
 - design changes;
 - gaining environmental approvals took longer than anticipated;
 - adverse weather;
 - delays to long-lead items;
 - unforeseen ground conditions and buried services;
 - effective site management and staff performance achieved savings;
- Rodbourne

- re-prioritisation;
- changes to procurement strategy (which saved cost);
- difficulty negotiating access with landowner;
- unexpected need to relocate dormice; and
- consequential winter working with more weather-related disruption.

Contingency held at GRIP 5 Authority

5.3.13 With the exception of Glendon and Seaton Viaducts, the contingency held on each project was in line with the guidance of 7.5% for Buildings and Civils Renewals.¹⁰⁰ As has been discussed, the contingency level on that project was used to fund additional works, arising in part from a favourable tender and in part from the combination of two sites where economies of scale could be realised.

5.3.14 We have been given no data on the level of contingency included in the sum first authorised.

Opex : Capex

5.3.15 All these projects were managed by teams responsible for a portfolio of projects, and NR's direct costs are not recorded against individual projects. Opex : Capex indicators are thus not available at project level.

Programme-Level Observations¹⁰¹

5.3.16 The B&C department manages approximately 4,000¹⁰² projects in various stages.

5.3.17 Historical (superseded) authority levels and AFC's are not readily accessible, as ORACLE Projects over-writes data with the current values. The portfolio is managed overall through what is known as a Visible and Agile Work Plan (VAWP), which includes targets for CP4 and provisional targets for CP5. The intention is to populate the VAWP with bottom-up estimates for CP5 by June 2012 – a significant step.

5.3.18 Programme Controllers are focussed on the management of annual AFC's and risks to outturn, including contingencies and accruals. Some 10% of works planned in any year may slip from one year to the next, with volumes being measured by the Real Economic Efficiency Measure and the Cost Efficiency Measure, which are audited by Arup as Independent Reporter on behalf of the ORR, which has not agreed the volume output policy. Some works are brought forwards to compensate, where practicable.

5.3.19 The contingency spreadsheet shows £26.8 million left in 2011/12 and, extrapolating the rate of expenditure to the year-end, the contingency as a percentage of the cost-to-go in the year is approximately 11%. Since 2011, B&C has used an Outturn Risk Review Process which highlights over-accruals and over-provision of contingency at quarterly meetings.

¹⁰⁰ Projects Work Instruction: Implementing Cost Risk Management (GRIP 4 to 8) v 2 September 2011 [8.3]

¹⁰¹ Interview with Simon Offley and Chris Sills, 11 January 2012.

¹⁰² 5,500 of the 9,500 projects in the portfolio are reported to have been closed.

Ref.	Good Practice	Outturn Risk Review
18	We observe that B&C use a process to highlight over-accruals and over-provision of contingency, and amend delivery business plans for future years to provide for savings that will accrue in future years due to actions taken to date.	
	Recommended Action	Responsible – Network Rail
	We recommend that these practices are deployed to other parts of IP, if not already in hand.	

- 5.3.20 Any tendency to provide surplus contingency in estimates at GRIP 5 is countered by re-authorising a project when the principal contract has been awarded. Contracts let to framework contractors are tendered from amongst the framework contractors, but some contracts are tendered independently.
- 5.3.21 Factorisation of projects is driven by the desire to perform groundworks in the summer rather than in the winter, and annualisation of funds was said to lead to inefficiencies.
- 5.3.22 Delivery teams are targeted on a Capex spend of £2 million per head (before consideration of Project DIME savings). Senior Programme managers are targeted with managing £250m annual expenditure, Programme Managers £125m / annum and Project managers £25m / annum.
- 5.3.23 Buildings & Civils advised that its RAMS and WLCC considerations are usually driven by asset policy and standards (principally design life) and significantly in respect of access. For example, the replacement of bridges in some locations might be justified in all other terms but is often not the selected option because access to the railway is prohibitively expensive and disruptive. In earth structures, the question was often not what renewal solution to adopt but the extent of the treatment. The task of trading-off whole-life decisions was stated to be in the judgement of NR’s Asset managers.

5.4 Track

Overview

5.4.1 Four case studies were submitted for our examination:

Project Name	Description
SE-PL Ascot - Bagshot - 10/11 (117642)	8.868 composite km of Cat 11 track renewals
Wigan Station Junction (112831)	9 equivalent units of S&C renewal with 147 yards of plain line renewal of rail, sleepers and ballast
WES-HO Campaign BGL Up - 10/11 (118982)	57.243 composite km of High Output Track Renewals
Scunthorpe Trent Junction S&C Renewal (116599)	16 equivalent units of S&C renewed like-for-like in modern equivalent form

Figure 5.5: Description of track case studies

5.4.2 Summaries of key data for each project are given in Figure 5.6.

Objectives & Scope

Business Case

5.4.3 No business cases were prepared. We were advised in each case that delivery of track renewals took place in accordance with the Route Asset Managers' requirements, driven by the Track Asset Policy.

5.4.4 There was evidence of the consideration of wider Route Utilisation Strategies, in that the High Output (HO) Campaign installed track to alignments which supported speed enhancements at no extra cost.

Stakeholders

5.4.5 All the projects classed the Route Managing Director, the Route Director and/or the General Manager and the Route Asset Manager as their stakeholders, except Ascot – Bagshot, which only cited the RMD. Wigan Station Junction also cited the Director, Track Asset Management as a stakeholder.

Option Selection & Value Engineering

5.4.6 Option selection procedures varied between the projects as follows:

- Ascot – Bagshot: the renewal was driven by track-bed condition;
- Wigan Station Junction: the specification detailed a “like-for-like renewal”, so single option development was not required, but a feasibility and compliance study was completed to ensure adherence to modern standards and requirements;

Name of project	Cost			Duration, GRIP 0 to 8			Contingency at GRIP 5, % of cost to go	Opex : Capex, %	Commentary
	Original Auth'y, £m	Authorised AFC, £m	Actual Cost, £m	Originally Planned, years	Authorised, years	Actual, years			
Ascot - Bagshot	2.04	2.04	2.02				0.7		Start date for plan not provided. GRIP Stage 6 achieved on plan made at GRIP 4, GRIP Stage 7 completed 6 months later.
Wigan Station Junction	4.12	3.95	3.82	2.2	2.2	2.5 *	0.3		Savings from modular design and installation in single blockade. Delay to final completion due to delayed delivery of long-lead time items and need to await new possession availability. * = Forecast
HO Campaign BGL Up	12.10	12.04	11.82	3.0	3.0	3.1	1.8		Plan was to deliver 57.276 composite km of HOTR. 3.007 ckm was cancelled, implying an unadvised section of 2.974 ckm was completed extra to plan. Track aligned to suit speed enhancement at no extra cost.
Scunthorpe Trent Junction	5.45	5.45	4.00	3.4	3.4	3.6	0.0		Savings achieved by use of modular S&C panels, refurbished point machines and more favourable contract rates than assumed.

Figure 5.6: Track Case Studies

- HO Campaign: we were told that justification for the option selected was not applicable, as the project was for Plain Line HOTR – but we were not given any information as to why the scope was varied from the plan;
- Scunthorpe Trent Junction: S&C renewals had to fit into existing geometry between non-renewed units, necessitating the existing geometry – no speed increases were required here.

5.4.7 Value engineering also varied between the projects:

- Ascot – Bagshot: no value engineering was undertaken;
- Wigan Station Junction: whilst no formal value engineering was undertaken, the project was evaluated for value and best practice throughout, with the use of modular S&C panels and delivery in a single blockade (saving design and stage works);
- HO Campaign: the opportunity was taken to install the track to a new alignment which supported speed enhancements at no extra cost;
- Scunthorpe Trent Junction: modular S&C panels were used here too, as well as the use of refurbished point machines.

RAMS & WLCC

5.4.8 RAMS was not specifically mentioned in any of the responses, except that in-bearer clamp locks were installed at Wigan with a view to improving maintainability and reliability.

5.4.9 The standard response in respect of each project was that whole life cost considerations are addressed in the Track Asset Policy, resulting in the specification.

Lessons learnt and benefit management

5.4.10 Lessons learnt and benefits management exercises were said to be not applicable, except in the case of Wigan Station Junction where, subject to a formal review upon final completion, successes and benefits were seen as:

- the avoidance of speed restrictions through delivery of a timely renewal;
- a reduction in the number of follow-up shifts required during junction renewal through the maximisation of core shift activities and productivity;
- improved future maintainability of Wigan Station Junction; and
- compliance with the Sponsor's specifications.

Schedule

Key reasons for changes

5.4.11 No schedule variances were advised in respect of Ascot – Bagshot or the HO Campaign, nor, in respect of the latter, was any explanation given for the cancellation of one item of work within the campaign or the slight delay to completion of the last item.

5.4.12 On Wigan Station Junction, the use of modular S&C panels enabled the works to be completed in one major possession instead of two, but a failure to deliver long-lead items prior to the possession has necessitated follow-up works which are planned for

20 February 2012. On Scunthorpe Trent Junction, the Taking Over Certificate was signed earlier than planned, owing to reduced follow-up works needed because of high quality of installation.

Cost

Key reasons for changes

5.4.13 Both S&C jobs, Wigan Station Junction and Scunthorpe Trent Junction, reported savings due to the use of modular S&C panels and we were advised that the AFC for the former scheme had increased between the original authority and the authorised sum due to inflation.

5.4.14 The situation varied across the projects:

- Ascot – Bagshot: the principal changes were increases in site costs and the cost of sleepers, offset by savings in haulage and unspent contingency;
- Wigan Station Junction: unexplained (except as noted in paragraph 5.4.13) savings arose compared to the provisions for early S&C design and principal contractor costs;
- HO Campaign: noting that there was no explanation for a reduction in scope of about 5%, there were significant unexplained variances on a number of cost codes, principally:
 - site costs: + £667 k (+ 10% of the original estimates for these costs);
 - haulage: + £96k (+ 11% of the original estimates for these costs);
 - ballast and other materials: - £320k (- 39% of the original estimates for these costs);
 - minor works on site and contingency: - £213k (- 2% of the original authority)
 - re-charges: - £473k (- 4% of the final AFC);
- Scunthorpe Trent Junction: it is noticeable that the cost codes used on this job differ significantly from those used on Wigan Station Junction, but the principal savings came from reduced costs, overheads and profit associated with site works, haulage and contingency .

5.4.15 Apart from the HO Campaign (where the situation was not advised to us) the final accounts have not yet been settled for any of the projects.

Contingency held at GRIP 5 Authority

5.4.16 The contingency declared at original authority (taken to be the inclusion of the work in the annual plan and equivalent to GRIP 3) was about 1.7% for plain line jobs, and 3.7% for S&C ones, both figures being significantly within the target of 15%¹⁰³. When the project budget had been set (taken to be equivalent to GRIP 5) had been set, the contingency shown in the cost codes was virtually zero, except in the case of the HO Campaign, when it rose to 1.8%. However, Wigan Station Junction included

¹⁰³ Projects Work Instruction: Implementing Cost Risk Management (GRIP 4 to 8) v 2 September 2011 [8.3]

significant amounts in the original estimate for S&C Design which was not spent, and the initial estimates for all jobs except Ascot - Bagshot contained a small amount (less than 1%) for “minor site works”, which could be considered as a form of contingency.

5.4.17 Contingency released against Ascot – Bagshot was said to have been used to support other projects. On the other hand, we were advised that contingency released from the HO Campaign was declared as efficiency.

Ref.	Good Practice	Portfolio management of contingency
19	We observe that contingency in track renewals is managed a portfolio level.	
	Recommended Action	Responsible – Network Rail
	We recommend that these practices are deployed to other groups of projects, where appropriate.	

Ref.	Critical Issue	Efficiency v Slippage
20	We observe that unused contingency on the HO Campaign has been declared as an efficiency, whereas the reason for net under-spend is not clear to us, given the large swings in cost components and the unexplained re-charge and the apparent 5% shortfall in delivery by volume.	
	Recommended Action	Responsible – Network Rail
	We recommend that the definition of efficiency is clarified and consistently applied to distinguish it from slippage or other causes of under-spend.	

Opex : Capex

5.4.18 All these projects were managed by teams responsible for a portfolio of projects, and NR’s direct costs are not recorded against individual projects. Opex : Capex indicators are thus not available at project level.

Programme-Level Observations

5.4.19 Unlike the teams managing renewals of other classes of assets, track renewals teams are part of the Asset Management directorate, not Investment Projects. We note the following general points:¹⁰⁴

- the rates used for contingency are extremely low compared to other types of projects. We note that portfolio risk management is used, whereby under-spends on one project are used to support others which might otherwise overspend;
- there is no over-planning of track renewals, so if an item slips or is partially delivered, there will be an under-spend unless it can be re-planned within the year or another job brought forward to offset the shortfall;

¹⁰⁴ Interview with Nick deBellaigue and Joan Heery, 11 January 2012

- volume is easier to measure in track renewals than in some other asset classes, owing to the greater repeatability of the work, but whilst volume is measured, the distinction between efficiency and net slippage is opaque;
- we also note that cost codes are not used consistently across the S&C projects, which is mirrored in our observations elsewhere;
- metrics are provided on the release of contingency and the prompt close-out of projects;
- it is possible that the low contingency rates on individual items are sustainable in cost terms because of the propensity for the portfolio to under-achieve its overall volume target;
- NR were unable to supply any information about whether there were any renewals advanced in order to achieve the HO Campaign in the case study, or more widely, so that an impression could be gained of efficiency versus effectiveness.

5.5 Electrification

Overview

5.5.1 Three electrification case studies were submitted for our examination:

Project Name	Description
Depot Gap Works – Selhurst LMD's	Development of depot feeding arrangements to support the introduction of new rolling stock.
Anglia PSU	Power supply upgrade to support delivery of train lengthening and all other service alterations on the Anglia route.
AC Switching Stations & DNO Supplies	3 new switching stns and 2 new DNO supply points

Figure 5.7: Description of electrification case studies

5.5.2 Summaries of key data for each project are given in Figure A.

Objectives & Scope

Business Case

5.5.3 No specific business case evidence was provided for the three electrification projects submitted for review. However, all three were able to explain the background to the need for the schemes implemented and made reference either to the design development remits or higher-level documents referring detailing the wider outcomes expected from power supply upgrade programmes on a route basis.

5.5.4 In the questionnaire responses Anglia PSU demonstrated the clearest understanding of the link between the delivered works and the underlying business need. 'AC Switching Stations and DNO Supply Points' appears to have been a residual project from the Southern PSU programme and sight of the original business objectives appears less clear. Selhurst LMD was part of the Southern Region PSU to support the introduction of new rolling stock.

Stakeholders

5.5.5 All three projects demonstrated an understanding of the respective key stakeholders through the management plan documentation provided. Proposals for Selhurst were initially rejected by Southern Trains.

Name of project	Cost			Duration, GRIP 0 to 8			Contingency at GRIP 5, % of cost to go	Opex : Capex, %	Commentary
	Original Auth'y, £m	Authorised AFC, £m	Actual Cost, £m	Originally Planned, years	Authorised, years	Actual, years			
Depot Gap Works – Selhurst LMD's	5.75	8.47* (7.25)	4.76	0.95	3.19	4.7	12-14%**	9%***	*£8.47m includes £1.2m of 'free-issue' material thus £7.25m is comparable with outturn of £4.76m. Project significantly delayed due to 'reorganisation' and 'delay due to difficulties experienced with construction method'. Reduced cost against that authorised is stated to be due to 'the keen contractual market at the time of tendering'. We consider a saving of that scale to be extraordinary and suspect that the original estimating was conservative. Project has yet to be closed-out. **Contingency range including and excluding free-issue material. ***Covers PM costs for 3 schemes; Selhurst, Streatham Hill and Brighton.
Anglia PSU	14.42	12.57	10.90	3.89	3.89	3.67*	4%**	8%	GRIP 8 forecast* to be complete slightly ahead of schedule but 'entry into service' occurred in December 2011 – just over a year before close-out. Reduced costs from 'Original Announcement' to 'Forecast Outturn'* are attributed to reduced costs of new transformers and value engineering by the project team during option selection. Of the £0.5m** contingency at authority £0.25m was handed-back as an 'efficiency release' upon confirmation of prices from successful tenderer.
AC Switching Stations & DNO Supplies	10.23	10.23	7.37	1.33	3.25	3.75	N/A	18%	Delay was encountered due issues with a supply chain contract and interface issues were encountered as the contracting strategy engaged multiple contractors for the design & installation. Despite this, the original forecast cost dropped due to 'free issue of equipment and split-out of design responsibilities'. NR unable to state authorised contingency due to 'budget transfer' but the project is forecasting a return of £2.86m to the business.

Figure 5.8: Electrification Case Studies

Option selection & Value Engineering

- 5.5.6 No option selection details have been provided for Selhurst but it is apparent that Network Rail followed its standard design development process. The other two projects are stated to have been developed and specified by central in-house Network Rail engineering functions.
- 5.5.7 No value engineering was evident for Selhurst. Development of Selhurst commenced in Control Period 3 before being delivered early in Control Period 4; thus Selhurst would appear to pre-date the requirement to undertake formal value engineering.
- 5.5.8 Although not formally undertaken for Anglia PSU value engineering initiatives are stated to have been included directly into the design with a saving of £1m over two sites and a delivery time saving of 6 months. This is consistent with the time and cost progression of the project. This project started GRIP 1 in 2009 and would have just pre-dated the requirement to undertake formal value management on enhancement projects.¹⁰⁵
- 5.5.9 ‘AC Switching Stations and DNO Supply Points’ was the only project to produce evidence of formal value engineering in which it considered the key factors affecting which location to install new equipment. This focussed development of the right option at an early stage.

RAMS & WLCC

- 5.5.10 Selhurst offered no view and the other two projects refer to RAMS and WLCC having been considered by a central function suggesting that Network Rail project management did not have oversight of the balance between ‘first cost’ and WLCC / RAMS considerations.

Lessons learnt and benefit management

- 5.5.11 Mixed responses were provided in relation to benefits management:
- Selhurst, despite completing in September 2008, declared that has yet to be formally closed-out;
 - ‘AC Switching Stations and DNO Supply Points’ considered benefits management to be a check on whether the installed equipment worked correctly enabled alternative high voltage network feeding; and
 - Anglia PSU which deemed success to be the introduction of the revised December 2011 timetable and that monitoring of the electrification system confirmed that there is no ongoing voltage or current regulation issues.
- 5.5.12 In respect of ‘lessons learnt’:
- Selhurst, having not been closed-out has not provided any specific lessons, but did provide a PSU-wide lessons learnt report which is discussed below;

¹⁰⁵ As a ‘Level of Control 2’ Enhancement Scheme Anglia PSU would have been bound to comply with ‘Risk & Value Management Plan: Enhancement Asset’, IP Enhancements, June 2010.

- ‘AC Switching Stations & DNO Supplies’ stated that a contractor experienced significant delay because NR did not assess its integration capability, failure to engage SCADA stakeholders led to re-work and re-design post contract award. Despite this the project was delivered under-budget through the ‘free issue of equipment and competitive tender’. This project also return £2.86m to the business from its investment authority of £10.23m which suggests that the authority included unstated contingency or was based on a conservative estimate;
- Anglia PSU was commissioned in December 2011 and stated that it planned to undertake its GRIP5-8 ‘lessons learnt’ review at the appropriate timing. A GRIP1-4 lessons-learnt report was provided which focussed on forward-looking issues concerning the Distribution Network Operator (DNO); a single-source supplier to NR and therefore a vital stakeholder.

5.5.13 The ‘lessons learnt’ document of November 2005 provided by the Selhurst project appears to relate to the wider PSU programme. It highlights several key issues:

- GRIP was seen as being followed too rigidly by Network Rail to the extent that sight of the overall objective was being lost. It was also felt that *“the early stages of GRIP encouraged massively inflated costs but heavy Sponsor challenge and the WAC process gave a sense of control and were able to significantly reduce the overall cost GRIP issues were generally overcome with strong sponsor management”*;
- Engineering was prone to making scope decisions of its own accord, preferential interpretation of standards was an issue and some engineering resources were constrained;
- A change in programme manager led to an overall reduction in the high-level nature of scope and costs dropped as a result. The programme appears to have been engaged in a rolling exercise to understand and challenge high-level scope.

Schedule

Key reasons for changes

5.5.14 From the explanations and data provided by NR we make the following observations in respect of schedule:

- Two projects took over double the original timescale to complete commissioning i.e. from ‘first announcement’ to ‘completion’. Delays were also experienced post investment authority;
- Selhurst appears to have spent over two years in project development. No details are available to explain this duration. The overall delay of 1.5 years in comparison with the original expected completion date was stated to be due to ‘reorganisation’ and ‘delay due to difficulties experienced with construction method’;
- ‘AC Switching Stations & DNO Supplies’ also seems to have spent two years in development and explained its delay of half a year post investment authority due to supply chain competence (which NR did not validate) and integration issues between multiple contractors;

- NR's works on Anglia PSU were commissioned on-time in December 2011 and the DNO's works remain to be completed in 2012.

Cost

Key reasons for changes

- 5.5.15 In comparison with the schedule issues outlined above both pre and post contract for Selhurst and 'AC Switching Stations & DNO Supplies', the following observations are surprising as both projects were delivered markedly below the forecast costs both at 'initial announcement' and 'investment authority':
- Selhurst:
 - Despite being delivered 1.5 years late in comparison with the original forecast completion date the project cost almost half its authorised value and a third less than the AFC forecast at contract award. The scale of the saving is stated to be due to 'the keen contractual market at the time of tendering'. We consider a saving of that scale to be extraordinary and suspect that the original estimating was conservative.
 - 'AC Switching Stations & DNO Supplies':
 - The forecast cost at investment authority dropped due to 'free issue of equipment and split-out of design responsibilities';
 - No contingency appears to have been authorised and the project is forecasting a return of £2.86m to the business which suggests that contingency was built-into the authority somewhere.
- 5.5.16 Although market conditions have driven savings in Control Period 4 we consider that this does not explain the full extent of the savings in view of the issues and delays reported. We therefore consider that these projects have been generously estimated.
- 5.5.17 Anglia PSU also demonstrated cost reductions between 'first announcement', 'investment authority' and 'outturn'. The explanation of the difference between 'investment authority' and 'outturn' are attributed to reduced costs of new transformers and value engineering by the project team during option selection. Of the £0.5m contingency at authority £0.25m was handed-back as an 'efficiency release' upon confirmation of prices from successful tenderer. Coupled with on-time delivery so far the savings here appear robust.
- Contingency held at GRIP 5 Authority*
- 5.5.18 The contingency provision at investment authority varied widely between Anglia PSU (4%, half of which was returned to the business) and Streatham (14% if 'free issue' material is discounted). The contingency value for the 'AC Switching Stations & DNO Supplies' scheme was not visible in either the investment authority paper or the Oracle Projects data provided.

- 5.5.19 NR currently recommends a contingency threshold of 8% and 5% for SP&C projects at GRIP 4 and 5 respectively.¹⁰⁶ Streatham was procured using a 'build only' contract and contract award would therefore have occurred at the end of GRIP 5.
- 5.5.20 Streatham is a relatively old project (completed within the first year of Control Period 4) and was therefore delivered before the current guidance, but it demonstrates that a high level of contingency was deemed applicable.
- 5.5.21 Anglia PSU – a recent project – was procured using a design and construct form of contract at the end of GRIP 4. The 4% contingency calculated at the end of GRIP4 is half the guideline of 8%. The project was able to release half of the 4% on the basis of the tender return values. This project demonstrated focussed value engineering and this is likely to have influenced better control over base cost and contingency.

Opex ; Capex

- 5.5.22 Anglia PSU is being delivered with a project management overhead of 8%. Selhurst's project management was 9% when shared with two other projects.
- 5.5.23 'AC Switching Stations & DNO Supplies' is higher at 18% but from the description of NR's management and the form of contracts it appears that NR undertook all contract management itself. This should therefore have led to a commensurate reduction in the contractor preliminaries attracted. As noted above, integration risk was an issue on this project which led to delay. There is a value decision to be made between so-called 'hub and spoke' management by NR in-house which, if managed well, can reduce overall costs if integration is management well versus the Anglia approach which appears to attract low NR opex costs with lower integration risk, but is at the expense of paying the contractor management preliminaries.

Programme-Level Observations

- 5.5.24 Electrification projects and programmes are managed under the 'Signalling, Power and Communications' (SP&C) Asset. Our observations at programme level for electrification are discussed at section 5.6 below.

¹⁰⁶ Projects Work Instruction: Implementing Cost Risk Management (GRIP 4 to 8) v 2 September 2011, section 8.3, page 15.

5.6 Signalling

5.6.1 Five electrification case studies were submitted for our examination:

Project Name	Description
Hitchin Interlocking Renewal	Type “B2” renewal of Hitchin interlocking with Interfaced SSI in a new enclosure also accommodating a renewed local control panel
EMSR North Erewash 1B - Tapton	Renewal in modern equivalent form of the life expired signalling and selected junctions
Moorthorpe Resignalling	Renew both Moorthorpe and Hickleton signalling control areas SSI and renew all life expired external signalling equipment and transfer control to York IECC
Manchester Area PP's & TD's	Renewal of the train describer systems (at 6 specified locations) in modern equivalent form due to obsolescence and reliability issues with the existing equipment
Newport Area Signalling Renewals Phase 1	Major re-signalling and re-control incl. Park & Gaer Jcns and Gaer chord enhancement

Figure 5.9: Description of signalling case studies

5.6.2 Summaries of key data for each project are given in Figure 5.10.

Objectives & Scope

Business Case

5.6.3 None of the signalling projects reviewed prepared specific business case documentation to justify the investments made. All projects stated that the main justification was the replacement of life-expired assets and the justification for each in respect of scope, timing, cost and benefits was detailed in each case in the Investment Authority papers. One Option Selection report was provided (Tapton) and this refers to cost-benefit analysis having been undertaken for eight options. We may not have been presented with the full extent of NR’s business case appraisal for these projects.

Name of project	Cost			Duration, GRIP 0 to 8			Contingency at GRIP 5, % of	Opex : Capex, %	Commentary
	Original Auth'y, £m	Authorised AFC, £m	Actual Cost, £m	Originally Planned, years	Authorised, years	Actual, years			
Hitchin Interlocking Renewal	18.73	18.73	17.43	4.6	6.6	6.9	12%	12.8%	This asset-condition renewal project was significantly re-evaluated in view of asset condition and acceleration of ERTMS which is estimated to have saved £34m in Network Change engineering access costs. Execution of the project was re-phased on four occasions due to: re-scope the project from full re-signalling to 'interfaced SSI' (VE as above); a delay of 1-year due to a clash with WCRM activity, a 6-month delay due to tester availability and a final 6-months due to a scope change. GRIP 6 was completed in March 2011 from a forecast date of December 2010 at contract award. Project was delivered within the original investment authority.
EMSR North Erewash 1B - Tapton	42.86	42.86	54.43	5.4	5.68	6.13	4.5%	3.5%	This major re-signalling renewal was re-authorised in 2008 following a) Supply chain delay in delivering concrete bearers to the planned timescales; b) a change in the scope of works to upgrade the goods line between Coney Green and Tapton Junction; c) a movement in the commissioning date from May 08 to September 08 due to WCRM priorities.; and d) scope change to include a training simulator to new requirements.
Moorthorpe Resignalling	10.10	16.90	16.11	1.89	6.12	6.42	11.6%	9.25%	Scope of project was increased between 2006 and 2008 authority papers to include Hickleton as well as Moorthorpe interlocking. AFC increase from £10.100m to £16.898m. This includes the following items that emerged during development; scope changes +£2.461m, removal of a 3 aspect signalling island and SPAD mitigation +£2.987m and the introduction of previously excluded schedule 4 compensation +£1.350m. The project spent c. 3 years in GRIP 4 development prolonging the forecast completion date from the original forecast for several reasons connected with extension of the interlockings affected, change from 3 to 4-aspect signalling, re-phasing due to LNE workload review and re-authority in 201 due to a possession clash with Water Orton. Re-authority resulted in EOT and a net saving in Schedule 4 costs by £0.215m.
Manchester Area PP's & TD's	2.67	1.16	1.16	0.61	0.59	1.0	8%	9%	Reduction due to decrease in scope to move panel processor work to another project (level of de-scoping not stated).

Name of project	Cost			Duration, GRIP 0 to 8			Contingency at GRIP 5, % of cost to go	Opex : Capex, %	Commentary
	Original Auth'y, £m	Authorised AFC, £m	Actual Cost, £m	Originally Planned, years	Authorised, years	Actual, years			
Newport Area Signalling Renewals Phase 1	166 / 189 (Orig. Phase 1&2)	158 (Phase 1 only)	148.43 (Phase 1 only)	5.97	6.47	7.96	8%	9.3%	<p>Major re-signalling re-authorized in May 2008 to split the scheme into 3 phases from an original 2. It appears that the original Phases 1 &2 had an AFC of £166m. The re-forecast AFC of £158m only appears to cover the re-scoped Phase 1 which suggests that the total revised AFC for Phases 1, 2 and 3 will be greater than the £166m (or £189m originally forecast); there is no articulation of the total revised AFC. Variance between £166m and £158m is stated to be due to:</p> <ul style="list-style-type: none"> • Scope Reduction – (£2,729k) this was from the Welsh Assembly Government who could not pay for the Gaer Junction turn back facility so the AFC was reduced. • Schedule 4 Costs paid centrally and removed from AFC – (£4,985k) • Contingency Hand Back – (£1,855k) <p>An Enhancement element to upgrade Ebbw Vale funded by WAG which has in-turn attracted NRDF funding to this project.</p>

Figure 5.10: Signalling Case Studies

- 5.6.4 Although there is no formal calculation of the benefits of each scheme the signalling Investment Authority papers viewed address a range of issues which informs decision-making. Key matters considered include:
- ‘Strategic fit’ – this considers the relationship of the proposed signalling renewal or enhancement with other initiatives, such as ERTMS and infrastructure enhancements. For example, Hitchin considers the timing of the asset condition led renewal with the constraints imposed by ERTMS (which influenced the interlocking solution to ensure future system compatibility, but allowed some de-scoping of the renewal to retain current external equipment which will be replaced once ERTMS is implemented) and the proposed Hitchin flyover (which necessitates the addition of an additional interlocking in the proposed renewal to facilitate the flyover);
 - ‘Consequences of authority not being granted at proposed commencement date’ considers the tension between consequences to asset condition, the effect of not meeting wider Delivery Plan obligations and planned access arrangements. The consequences are described qualitatively rather than quantitatively, but airing of the potential issues allows judgement to be made;
 - ‘Consequences of authority not being granted at a later date within next [5] years’ tests to the previous consideration and the potential consequences of planned slippage. This is a fair and sensible test and is used in the oversight challenge frameworks by Comparator C to strong effect. To be effective this requires a full view of the proposed business plan / workbank in order to achieve prioritise decision-making;
 - The ‘justification and benefits’ typically entails a statement emphasising that the key objective is to maintain the integrity of the equipment that needs to be replaced. Beyond this justification boils down to demonstrating cost efficiency savings.

Stakeholders

- 5.6.5 All of the project investment papers deal with ‘customer and stakeholder management’ under ‘corporate risk’. Newport provided a strong demonstration of striving to understand and address external stakeholder issues which led to combination of the major signalling with enhancement works to re-instatement of a crossover on the main lines at Gaer Junction and other works necessary at Park Junction and along the Gaer Chord to permit timetable operation of passenger services from Ebbw Vale to and from Newport Station from 2010/11 onwards. The enhancement work is funded by the Welsh Assembly Government (WAG) and a contribution from the NRDF.
- 5.6.6 ‘EMSR North Erewash 1B – Tapton’ presented a very comprehensive stakeholder communication plan. This project also considered the consequences of adopting a lower performance specification which was rejected to avoid customer issues and undermining the objectives of the ‘7-day railway’.

Option selection & Value Engineering

- 5.6.7 Apart from ‘Tapton’ which provided its final Option Selection report we were referred to the Investment Authority documentation for a description of option selection. It is apparent from the objectives and narrative that all of the signalling

projects take particular care over option selection to balance a wide range of competing factors, such as:

- Signalling Infrastructure Condition Assessments (SICA) generally promoting a need for affirmative intervention to avoid safety and operational consequences;
- Often, a need to look forward to future initiatives, in particular ERTMS, which might necessitate a certain choice of re-signalling and may allow some reduced scope to replace only those elements that must be replaced. Thus NR is making the assumption that ERTMS will be implemented in a certain timescale in its signalling renewals today;
- Following Rugby Re-signalling there seems to be a move to implement re-signalling projects in a larger number of shorter possessions rather than in one large blockade. This would appear to be a schedule risk mitigation;
- Often, a need to stick to long-ago agreed access requirements;
- A drive to reduce the total number of SEUs through rationalisation of track layouts;
- An emphasis on demonstrating efficiency.

RAMS & WLCC

5.6.8 ‘Tapton’ produced a RAMS Statement but this included the following statement which obviated from a RAMS approach, apparently on the basis of the client requirement to design the scheme to standards that prevailed at the time:

“GRIP procedure now includes the requirement to state RAMS targets during the development of signalling renewals schemes and monitor post commissioning performance. Whilst not undervaluing the clear engineering and commercial benefits that detailed RAMS analysis can offer to the railway signalling environment, following consultation with Engineering Peers the decision has been made to take a wholly realistic approach to Network Rail’s stakeholder management, in that many schemes using “conventional technology” will not deliver quantifiable performance improvement (other than a short term factor due to the provision of brand new equipment). East Midlands clearly falls into this strategy with a proposed SSI technology solution currently under consideration.”¹⁰⁷

5.6.9 ‘Tapton’ was developed in Control Period 3 and delivered early in Control Period 4 however it contrasts with ‘Newport’ which was developed and delivered over a similar timescale which did report Mean Time Between Failure (MTBF) analysis which at least points to some work on reliability.

5.6.10 The other case studies all stated a similar position for both RAMS and WLCC which was that these considerations did not apply as the ‘like-for-like’ renewals which required compliance with current standards. It could be that RAMS and WLCC analysis has been undertaken at standards / policy level to ensure consistent application but it would appear that such decision-making is generally not evident at project level.

¹⁰⁷ East Midlands Signalling Renewals, RAMS Statement, August 2005, page 9.

- 5.6.11 Although the projects all responded that WLCC analysis was not formally undertaken it can be seen from the Investment Papers that whole-life thinking is implicit in some of the objective-setting and scope decision-making.
- 5.6.12 We note the concentration in signalling projects to focus on reducing the overall number of SEUs and also reducing the first-cost of installation. What is not apparent from the evidence viewed is whether the same rigour is being applied at a strategic level to ensure that solutions are appropriate on a whole-life basis embracing the principles of both RAMS and WLCC. Such an analysis may create a tension with the short-term objectives of reducing first-cost and meeting Control Period efficiency targets. We consider that such analysis should be available to justify the overarching approach.

Lessons learnt and benefit management

- 5.6.13 No view of the treatment of benefits management can be provided as the projects reviewed are generally at the point between GRIP 6 (construction, testing and commissioning) and 7 (scheme handback) and therefore no formal close-out evaluation is available for review.
- 5.6.14 Although the Investment Authority papers viewed illustrate general intent they do not present specific outcomes or outputs which the delivered projects can be specifically measured against. This would appear to be an area that could be tightened, particularly in view of the RAMS and WLCC observations made above.
- 5.6.15 In respect of ‘lessons learnt’ a familiar pattern emerges:
- Hitchin reported itself a success and noted more positive observations than problems in its own review. NR / signalling contractor relations were stated to be collaborative which allowed problems to be overcome the key issues associated with missing or poor source records and legacy equipment. As discussed below, this project obviated £34m of Network Change access costs after the scheme was re-evaluated in light of future ERTMS works. A key lesson therefore, is to take advantage of future changes in solution optimisation today;
 - Moorthorpe produced a very open and honest ‘lessons’ learnt’ document which highlights a long list of key issues including communications, process and documentation. Specific issues included design co-ordination issues with an interfacing project which could have been addressed in development; this resulted in development work being repeated in detailed design. Decision-making based on standards compliance rather than value engineering was raised as an issue;
 - ‘Tapton’ also produced a long list of issues which appear to underpin the need for this project to require re-authority;
 - Newport’s approach to ‘lessons learnt’ was thorough and highly structured which appears to have been as a result of this being led by the Risk and Value specialist. Newport undertook this exercise after each commissioning and key lessons reported included focus on people and behaviours, integrated planning an de-risking the schedule. NR fully involved its supply chain in this exercise which suggests and enlightened and collaborative approach.

Schedule

Key reasons for changes

5.6.16 From the explanations and data provided by NR we make the following observations in respect of schedule:

- Hitchin's overall delivery timescale extended by a total of two years from the timing originally envisaged. Completion was delayed by three months in comparison with the forecast delivery date, suggesting that possessions were required at Easter 2011 in addition to December 2010. The decision to revert from full re-signalling to 'interfaced SSI' in view of the future intention to implement ERTMS extended the GRIP 4 timescale. Although the timescale extended this is stated to have achieved a £34m saving in Network Change Access costs. The project was put back by one year due to a possession clash with WCRM which appears to have been out-with the control of the project. A further delay of six months was incurred due to a lack of tester availability;
- 'Moorthorpe' was delivered over four years from the forecast at 'initial announcement'. GRIP 6 was completed in September rather than May 2011. The re-scheduling of this scheme is stated to be due to scope change (the addition of Hickleton interlocking and lineside equipment), a change from 3 to 4 aspect signalling, re-baselining of the LNE workload and an extension of time due to a possession clash with another project;
- 'Tapton' was delivered three months later than forecast at 'initial announcement' due to changes in the scope of the track scope allied to this re-signalling project. This required re-authority to increase the budget;
- 'Newport' was commissioned six months later than original envisaged at 'initial announcement' and two months after the date forecast at investment authority. The principal reason for the latter delay is stated to be due to the installed signalling system having an unforeseen lack of capacity on the installed interlocking. NR state that no re-authority was required to address this major issue and all costs were absorbed by the supplier;
- 'Manchester Area PPs and TDs' was delivered two months later in comparison to 'original announcement' and three months later than forecast at investment authority. NR offered no explanation for the difference.

Cost

Key reasons for changes

5.6.17 Although none of the projects delivered on or ahead of schedule a mixed picture emerges in respect of cost variance:

- Despite significant post-contract delay Hitchin delivered within its investment authority and authority at 'initial announcement';
- 'Moorthorpe' experienced scope increases between the 2006 and 2008 authority papers to include Hickleton as well as Moorthorpe interlocking resulting in an AFC increase from £10.100m to £16.898m. Project outturn was £16.11m;
- 'Tapton' sought an increased authority of 27% to address a variety of post contract changes including a) Supply chain delay in delivering concrete

bearers to the planned timescales; b) a change in the scope of works to upgrade the goods line between Coney Green and Tapton Junction; c) a movement in the commissioning date from May to September 2008 due to WCRM priorities; and d) scope change to include a training simulator to new requirements;

- The authority history for ‘Newport’ is complex to follow but it appears that the original authority dropped from £166m (or £189m) for Phases 1 and 2 to £158m authority for Phase 1 only. The drop between the authority and the current outturn forecast of £148.4m is comprised of reduced third party scope (£2.7m), central payment of Schedule 4 costs (£5m) and contingency handback (1.9m);
- ‘Manchester Area PPs and TDs’ cost dropped by £1.5m due to de-scoping. It was delivered for the exact investment authority granted.

Contingency held at GRIP 5 Authority

- 5.6.18 The contingency provision at investment authority was 12% for both Hitchin and Moorthorpe, 8% for both Newport and Manchester and 4.5% for ‘Tapton’.
- 5.6.19 NR currently recommends a contingency threshold of 8% and 5% for Signalling projects at GRIP 4 and 5 respectively.¹⁰⁸ All of the projects were procured using NR’s bespoke design and construct contract which suggests procurement at the end of GRIP 4 and the higher contingency of 8% as a guideline.

Opex ; Capex

- 5.6.20 The cost of NR’s Project Management effort for all projects was c.9% with the exception of Hitchin at almost 13% and Tapton at a lower value of 3.5-5% (depending on how much of the sunk costs are project management only).

Programme-Level Observations

- 5.6.21 IP S&E manages approximately 2060 projects¹⁰⁹ in various stages, covering assets managed by the Asset Management SP&C department.
- 5.6.22 The portfolio is managed overall through spreadsheets, including those cited in the previous paragraph, and there is some evidence that portfolio management is being adopted as a means of managing contingency provisions across all the projects – signalling (including level crossings) monitor a “programme reserve”, the net total of which is approximately £37.45m over the years from 2009/10 to 2015/16. However, the electrification spreadsheet has not been populated with such data.
- 5.6.23 The variances noted in the case studies show improvements with respect to more recent projects, and we have seen evidence of a new efficiency scorecard procedure. However, the inherent difficulty in consistently measuring physical progress in projects which are different in nature leads to uncertainty in reporting. Physical progress can be measured in a number of ways, including:

¹⁰⁸ Projects Work Instruction: Implementing Cost Risk Management (GRIP 4 to 8) v 2 September 2011, section 8.3, page 15.

¹⁰⁹ Spreadsheets entitled “Wk4 STR 07 Multi CP E&P 06-Jan” and “Wk4 STR 07 Multi CP Signalling 06-Jan”

- by earned value analysis, which generates schedule and cost performance indicators (which is the most robust method of those listed here, but which requires detailed analysis of the effectiveness of the work done and paid for);
- by monitoring the number of milestones which have been met (but which does not assist in assessing what to do if compliance is not maintained);
- by monitoring progress against plan with the delivery of unit “volumes” of repeatable work items (but which only assists in assessing progress of standard items of work, and does not address progress with other types of activity);
- by monitoring physical progress empirically (but depends on the project manager’s assessment, which may be subjective); or
- by comparing the cost of work done to the anticipated final cost (but which by definition accounts for wasted costs and is thus unreliable).

- 5.6.24 NR adopts a number of different methods of assessing physical value, depending upon the level of complexity of the project concerned. It favours the use of volumes, as that method can also be used to demonstrate improving efficiency over time.
- 5.6.25 There is evidence that earned value analysis is being rolled out to signalling projects,¹¹⁰ but physical progress is also measured by reference to milestone achievement and volumes, which methods have limitations. For example, inconsistencies have been observed in one list of about 500 signalling and level crossing projects,¹¹¹ where only 7% had volumes described, compared to 85% in wider lists of 1600 such projects¹¹² and (not unexpectedly) compared to 6% in a list of about 430 electrification projects.¹¹³
- 5.6.26 The 2011-12 full-year forecast for Signalling indicates an under-spend of 7.9%, and that for E&P, 16.1%. We were shown no system-wide data on physical progress.
- 5.6.27 At the end of 2009/10, contingency provisions on a sample of signalling and electrification projects ranged between 0 and 30% of the respective projects’ costs to go.¹¹⁴ We were shown some data on contingency provision for 2011-12, but the list of projects did not reconcile with that from which the budgetary performances were calculated, so we are unable to draw any conclusions about progress with contingency management and project governance.

¹¹⁰ Presentation entitled “Period 9 MBR Pack LS 11-12 09-Dec” (covering one operational area only, i.e. LNW & Scotland)

¹¹¹ Spreadsheet entitled “Wk4 Next Step 09-Dec”

¹¹² Spreadsheet entitled “Wk4 STR 07 Multi CP Signalling 06-Jan”

¹¹³ Spreadsheet entitled “Wk4 STR 07 Multi CP E&P 06-Jan”

¹¹⁴ Presentation entitled “SPC ERM P13 v5 (SP&C Asset Executive Review Meeting Period 13 - 2009/10)”

5.7 Enhancements

Overview

5.7.1 Four Enhancement case studies were submitted for our examination:

Project Name	Description
Glasgow Barrhead Kilmarnock (GBK)	Provision of additional infrastructure to allow a half-hourly service to be introduced between Glasgow and Kilmarnock.
Ayrshire Inverclyde Platform Extensions (AIPE)	<p>To facilitate the introduction of new, longer trains on the Ayr and Inverclyde routes, Transport Scotland commissioned NR to deliver the following works:</p> <ul style="list-style-type: none"> • Extension of a total of 52 platforms at 32 stations on the routes; • Signal, telecoms and E&P equipment relocation to facilitate platform works; • Fitting of equipment to allow use of Selective Door Opening (SDO) technology on the new trains at stations where physical constraints mean that platforms cannot be extended at reasonable cost (Greenock West and Stevenston); • Platform and structures gauging for new train route clearance. • Capacity enhancement to OLE feeder stations at Eglinton Street, Port Glasgow and Ardrossan South Beach to allow running of the new trains and to “future proof” the electrical supplies at these locations to accommodate planned future growth; • Stabling capacity enhancement at Ayr Townhead depot.
Cotswold re-doubling	<p>This project appears to be funded from a variety of sources: initially from the NR Out-Performance Fund and, subsequently, from; DfT HLOS funding, Signalling Renewals and the 7-Day railway Fund. Perhaps because of the governance of the funds NR has conducted a full business case analysis which returned a BCR of 8.29.</p> <p>The current infrastructure between Oxford and Worcester is operating at or close to 100% capacity for significant parts of the day and prevents further services being introduced.</p> <p>This project will reinstate the original double-line track between Charlbury and Evesham; improving its performance and increasing capacity whilst sustaining reliability for passenger and freight operators and introducing a robust hourly clock-face timetable.</p> <p>This scheme will also enable the introduction of the Intercity Express Programme (IEP) throughout the Western Route as per DfT specifications for increased capacity and journey time improvements.</p> <p>The scheme is time-constrained and must be commissioned by August 2011 to achieve the HLOS outputs and avoid impacting access required by the Crossrail and Reading projects.</p>

Project Name	Description
North London Line	<p>This major project is part of a TfL initiative, set out in its Transport 2025 Strategy, to increase the frequency of the North London Line train service to a minimum of four trains per hour on all of the routes served.</p> <p>The increased capacity requires significant work to the rail infrastructure, including new signalling, track, rebuilding bridges and work at stations.</p> <p>TfL's new fleet of Class 378 units will be lengthened to 4-cars during the life of the Project, necessitating platform extensions at stations along the Route.</p> <p>All the above achieved while maintaining capacity for freight both at present levels and those used for growth as set out in the Cross-London RUS.</p> <p>This programme attracted £250m of external funds and was jointly developed by Network Rail and Transport for London ("TfL"), the promoter for the NLL as part of the London Overground network. As it is also one of the projects to improve transport links to the 2012 Olympics and the Olympic Delivery Authority ("ODA") is therefore a major stakeholder and funder of TfL.</p> <p>As the funds are tied to the programme for the Olympics and this constrained timescales, necessitating activities being carried out in parallel rather than sequentially.</p> <p>At the time of first full investment authority there was a funding gap of around £18m</p> <p>The project comprises two work packages; one managed by Network Rail ("the Network Rail works"), the other by TfL ("the TfL works"). These were both included within NR's authority as, under the proposed commercial arrangements with TfL, Network Rail has a financial interest in both, sharing the benefit of cost saving or risk of cost overrun.</p> <p>The scope of the Network Rail works was cut-back to remove a four track section in the Camden Road area as part of a joint initiative with TfL to reduce the cost of the project to an affordable level. This was largely successful although a funding gap remains and it necessitated a corresponding reduction in the planned train service. The revised train plan was modelled to confirm that the change of scope can support the expected train service.</p> <p>The TfL works (also referred to as Phase 1A) cover the construction of a connection from the north end of the East London Line ("ELL") to run alongside the NLL from Dalston Junction to Highbury & Islington Station where the ELL services will terminate and passengers will change between the ELL and NLL services. Whilst TfL is responsible for managing these works, Network Rail might deliver part of the scope and will have an asset protection role. Network Rail will also be the Infrastructure Manager for the railway created by the TfL works (EMG minute 08/136) and will thus need to accept the TfL design.</p> <p>Previously included within the authority was work to the signalling on the Gospel Oak to Barking Line ("GO-B") to improve the headways between Upper Holloway and Woodgrange Park. This includes the provision of additional signals and modification of existing systems; the opportunity is being taken to close Harringay Park Junction signalbox and move control of its area to South Tottenham signalbox. Again this is needed to support the proposed train service, but this work is not included within the commercial arrangements between TfL and Network Rail and is funded separately through P-TIF and Signalling renewals. As agreed at the Network Development MBR of September 2008, therefore, this scope and authority has been taken out of the NLL Capacity Enhancement project and set up as a separate Project.</p>

Project Name	Description
North London Line (cont.)	<p>Also included within the Network Rail works is the construction of a turnback at Willesden high level to free up capacity at Willesden; this is being promoted by the Head of Route Planning and will be funded from the Network Rail Discretionary Fund.</p> <p>Another Network Rail project (107905) is dealing with other alterations to the existing infrastructure to accommodate the new trains, replacing track circuits in areas not being resignalled and work to platform coping stones to enable the new trains to run on the NLL.</p> <p>Further projects funded by TfL and the train operator for the NLL (“LOROL”) deliver other improvements to the stations on the line, e.g. improved lighting and tactile paving, and Network Rail is working closely with TfL and LOROL to co-ordinate the works at each station.</p>

Figure 5.11: Description of Enhancements case studies

5.7.2 Summaries of key data for each project are given in Figure 5.12.

Name of project	Cost			Duration, GRIP 0 to 8			Contingency at GRIP 5, % of cost to go	Opex : Capex, %	Commentary
	Original Auth'y, £m	Authorised AFC, £m	Actual Cost, £m	Originally Planned, years	Authorised, years	Actual, years			
Glasgow Barrhead Kilmarnock (GBK)	25.13	29.59 (30.75)	29.95	2.10	2.2	4.2	9%	8%	NR was engaged to deliver this project at the end of GRIP 4. The project was re-authorised to £30.75m in August 2010 following the receivership of the main contractor which left the project incomplete. The project advises that double-tracking was achieved by 13 December 2009 achieving operational functionality, but other elements of the work were not completed until 11 February 2011. The latter was reportedly due to the liquidation of the main contractor. The increase in the original authority of c. £25m (a GRIP 3 estimate) to £29.5m (based on tender returns) was incurred due to increased scope, contractor, materials, project management and contingency costs. Some estimated costs decreased including land and some scope reduction. Renewals contributed some funding due to the scope enabling future renewals to be avoided. The August 2008 authority paper states that the additional costs were RAB funded. Although the project was delivered later than planned overall it was delivered within the revised investment authority following the main contractor's receivership and almost within the August 2008 authority.

Name of project	Cost			Duration, GRIP 0 to 8			Contingency at GRIP 5, % of cost to go	Opex : Capex, %	Commentary
	Original Auth'y, £m	Authorised AFC, £m	Actual Cost, £m	Originally Planned, years	Authorised, years	Actual, years			
Ayrshire Inverclyde Platform Extensions (AIPE)	21.95 / 17.87	16.53	14.00	2.30	2.30	2.22	16%	18%	<p>The objective to implement platform extensions to accommodate the introduction of new Class 380 trains from September 2010 was achieved. The original GRIP 3-4 AFC of £21.95m (June 2008 ERIP) or £17.87m (from ORR Delivery Plan) was an 'efficient emerging' estimate which included depot and OLE scope which was later removed. The £16.528m authorised had work both added and omitted at the point of tender returns, some of which was diverted to a different project. The £16.528m was also stated not to include infrastructure adjustments (route clearance and OLE alterations) which might have been needed and it is understood that these works were authorised separately. Thus no comparison between the efficient emerging cost estimate of £17.87m (or £21.95m) and outturn can be made without consideration of a wider portfolio of projects. Post authority NR state that an outturn of £14m was achieved due to de-scoping agreed with Transport Scotland and a lower contract award value than estimated.</p> <p>The project was originally scheduled to be substantially complete in September 2010 (according to 2009 authority paper) and was delivered ahead of schedule in August 2009.</p>

Name of project	Cost			Duration, GRIP 0 to 8			Contingency at GRIP 5, % of cost to go	Opex : Capex, %	Commentary
	Original Auth'y, £m	Authorised AFC, £m	Actual Cost, £m	Originally Planned, years	Authorised, years	Actual, years			
North London Line (NLL)	280.74	264.22	274.62	4.61	4.61	4.76	13%	6%	<p>28th October 2008 NR Authority Paper stated that the new SLC2K service would be introduced in January 2011. The service did not commence until 22 May 2011. This suggests a delay to completion and benefits realisation but NR advised that the introduction of the new service was re-set to June 2011 implying that the programme delivered its obligations on-time. However, this change of deadline is not reflected in any of the re-authority papers. The project is stated to have been completed in the face of challenging Olympic-driven funding milestones and a challenging interface with NR's national FTN programme.</p> <p>The forecast and actual cost position is complicated by the respective elements of the scheme to be delivered by NR and RfL. The total authority sought by NR in October 2008 was £346.738m; the NR delivered component of this was £280.738m and RfL-delivered £66.0m. £3m of the NR total was subsequently funded by Access for All for works at Camden Road and Gospel Oak Stations. However, it appears that removing the A4A works did not reduce the overall authority for the NR-delivered works. The £3m appears to have been transferred to the A4A budget and a further £1.637m was transferred to a maintenance budget in relation to 'IBJ & hollow bearers scope'¹¹⁵ The authority remained at £280.8m and the transferred budget appears to have been used to revise the authority to pay for a contractor's final account.</p> <p>Despite the issues raised in the October 2010 Position Paper which forecast a potential overspend of the target cost agreed with RfL, NR presently forecasts that it will deliver all works for £274.62m; within the £280.74m NR budget.</p>

¹¹⁵ See F3 and F4 - Revised project Authority.xlsx

Name of project	Cost			Duration, GRIP 0 to 8			Contingency at GRIP 5, % of cost to go	Opex : Capex, %	Commentary
	Original Auth'y, £m	Authorised AFC, £m	Actual Cost, £m	Originally Planned, years	Authorised, years	Actual, years			
Cotswold Re-doubling	48.50	66.80	59.50	2.4	4.9*	4.9	8%	6%	Schedule was re-phased to commission in August 2011 from March 2009 in order to facilitate TOC re-doubling of Chipping Camden tunnel. The project was delivered on-time to the timescale subsequently agreed. Original forecast AFC of £48.50m rose to £66.80m to account for improved definition of scope. Project was delivered for less at £59.50 due to value engineering and EID initiatives including modular signalling (£0.17m), internal resources (£0.23m), Workbank Planning (£1.0m), plain line track (£0.3m) and other VE savings (£0.6m).

Figure 5.12: Enhancements Case Studies

Objectives & Scope

Business Case

5.7.3 A mixed position is evident in relation to business case justification for the projects reviewed:

- The North London Line (NLL) programme was driven and predominantly funded by TfL / RfL (NR funded £85.7m and RfL £253.5m). Although the scheme represents an enhancement overall it appears that the NR-funded works (as opposed to the NR-delivered works) are renewals rather than enhancements. It is perhaps for this reason that NR has not undertaken a full business case appraisal of the whole scheme; presumably this fell to RfL and its part-funder, ODA, to undertake. NR did however prepare a business case analysis for the Willesden turn-back element of its works as it was specifically funded by the Network Rail Development Fund (NRDF) in accordance with the governance arrangements for that fund. Although a formal business case appraisal was not prepared the overall intent and outputs of the scheme were outlined in the NR authority papers. Although not viewed by us, it is assumed that these requirements reflect the formal agreement between NR and RfL to secure the funding;
- NR's customer for 'Glasgow Barrhead Kilmarnock' (GBK) was Transport Scotland and the scheme is stated to be a RAB funded enhancement. There is no evidence of an NR specific business case. As Transport Scotland was the customer for the scheme we assume that it prepared the business case in accordance with its own governance;
- Ayrshire Inverclyde Platform Extensions (AIPE) was funded by Transport Scotland. As with GBK no NR business case is apparent but the investment authority paper provides an outline of the objectives and expected benefits;
- Cotswold Re-doubling was funded from a variety of sources: initially from the NR Out-Performance Fund and, subsequently, from; DfT HLOS funding, Signalling Renewals and the 7-Day railway Fund. Perhaps because of the governance of the funds NR has conducted a full business case analysis which returned a BCR of 8.29.

Stakeholders

5.7.4 All projects demonstrated awareness of key issues in the relevant authority papers pertaining to customer relations and stakeholder management:

- NLL presented a particularly complex programme which was time constrained. In addition, the funding arrangements required NR to enter into a target cost contract with its principal funder, TfL / RfL, which was in turn funded by the ODA. We are given to understand that commercial issues remain outstanding on this project but we have not been advised of the details. NR was also constrained by its own national FTN programme which appears to have created schedule challenges during delivery. NR also had to address interfaces with local authorities and seek planning consents for some works;
- Although NR delivered the majority of the NLL works, RfL / TfL also delivered works to extent the East London Line from Dalston Junction to Highbury and Islington station; NR had an asset protection role in this area during delivery

and inherited maintenance responsibility for these works upon completion. Despite these challenges the programme is stated to have been delivered within the agreed ORR Delivery Plan and within the AFC for NR works however it is not clear whether or not outstanding funding issues remain;

- GBK's principal customer was Transport Scotland and due to the nature of the works (platform extensions and associated works) NR had to engage with a variety of lineside stakeholders and the local authority. The project had to seek re-authority in part due to a landowner refusing to sell land or provide access rights. Throughout all of our reviews of NR's activities we note that access is a repeating issue which is often outside NR's control and has the potential to increase cost. This project delivered its operational element in December 2009 but did not complete entirely until February 2011; NR stated that this was mainly down the receivership of the main contractor;
- The AIPE programme was time-driven and as these infrastructure improvements were required to support the introduction of new Class 380 trains, NR's stakeholder interface included all key members of the programme board including Transport Scotland, First ScotRail and train manufacturer. The Stakeholder communications plan is also notable for the recognition of very specific stakeholders such as Clyde Port and Prestwick Airport, albeit the project recognises that issues relating to both of these stakeholders could have been identified earlier;
- NR state in its documents that Cotswold re-doubling presented it with a politically sensitive set of stakeholders including Lord Adonis and Prime Minister. NR also appears to have invested effort in its customers, First Great Western and the sole freight operator serving Long Marston. As this scheme is focussed on delivering and sustaining the target Public Performance Measure (PPM) for First Great Western (FGW) Cotswold Line services of 92.6%, whilst also providing for additional passenger services and off peak freight paths, the scheme has a strong customer-driven focus.

Option Selection & Value Engineering

5.7.5 All projects reviewed present evidence of option selection incorporating value engineering focussed on reducing the first-cost of the works in each case:

- NLL appears to have been the subject of an intense option selection and value engineering exercise focussed on securing the absolute requirements agreed with funders RfL / TfL and ODA. Unmoveable requirements included a fixed commissioning schedule of January 2011, ODA requirements absolute, a capex limit of £328m, a PPM average of less than 90% unacceptable and a minimum of 4tph. Myriad value engineering savings were devised to achieve these constraints. A major value management (de-scoping) exercise was undertaken in GRIP 4 which resulted in the reduction of the four track section in the Camden Road area. This decision might have been made earlier however had the programme had access to a live 'rolling' estimate;
- The NLL evidence provided suggests that value engineering was undertaken with strong RfL / TfL input in order to achieve the funding criteria which suggests that whole-life considerations were secondary. If not already undertaken NR might consider the consequences of the value engineering decisions on the long-term maintenance of the railway;

- GBK undertook a facilitated value engineering workshop to determine the relative merits between a short or long dynamic loop between Lugton and Stewarton station. A marking system was devised which allowed a variety of factors – including RAMS considerations – to be weighed against the cost of the options. It is also noted that GBK was re-authorised to include for items which were considered to be important with regard to the future maintenance and operation of the railway;
- AIPE demonstrates the value of good surveys, intimate knowledge of assets and what appears to be open and diligent challenge of the understood scope in order to either eliminate the need for platform extensions or to reduce the volume of work required. Minutes from the value engineering meetings conducted involved all key stakeholders;
- Cotswold re-doubling also undertook a facilitated value engineering workshop attended by all key stakeholders. This identified concerns, assumptions and opportunities and set actions for further investigation rather than making decisions. Cotswold re-doubling sought to embrace the Efficient Infrastructure Delivery (EID) initiatives developed by Investment Projects and claims a 3.7% saving against its original estimates. These EID initiatives included EID included modular signalling (£0.17m), internal resources (£0.23m), Workbank Planning (£1.0m), plain line track (£0.3m) and other VE savings (£0.6m).

RAMS & WLCC

5.7.6 Although these are enhancement projects NR appears to have given limited formal consideration of RAMS and WLCC:

- NLL produced a RAMS plan which sets-out targets and activities to inform specification and option selection. The RAMS activities were undertaken Enhancement Engineering's Systems Integration & Reliability Team (SIR). NLL also undertook early engagement with Route maintenance to understand asset condition issues which were addressed in the original Programme Requirements Specification (PRD). NLL state that it was the first programme to use a PRS and this generally proved to be a successful approach which has been replicated on other programmes. We previously observed as Independent Reporter¹¹⁶ that NR had not undertaken any formal WLCC analysis and no further evidence was forthcoming in this review that this had been addressed;
- GBK did not respond to the request to provide visibility of RAMS or WLCC considerations;
- AIPE did not respond to the request to provide visibility of RAMS or WLCC considerations;
- Cotswold re-doubling stated that no explicit RAMS or WLCC analysis was undertaken but that the design and construct contract used to procure the GRIP 5-8 works obliged the use of NR standards.

¹¹⁶ Independent Reporter, Office of Rail Regulation and Network Rail, Quality Review, North London Line Project (CH002), Final Report, Halcrow group Limited, December 2009

Lessons learnt and benefit management

5.7.7 All of the projects have taken a diligent approach to lessons learnt. The approach to benefits management is less clear-cut:

- NLL's VM4 Lessons Learned Report¹¹⁷ is a valuable source of learning for any future programme given the range of interfaces and works that had to be delivered within a constrained timescale with a funding shortfall. We suggest that learning from this is distilled with particular regard to NR's plans to integrate to a greater extent with its funders and customers as there appear to be valuable learning points for the whole industry with respect of formal agreements and behaviour and values in applying contractual mechanisms. The VM4 report contains honest observations on the performance of NLL which highlights that an element of the Service Specification with RfL was threatened due to signalling misinformed signalling design and capacity analysis which have since been mitigated;
- GBK undertook a facilitated Lessons Learned exercise and made clear statements as to whether or not the project's success criteria had been met or not (all were met) however only NR and its contractor attended the facilitated workshop; neither the funder nor the TOC were represented;
- AIPE's VM4 Lessons Learned Report is also a valuable source of future learning. It lists poor scope definition, overly-complex project organisation (driven by poor scope definition), late project start and inflexible end date all contributed to late delivery of GRIP 4 and prolonged procurement timescales. Positives included stakeholder management (with the ongoing input and support of the TOC being seen as critical in this time-driven scheme), flexibility and pragmatism and the ongoing involvement of the development team into delivery;
- Cotswold re-doubling has undertaken a Lessons Learned exercise with regard to its commissioning and plans to do so for the project overall at the appropriate timing. The project handed-back on-time at the end of the 16-day blockade but were not signed fully back into use which led to four days of degraded working. It appears that the situation could have been worse without the affirmative action of the project and the operator to get a service running. The issues described as contributing factors to this issue are consistent with those which contributed to the high-profile overruns at Liverpool Street, Shields Junction and Rugby at New Year 2008. NR has since introduced a Work Instruction specifically aimed at reducing the incidence of such issues and the learning from Cotswold should be fed back into the Possession Overrun Management workstream.¹¹⁸

¹¹⁷ VM4 Lessons Learned Report, CCMS 62196285, Version 2.0, 1 December 2011.

¹¹⁸ See ORR_27-07-11_ver1.4.ppt. NR has been keeping ORR apprised of its ongoing efforts to improve the Delivery of Work in Possessions since this issue was removed from the Regulatory Escalator in June 2011.

Schedule

Key reasons for changes

5.7.8 Schedule change was apparent as follows:

- The 28 October 2008 authority paper stated the NLL SLC2K service to be 4 January 2011 however NR advises that this date was an aspiration and was later changed for the purposes of the NR Delivery Plan to be June 2011 and presumably this included agreement with NR's funders. We understand that the services commenced on 22 May 2011. Although there were delays to interim milestones on the programme NR advise that RfL are content that NR met its commissioning date obligations. Although the SLC2K commissioning timing was achieved NR is reporting that various 'non critical residual works' will not eventually be completed until March 2012;
- GBK completed double-tracking works by December 2009 which ensured that operational capability was achieved but due to receivership of the main contractor all works were not finally completed until March 2011;
- AIPE was delivered slightly ahead of the substantial completion date set by the 2009 Authority paper, being delivered in August rather than September 2010;
- Cotswold re-doubling was commissioned on-time in August 2011 albeit with a degraded service which was subsequently rectified.

Cost

Key reasons for changes

5.7.9 The Enhancement projects reviewed presented mixed cost performance and highlight the need to establish a clear scope through robust early development and holding schedule. Although there are various lessons to be learned from these projects the evidence suggests that there was always a diligent and often an affirmative approach to keeping cost under control:

- NLL is forecasting an outturn for the NR-delivered works of £274.62m rather than the £280.74m authority. That said, NR report that the project overall has not been delivered to the target cost agreed with RfL. As NR entered a target-cost agreement with RfL for the delivery of the full project NR is exposed to risk on the total cost. The extent of NR's potential liability is not visible to us. As discussed above the project scope and costs were extensively challenged in order to bring the project in within the funding available and this led to late de-scoping of the 4-track section in the Camden Road area at GRIP 4 stage (i.e. after single option selection). NLL's VM4 pinpoints the lack of a rolling cost plan as the reason for pressure on the target cost did not emerging until after single option selection decisions had been made;
- GBK is forecast to cost £29.950m compared to £25.13m original authority. The increase in the original authority of c. £25m (a GRIP 3 estimate) to £29.5m (based on tender returns) was incurred due to increased scope, contractor, materials, project management and contingency costs. The project was further re-authorised to £30.75m to address the impact of the main contractor entering receivership. The project appears to have controlled the outfall from failure of its contractor well on the basis of the forecast outturn cost;

- AIPE's forecast cost progression has been complex to follow. Our understanding is that the original GRIP 3-4 AFC of £21.95m (June 2008 ERIP) or £17.87m (from ORR Delivery Plan) was an 'efficient emerging' estimate which included depot and OLE scope which was later removed. The £16.528m authorised had work both added and omitted at the point of tender returns, some of which was diverted to a different project. The £16.528m was also stated not to include infrastructure adjustments (route clearance and OLE alterations) which might have been needed and it is understood that these works were authorised separately. Thus no comparison between the efficient emerging cost estimate of £17.87m (or £21.95m) and outturn can be made without consideration of a wider portfolio of projects. Post authority NR state that an outturn of £14m was achieved due to de-scoping agreed with Transport Scotland and a lower contract award value than estimated. This project appears to demonstrate a concerted approach to scope challenge and cost reduction;
- Cotswold re-doubling experienced changes a significant increase in the outturn AFC from the authority originally envisaged; the original forecast AFC of £48.50m rose to £66.80m to account for improved definition of scope. At completion the project was delivered for less at £59.50 due to value engineering and EID initiatives including modular signalling (£0.17m), internal resources (£0.23m), Workbank Planning (£1.0m), plain line track (£0.3m) and other VE savings (£0.6m). On the one hand this project demonstrates a determined approach to control and reduce costs through valid challenge of specification and methodology but on the other demonstrates that challenge NR face in clarifying the scope early and estimating to an acceptable level of accuracy.

Contingency held at GRIP 5 Authority

5.7.10 With the exception of Cotswold re-doubling, which received its first full investment authority at the end of GRIP 4 the other Enhancement projects reviewed all received first full investment authority at the end of GRIP 5. In relation to the guidance thresholds stated by NR's *Implementing Cost Risk Management*¹¹⁹ guidance:

- NLL was authorised 13% contingency at GRIP 5 which is in-line with the expected enhancements guidance threshold of 12.5%. It is noted in NLL's Lessons Learned document that the de-scoping required at the end of GRIP 4 suggests that any contingency allowance generated is only as good as the decision-making concerning base scope and cost. NLL would have exhausted its contingency provision had it not been for the agreement of NR and its funders to alter the project scope at the latest point in programme development;
- GBK was authorised 9% contingency at GRIP 5 which is within the expected enhancements guidance threshold of 12.5%. GBK was a 'Level of Control 2' Enhancement which suggests that different risk exposures and contingency provisions might be appropriate for less complex schemes;
- By contrast AIPE – also a 'Level of Control 2' project – was authorised 16% contingency at GRIP 5 which is somewhat above the expected enhancements guidance threshold of 12.5%;

¹¹⁹ *Implementing Cost Risk Management (GRIP 4-8)*, version 2.0, Network Rail, September 2011, p. 15.

- Cotswold re-doubling was unable to state the ‘Level of Control’ of the project but was authorised at 8% contingency at the end of GRIP 4 which is low in comparison to the 15% guidance threshold.

Opex ; Capex

- 5.7.11 The cost of NR’s project management effort on these Enhancement projects was 6-8% of the overall capital cost with the exception of AIPE which was 16%. As observed at section 6.4 below NR’s average project management overhead for Enhancements currently runs at 8-9% depending on whether or not Crossrail and HQ opex costs are included. In AIPE’s defence the Lessons Learned report notes that the project structure and organisation were not ideal in that the project started as a straightforward platform extension programme but as the scope emerged the team had to be bolstered to achieve the time constrained schedule; we interpret this to mean the project team effectively had to accelerate to deliver an enhanced scope by a fixed end-date.

Programme-Level Observations

- 5.7.12 The baseline for NR’s Enhancements portfolio was originally set by NR’s Control Period 4 submission and ORR’s corresponding Determination of 2008. The determined baseline is monitored and change-controlled with reference to the published CP4 Delivery Plan and its revisions.¹²⁰
- 5.7.13 As discussed at section 4.4 above we note that there has been extensive change control to the Enhancements programme during CP4. Some £2.3bn of work has been removed from CP4 (either cancelled or re-phased to CP5) and £1bn of new work instructed. Whilst we do not challenge the rationale for the changes – and change is always to some extent inevitable – change on this scale is not insignificant and will have required NR to constantly re-adjust its own resources and management of both the supply chain and stakeholders. These are time-intensive programme management activities.
- 5.7.14 In addition to the published CP4 Delivery Plan NR derived its own baseline which analysed the gap between its CP4 submission, the ORR Determination and its opinion of the updated scope and forecast cost.¹²¹ This reveals that NR was immediately reporting an affordability gap of c. £560m. £260m of this gap was attributable to the Southern Platform Extensions programme which was stated to have been the subject of scope increases; we understand that this programme has received ongoing scrutiny to try and maintain the outputs without breaching the allocated funding.
- 5.7.15 This gap between the CP4 Determination and NR’s Delivery Plan forecast has been tackled a number of ways including the application of an initial top-down stretch target of c.12.5% on all projects; this essentially re-set the NR submission to the value of the ORR Determination. NR also created a further £230m of ‘headroom’ (essentially ‘programme level contingency’) by ring-fencing budget on programmes such as ECML improvements and Manchester Improvement schemes. This is

¹²⁰ Network Rail, CP4 Delivery Plan 2011 Enhancements programme: statement of scope, outputs and milestones, December 2011 update available at <http://www.networkrail.co.uk/asp/12072.aspx>

¹²¹ Network Rail Enhancements, CP4 Delivery Plan -Including 2009/10 Business Plan Project Details, Data Date 27 February 2009.

reflected in the Period reports that NR present to ORR on a period basis.¹²² This programme level contingency might be called upon for projects and programmes that require funding above the additional baseline.

- 5.7.16 Due to the nature of the funding sources we have found that care must be exercised in reading NR's Enhancement reporting. For example, the CP4 Forecast Analysis report presented to ORR on a Period basis does not provide insight into either the full baseline or forecast for the cost of delivering the Enhancements; it only relates to the original Periodic Review 2008 Determination baseline and the forecast expenditure of that funding after change control. Thus, it does not provide visibility of the full cost of NR's works where third party funding is involved. For example, the entry for North London Line suggests a CP4 total spend of £72.6m as opposed to the c. £280m of NR-delivered works and the c. £347m authorised budget (which includes RfL works to which NR is committed to a target cost arrangement).
- 5.7.17 The CP4 Forecast Analysis report reports the 'CP4 variance' which at Period 8 2011/12 was showing a £1.23bn under-spend against the PR08 baseline (after change control adjustment). This cannot be translated as a saving as a significant portion of this will be either works that have been cancelled or have been re-phased into Control Period 5.
- 5.7.18 The total picture of the delivery of the Enhancements programme is hard to discern from the reporting evidence provided. Contingency is authorised on a project / specific programme basis (at P80 confidence level) and the overall remaining contingency has to be rolled-up from the individual Period reports. However due to the funding arrangements for individual schemes the contingency cannot be treated as an overall fund on which NR can draw to support over-spending projects. This is a potential constraint for such a large programme of works but NR advises that comparison of programme level risk exposure versus the overall contingency held is a matter under consideration for pricing its delivery obligations in Control Period 5.¹²³
- 5.7.19 The case studies demonstrate to some extent that Enhancements has also sought to draw on the available EID initiatives. IP Enhancements devised its own EID Strategy¹²⁴ to drive-through delivery and NR monitors 'Financial Value Add' which is a measure of the efficiency savings which can be banked as NR 'profit' after in each annual business plan, after 'slippage' and is taken into account.¹²⁵ The Investment Projects Executive Report provides a running total of the forecast EID savings for Enhancements in Control Period 4 which stood at c. £1.8bn at Period 7 2011/12.¹²⁶

¹²² For example, see NR Enhancements, CP4 Forecast Analysis, Period 8 2011.12, 09/01/2012.

¹²³ Discussion with Jeremy Harrison, Head of Risk and Value, 27/02/2012.

¹²⁴ IPE Enhancements Programme Controls, Efficient Infrastructure Delivery (EID) Strategy, Issue 1.2, April 2010.

¹²⁵ Financial Value Add is reported in each Period MBR Pack.

¹²⁶ See 2011-12 P07 IP Executive Report v1.1.xls

- 5.7.20 In order support its Strategic Business Plan and Periodic 2013 submissions NR is presently conducting an Enhancements benchmarking review.¹²⁷ This will assess Enhancements at three levels:
- Output to output benchmarking – is there an efficient solution to an output requirement?
 - Project to project benchmarking – are the components of cost for delivery of an enhancements programme efficient?
 - Unit cost benchmarking – are the unit costs efficient for enhancements?
- 5.7.21 NR states that the ‘output efficiency’ benchmark is the hardest of these to assess. We concur that this is critical to overall efficiency as there is the risk that NR could deliver ‘the wrong solution at a low cost’. This introduces consideration of Whole Life Cycle Cost where the ‘efficient solution’ might be a solution with a higher initial capital cost in comparison to competing options but with RAMS and WLCC characteristics which present the best overall benefits.
- 5.7.22 We have raised this point previously in our review of the choice of electrification system for the Edinburgh to Glasgow Improvement Programme (EGIP) where GRIP 4 scope decision-making has been made on the basis of an existing system which is understood by NR and the market from a first-cost perspective but it has known reliability and maintainability issues that NR wish to eradicate. In parallel NR has developed a new specification which would offer a range of RAMS benefits as well as a sustainable supply chain position for future renewals. However, NR has not yet undertaken a WLCC calculation to distinguish the benefits of the two systems and NR is therefore at risk of selecting the known specification on the grounds of familiarity and first cost certainty.¹²⁸ We consider that NR understand that there matters of engineering policy that must be addressed and we consider that these should be explicit in the periodic Review 2013 submission and ORR’s Determination in order that ‘overall efficiency’ is demonstrable.

¹²⁷ Network Rail Benchmarking Strategy and Execution Plan, Network Rail, Issue 1, September 2011.

¹²⁸ Edinburgh to Glasgow Improvement Programme, Independent Reporter, Electrification, Quality Deliverability and Efficient Price, Draft Final report, Halcrow Group Limited, 27 January 2012

Ref.	Critical Issue	Justification of solutions underpinning PR13
21	NR has initiated a benchmarking exercise with the objective of demonstrating an efficient delivery profile for Control Period 5 Enhancement projects. A challenging element of this is to demonstrate that the solutions proposed are justifiable in relation to the expected outcomes i.e. 'the right solution' at the 'right price'. If this is not adequately articulated in NR's PR13 submission – and ORR's Determination - a risk exists that solutions will be proposed which give the impression of efficiency. Through its benchmarking proposal NR appears to recognise this issue but we have observed elsewhere that this is an issue in Control Period 4.	
	Recommended Action	Responsible – Network Rail
	The solutions underpinning the Control Period 5 proposals should be supported by asset policy decision-making which is underpinned by justified analysis and judgement, taking into account the relevant factors such as RAMS, WLCC and first cost affordability. This should aid the definition of a sustainable efficiency profile and should serve as a baseline should any different asset policy decisions be made mid Control Period. For example, if a better whole-life solution was sought by industry stakeholders mid Control Period which was not envisaged at Periodic Review, this could be change-controlled.	

5.8 Discussion

Overview

- 5.8.1 The twenty case studies submitted for our examination comprise a broad range of scheme sizes and complexities in both Enhancements and Renewals. Thus the observations drawn are indicative of the types of practice and issues that might exist more widely.
- 5.8.2 As discussed at section 4.5 above (and Critical Issue 11) it would be desirable if NR could harness its programme controls datasets to provide systemic comparison of project indicators across all projects. This would reveal statistically significant data with respect to actual performance from which valuable learning could be derived.

Objectives and Scope

Business Case

- 5.8.3 Throughout the case study reviews above it is apparent that project sponsors and delivery teams tend to refer to the Investment Authority papers as the source of business case justification and a statement of outputs. This is not quite the case as it currently falls to Network Development to undertake socio-economic analysis which supports the business planning process encompassing the Initial Industry Plan, Strategic Business Plan and, ultimately the ORR's Control Period Determination (i.e. 'pre-GRIP'). However, beyond this the link between business case and delivery comes across as being less well articulated once projects enter the GRIP lifecycle.
- 5.8.4 The link between the original business case and NR's investment authority process is the setting of a maximum funding value which is cross-checked when projects and programmes seek full authority. If this cap is breached the investment will be challenged. This might presume that the only variable at investment stage is cost and that the projected benefits and associated scope have not changed. Inevitably changes to scope – and potentially benefits – will occur and these variables must also

be monitored. We consider that delivery teams should have a very clear understanding of the business case – whether that is bespoke for a specific funder, or generically derived from an Asset policy – as understanding provides the ability to challenge and drive better value.

- 5.8.5 Although these matters will be monitored by the NR Sponsor, we consider that Comparator C has a more explicit approach at gateway and investment authority reviews to monitoring both business case benefits and affordability. NR could easily improve visibility by requiring Investment Authority requests to explicitly state whether the original benefits and business case are still being met in addition to remaining within the funding envelope.
- 5.8.6 This visibility is important throughout the investment lifecycle from ‘pre-GRIP’ right through to ‘post-GRIP’ close-out activities. From an *Increased Early Effort* perspective it is imperative that NR internally achieves the link between Asset policies and delivery solutions to ensure that the right investments are being made. One comparator has set output targets linked to its regulatory assessment in an attempt to drive innovation in its supply chain and reduce first-cost whilst maintaining key asset obligations. Another comparator undertook a complete review of its standards pertaining to a major upgrade programme to contain costs within its budget and to ensure fitness-for-purpose on a whole life basis.
- 5.8.7 Given NR’s intent to engage its supply chain earlier to drive innovation and reduce cost this implies that ‘business case’ decision-making that drives Asset policies will require review in view of the proposed output based approach to contracting Newco and others through contested works. If this is not challenged the opportunity for innovation and lower costs will be constrained.
- 5.8.8 In Enhancements, *Increased Early Effort* may remain constrained if NR is held at arms-length by funding decision-makers. Thus the need for better industry governance (as proposed by the RVM study and discussed above at section 4.4) is necessary. If this is not improved NR will be cast more as a ‘programme facilitator’ rather than a ‘programme manager’ and the proposed benefits of greater alignment between NR and its customers will be weakened.

Stakeholders

- 5.8.9 The case studies generally revealed a strong approach to stakeholder engagement but inevitably some schemes suffered due to the vagaries of stakeholder requirements. Track renewals essentially view internal rather than external stakeholders as being critical whilst in civils there is a strong dependence on adjacent landowners to obtain access and neighbours in order to ensure that the execution of work is accessible.
- 5.8.10 Signalling project in particular presented stakeholder considerations with clarity which is perhaps driven by the high degree of operational impact caused by such schemes and also the way that they tend to be funded both from renewals and ‘Funds’ in order to add Enhancement elements to Renewals where possible.
- 5.8.11 Appropriately, the Enhancement projects reviewed demonstrated the most developed approach to stakeholder engagement and highlight some of the significant constraints that NR must deliver its capital programmes. The Enhancements viewed demonstrated the effect of time-constrained outputs and funding on NR’s approach which required NR – particularly in the case of North London Line – to challenge internal processes in order to maintain the schedule. This is important learning and

demonstrates that if a need is presented, more efficient methods of working can be engineered in order to meet the targets set.

Option Selection, Value Engineering, RAMS and WLCC

- 5.8.12 Evidence of formal option selection and value engineering was mixed amongst the case studies but the wider evidence showed that NR does at least consider the options where it is merited.
- 5.8.13 Civils decision-making was driven significantly by access and there were noted attempts to bundle works which is an indicator of *Improved Efficiency*. Track refers little to option-selection or value engineering; the approach is driven by Line Standards and pre-determined solutions. This drives a consistent approach but in future there appears to be a challenge for the new Directors of Route Asset Management to interpret and apply Asset Policy appropriately. Thus *Increased Early Effort* will determine the future approach.
- 5.8.14 Electrification projects demonstrated mixed practice in articulating decision-making formally but effort can be discerned in most cases to select the right option and drive cost-out.
- 5.8.15 Signalling schemes reviewed demonstrated decision-making largely on the basis of asset condition but also demonstrated that future planned work (in the form of ERTMS) were being taken into decision-making for schemes proceeding now. There was also an emphasis placed on reducing SEUs.
- 5.8.16 Enhancements – as expected – demonstrated the strongest formal articulation of option appraisal and value engineering which generally highlight the benefits of formal challenge. However, the evidence also highlighted – in the case of North London Line) where major gaps between output expectation and the real cost of the proposed solutions can significantly effect what is delivered for the available funding; North London Line had to be de-scoped in order to fit the funding. Thus the value of *Increased Early Effort* at the point of ‘initial announcement’ (IIP / SBP / Periodic Review) must be exercised at the right time in order to ensure that acceptable outputs are achievable.
- 5.8.17 In all cases there was weak evidence of formal RAMS and, in particular, WLCC consideration of the solutions proposed. The feedback from the case studies was that either these decisions were already made for project delivery teams through standards or no requirement existed. This might be acceptable if rigorous whole-life scrutiny and decisions are being made at policy-level but with the intended purpose of introducing both competition to NR and earlier contractor involvement from the supply chain (at GRIP 3) NR should consider improving the arrangements for WLCC and RAMS for three reasons:
- To explain the role of Asset Policy and Line Standards in order that the supply chain understands what latitude it actually has to challenge and improve value;
 - To confirm how the supply chain will actually be incentivised to improve value. If NR (and to the extent applicable ORR) are silent or vague on the point of whole-life requirements and supply-chain contracts incentivise lower first-cost only, long-term value for money opportunities may be eroded;

- To understand better the constraints on optimising WLCC imposed by access constraints, such as the difficulty in gaining road and rail closures to renew bridges at congested locations.

5.8.18 This is an issue of *Increased Early Effort* (making the right decisions about infrastructure interventions) and, in the longer-term, *Reduced Overspends* as scope decisions today will affect the cost of maintaining and renewing the railway in future.

Lessons Learnt and Benefits Management

5.8.19 In many cases the concept of benefits management was interpreted as ‘delivering the scope on time and to budget’. Apart from a few cases where the link was made between the work and the need it was intended to fulfil was benefits management understood. The true benefits only accrue once the delivered scope (as opposed to the intended scope) is delivered and the full final cost is understood.

5.8.20 However, an implicit understanding comes across as to whether or not project delivery has contributed to a successful benefits outcome. Track understand the importance of avoiding speed restrictions after a renewal and avoiding unintended follow-up shifts; for civils the avoidance of additional planned access is crucial; in power and signalling the key test is whether or not the trains run post commissioning.

5.8.21 In Enhancements the result of benefits analysis should be explicit but we find that the test NR applies is whether or not it has met the contractual requirements agreed with its respective funders. This is understandable from a commercial perspective but the actual benefits accruing should be understood by NR to inform improved decision-making for future investments. We trust that the new arrangements for improved alignment between NR and its industry partners will provide appropriate visibility of both business case and benefits evaluation (the pre- and post-GRIP activities) which in-turn will drive better *Increased Early Effort* and *Reduced Overspends* in future.

5.8.22 Generally we noted good attempts at recording lessons learned (apart from the Track asset which deemed this as not applicable in its questionnaire responses) and increasingly these are taking-on a formal structure through the Value Management initiative. The North London Line lessons learned output should be mandatory reading for all Enhancement projects and offers an insight into the demands of working in an integrated fashion on a *programme* basis.

5.8.23 Some of the key feedback from projects from lessons learned exercises suggested that GRIP either added cost or, in the case of complex Enhancements such as North London Line, GRIP had to be adapted to address the concurrent nature of programme deliverables. Engineering was seen as a source of discretionary decision-making in some respects and there was recurring evidence of issues arising late in development either due to insufficient records and physical investigation. Design coordination and integration also repeated as an issue which meant in some cases that development continued at detailed design stage. This is an example of where *Increased Early Effort* would impact *Increased Efficiency*. These were generally drawn as examples of ‘additional scope’ but it is likely that the requirements always existed, but were just not identified early enough in the development process. In one case, poor understanding of the requirements driven by a lack of appreciation of the existing physical infrastructure threw the team into the task of ‘accelerating’ in order to deliver the emergent scope by the fixed end date. On the other hand NR demonstrated through one of the signalling projects that when things go wrong at

commissioning stage they are adept at taking affirmative action to recover the situation to allow services to run.

- 5.8.24 Positive ‘lessons learned’ were often articulated in relation to addressing key stakeholder requirements and concerns early and also working in a collaborative way with the supply chain, even if the contractual arrangements were ‘traditional’ (both example of *Increased Early Effort*).
- 5.8.25 Overall, we see evidence of NR generally trying to ‘do the right things’ – and there were various examples of good practice – but we consider that NR would achieve greater certainty of selecting appropriate solutions if the original outcomes were more clearly stated and NR then undertook rigorous formal review of all pertinent factors.
- 5.8.26 This will be brought into focus with NR’s proposed move to engage its supply chain at an earlier stage of the GRIP lifecycle (from GRIP 3 rather than GRIP 4 or 5 currently) to deliver on output-based specifications. This places great emphasis on the NR Client organisation to establish its required outcomes and to specify accordingly.

Cost

- 5.8.27 In reviewing both cost and schedule we wished to understand the progression of both – and the reasons for variance – at the following points of comparison during the development and delivery lifecycle:
- ‘*Original Announcement*’ – for example, when the project was first cited in a business plan or workbank plan;
 - ‘*Full Investment Authority*’ – when the project *first* received its full authority to complete its obligations;
 - ‘*Principal Contract Award*’ – when the project entered into contractual agreements to deliver its obligations which then crystallised the assumptions around pre-tender estimating and investment authority (if achieved before contract award); and
 - ‘*Outturn*’ – the actual outcome once all obligations (as varied by change control) were achieved.
- 5.8.28 We note that NR generally authorises projects fully once tender returns and negotiations with a preferred contractor are concluded. Thus the NR values for ‘Full Investment Authority’ and ‘Principal Contract Award’ were generally similar where these were reported. NR should consider that negotiating Alliances and similar collaborative contracts require a longer period of negotiation to get right. In view of maintaining schedule it may be that investment authority may need to occur ahead of contract award. We therefore suggest that NR continues to consider ‘Principal Contract Award’ as a potential point of future comparison.
- 5.8.29 From a cost perspective the results hold no statistical significance (hence our recommendations elsewhere that NR’s Infrastructure Management Systems are reviewed and revised as necessary in order to make such a comparison straightforward) but the following points emerge as matters for consideration in both improving estimation pre-authority and cost post-authority in future:

- The civils projects reviewed generally aligned with the investment authority budget at 'Outturn'. However, two of the four schemes reviewed were significantly under-estimated at 'Original Announcement' in relation to 'Outturn'. The reasons were similar including: access, inadequate site investigation (driven by access), design changes, environmental and unforeseen conditions. These issues stem from an incomplete understanding of the extent of scope at the point that the business / workbank plan is compiled. If this issue is systemic it would lead to a situation where either the workbank as a whole will not be delivered as the works contained within it are not affordable. NR runs the risk of not seeking enough funding to deliver the works;
- The track projects reviewed all received investment authority below that anticipated at 'Original Announcement' suggesting that track has a good understanding of repeatable works. This suggests control in workbank planning. Also, all of the track projects delivered around or below 'Full Investment Authority' at 'Outturn' albeit there was uncertainty about whether all of the intended scope was delivered. This suggests delivery control but cost success can only be claimed if the intended scope is physically delivered;
- All of the electrification projects delivered under 'Full Investment Authority' at 'Outturn'. Favourable market conditions were cited as a reason for some significant drops. This might have been compounded by conservative estimating based on older estimate datasets. However, there was also evidence of good value engineering in one case;
- The signalling projects delivered within 'Full Investment Authority' at 'Outturn' demonstrating delivery control but the position was mixed when comparing 'Original Announcement' to 'Investment Authority'. Major cost reductions were achieved in one instance by 'scope reduction' (suggesting that the corresponding benefits should have been checked), a major reduction in scope occurred due to future ERTMS roll-out and central payment of disruption costs. Two projects incurred increases between 'Original Announcement' and 'Full Investment Authority' due to scope revisions and re-phasing works driven by higher priorities and / or lack of scarce resources which added considerable time to the development phase;
- The Enhancement schemes were generally characterised by rising costs between 'Original Announcement' and 'Full Investment Authority' for a variety of stakeholder and scope-driven decisions. Supply chain failure also featured prominently and highlights the value that a secure supply chain has on NR delivering its obligations. For those schemes where costs rose between 'Original Announcement' and 'Full Investment Authority' there was evidence of costs being challenged and the projects performed within authority. One major programme was delivered within its authority but was subject to some re-authority which saw some elements of work being paid for by other NR funding sources.

5.8.30 Overall, the sample suggests that NR has good cost control post 'Full Investment Authority' but estimating at 'Original Announcement' (with the exception of track projects) is either too high or too low. Without a wider comparison across assets it is not possible to draw firm conclusions as to whether or not NR is over or under estimating. For the purposes of Periodic Review it is essential that focus is given to

the basis on which early estimates are prepared and how NR estimates the value of uncertainty.

- 5.8.31 From an efficiency perspective we also sought to understand the apparent cost of NR's project management effort against its own average costs per Asset. In instances where these cost were higher than the averages it was evident that the projects had suffered some form of delay in delivery or took an inordinate length of time to develop; this is clearly not surprising as utilisation of a standing project team for longer will obviously cost more. From an *Increased Efficiency* perspective holding forecast schedule is vital and it is encouraging that NR is measuring Indexed Performance Indicators in relation to both development and delivery.

Schedule

- 5.8.32 From a schedule perspective we have similarly compared the forecast completion milestone at the four points of comparison outlined at 5.8.27 above. We observe that:

- Civils projects generally took 1-2 years longer in total to deliver than originally envisaged. The delays are largely encountered in the development phase with start-dates frustrated by slow agreement of access and the other changes described above;
- Track projects are generally predictable in overall duration;
- One electrification project was delivered in accordance with the schedule envisaged at 'Original Announcement' but two others were delayed in their execution due to re-phasing in the face of more urgent work and supply chain issues;
- Signalling projects also took 1-2 years longer to deliver between the dates forecast at 'Original Announcement' and 'Outturn' for a host of reasons but substantially due to scope revisions;
- The Enhancement projects reviewed encountered different issues. Contractor failure significantly extended one project and re-phasing (for strategic reasons) delayed the original implementation of another project by 2 years. North London Line was delivered on-time; a significant effort given the scale of the project.

- 5.8.33 The feedback from the case studies generally demonstrates that prolongation of delivery in comparison with the milestones envisaged at 'Original Announcement' generally occurs in the development phase rather than as a result of delayed work post contract. The data-set is clearly not statistically robust but this suggests that either original estimates of delivery milestones are unrealistic or NR – and its stakeholders – spend too long developing schemes. Although the extra time taken (often years) will contribute to a better investment decision it does mean that the solution is being implemented later than originally forecast, thus reducing the timing of benefits accruing.

- 5.8.34 Where longer development timescales are underpinned by changes to scope this suggests that outline design is being re-worked and is eroding the efficiency of NR and its suppliers. This is an instance where *Improved Early Effort* will also promote *Increased Efficiency* by incurring fewer iterations based on clear outcomes.

Conclusion

- 5.8.35 The case study observations provide support to the observations of the RVM Study that *Increased Early Effort* (in particular) and *Increased Efficiency* are two key sources of potential cost savings if development and delivery problems can be identified and addressed.
- 5.8.36 The case studies suggest that NR generally has delivery control after projects are authorised (i.e. generally projects deliver schedule and cost; but not necessarily scope), delivering what it forecast to deliver. This suggests that *Reduced Overspends* is a line of improvement which is less relevant to NR. However, this conclusion would need to be validated with reference to a statistically meaningful sample. We recommend that NR undertakes such analysis to demonstrate if it actually has this level of control. Also the apparently low incidence of projects seeking investment re-authority which raises the question of whether projects are being a level which makes overspending investment authority unlikely, albeit NR's practice of authorising on the strength of tender returns mitigates this concern.
- 5.8.37 However, we remain concerned about the *Reduced Overspends* line of saving in view of the apparent disconnect between costs expected at 'Original Announcement' and 'Outturn' and. Again, we consider that NR should undertake analysis which draws the distinction between 'Original Announcement' and 'Outturn'. In this regard the Periodic Review process should seek to clarify the basis on which early estimates are made.

6 Potential PPM Cost Savings

6.1 Introduction

6.1.1 During the course of this study the ORR has asked us to consider:

- To what extent should NR be accountable for the ‘Whole System Programme Management’ cost savings identified by the RVM Study (and the underpinning work by Atkins); and
- What other savings might be attributable to NR under ‘Project and Programme Management’ as distinct from either Asset Management or Supply Chain Management identified by the RVM Study.

6.2 Approach

6.2.1 In order to answer the first point we have sought to understand from Atkins and ORR the following:

- How the Atkins’ savings ranges were derived;
- How the RVM savings are identified between:
 - Asset Management;
 - Supply Chain Management;
 - Project and Programme Management;
- What range of ‘Addressable Costs’ were assumed and to what extent NR can influence savings under certain cost headings; and
- What changes to Addressable Costs have either taken place or should now be adopted.

6.2.2 For potential savings beyond the RVM Study we have considered the findings of the previous sections of this report to conclude whether or not:

- The RVM Study covers all appropriate savings within the savings ranges accepted by both Network Rail and the McNulty Study team; and
- If any further savings might accrue through:
 - Savings which were not immediately considered by Atkins or the RVM Study; or
 - Savings identified by Atkins but which were not carried forwards either by themselves or the RVM Study, whether for reasons of the avoidance of double-counting, or otherwise.

6.3 The RVM Savings

- 6.3.1 The RVM Study was underpinned by two reports by Atkins,¹²⁹ in which the calculations were based upon the smoothed expenditure by the whole railway industry in 2009/10. The figures used for investment expenditure at 2009/10 prices were £1.6bn for NR's expenditure on infrastructure enhancements and £0.5bn for spending on the procurement of traction and rolling stock in that year.¹³⁰
- 6.3.2 Atkins identified three heads of potential cost savings for infrastructure enhancements:
- **Increased Efficiency** – by focussing on output rather than by process, with the addressable cost being assessed as 40% of the total enhancements budget, viz. that spent on “not-in-the-ground-spend”;
 - **Increased Early Effort** – resulting in net savings arising from better clarity of objectives, more apt option selection and lower risk exposure, with the addressable costs being assessed as the full enhancements budget; and
 - **Reduced Overspends** – by better planning and delivery, with the addressable cost being assessed as 60% of the enhancement budget.¹³¹
- 6.3.3 Atkins assumed in its assessments of *Increased Efficiency* and *Reduced Overspends* that the percentage split in enhancements expenditure between “in- the-ground” and “not-in-the-ground” costs was 60 : 40. We comment later at paragraph 6.7.4 on how closely those percentages have been reflected by the results we have seen.
- 6.3.4 Atkins did not include infrastructure renewals in its analysis, and it discounted *Reduced Overspends* from further consideration. It also identified a number of overlaps between these heads of savings and others in the RVM Study of between £0.17bn and £1.06bn (in 2009/10 prices), and assessed that £80m (also in 2009/10 prices) could be saved on enhancement projects as a result of Efficient Infrastructure Delivery¹³² initiatives as shown in Figure 6.1.

¹²⁹WS Atkins, *Rail Value for Money Study: Whole System Programme Management Final Report* (Issue 1.4, 25 May 2011) and WS Atkins, *Rail Value for Money Study: Asset Management & Supply Chain Management of GB Rail* (Issue 1.1, 25 May 2011)

¹³⁰ WS Atkins, *Rail Value for Money Study: Asset Management & Supply Chain Management of GB Rail* (Issue 1.1, 25 May 2011), Figure 5.4 and pages 62 - 63

¹³¹ 60% being that proportion of the enhancements budget which Atkins assessed as relating to “in the ground costs”

¹³² Efficient Infrastructure Delivery (EID) is a suite of cross-business initiatives that have been devised and implemented by Network Rail during Control Period 4 to address the gap between its Control Period 4 ‘bid’ and ORR’s Control Period 4 Determination of 2008. Network Rail is currently forecasting a c. £3.3bn aggregate saving as a result of EID initiatives over the whole of Control Period 4.

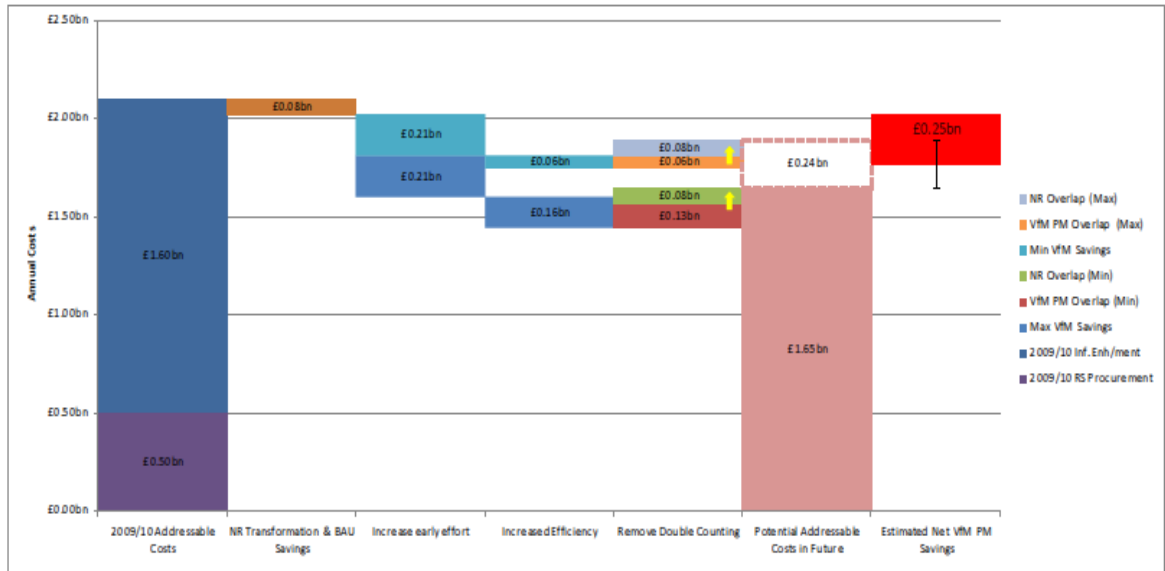


Figure 6.1: Whole System Programme Management Potential Savings in 2015/16 (2009/10 prices) (Atkins¹³³)

6.3.5 Atkins’ assessments of the addressable costs are shown in Figure 6.2, which also shows the range of savings which it considered could be achievable against each head of saving.

Head of savings	Infrastructure Addressable Cost, £m, 2009/10 prices	Low savings, %	High savings, %
Increased Efficiency	640	10	25
Increased Early Effort	1600	10	20
Reduced Overspends	960	25	50

Figure 6.2: Potential savings on infrastructure enhancements from Whole System Programme Management (Atkins)¹³⁴

¹³³ WS Atkins, *Rail Value for Money Study: Asset Management & Supply Chain Management of GB Rail* (Issue 1.1, 25 May 2011), Figure 5.7

¹³⁴ WS Atkins, *Rail Value for Money Study: Asset Management & Supply Chain Management of GB Rail* (Issue 1.1, 25 May 2011), page 63

6.3.6 The resulting savings (before overlaps) in 2018/19 on infrastructure programmes were then as shown in Figure 6.3.

Head of savings	Low savings, £m (2009/10 prices)	High savings £m, (2009/10 prices)	Carried forward in McNulty?
Increased Efficiency	64	160	Yes
Increased Early Effort	160	320	Yes
Reduced Over-Spends	240	480	No
Overall Atkins Range (discounting 'Reduced Overspends')	224	480	-

Figure 6.3: Potential savings on infrastructure enhancements from Whole System Programme Management (based on Atkins)

6.3.7 The RVM Study took forward savings for Whole System Programme Management in a range between £40m and £100m in 2018/19,¹³⁵ having:

- discounted potential savings from *Reduced Overspends*;
- removed from addressable costs the estimates of committed expenditure for mega projects deemed to have developed beyond GRIP 4;
- accounted for double-counting with other initiatives; and
- made other adjustments.

6.3.8 The RVM range of £40 to £100m in 2018/19 is therefore derived from the Atkins' range of £224m (£64m plus £160m) to £480m (£160m plus 320m). We are not sighted on the full detail of Atkins' efforts to identify and remove double-counts from its analysis and NR's own initiatives. We are also not sighted on the final adjustments made by the RVM team. However, in aggregate we note that the RVM range is approximately 80% lower than the range derived by Atkins in 2018/19.

6.3.9 The RVM Study also provided a factorisation of the total savings it considered achievable in 2018/19, in order to provide target savings in each of the years before then.¹³⁶ That factorisation is shown in Figure 6.4.

¹³⁵ Sir Roy McNulty, *Realising the potential of GB Rail: Final Independent Report of the Rail Value for Money Study, Detailed Report*, (DfT & ORR, May 2011), page 44

¹³⁶ Sir Roy McNulty, *Realising the potential of GB Rail: Final Independent Report of the Rail Value for Money Study, Detailed Report*, (DfT & ORR, May 2011), Table 4.6

Control Period	CP4		CP5					
Year	12/13	13/14	14/15	15/16	16/17	17/18	18/19	Ave
High Savings in year (£m,09/10 prices)	36	144	201	448	629	827	1050	631
High savings, %	3	14	19	43	60	79	100	-
Low savings in year (£m, 09/10 prices)	30	123	138	335	452	590	740	451
Low savings, %	4	17	19	45	61	80	100	-

Figure 6.4: Factorisation of potential savings (based on McNulty) showing how much of the saving predicted in 2018/19 the RVM Study predicted could be expected in previous years

6.4 Savings Analysis - Overview

Introduction

6.4.1 The analysis of potential savings in the context of the RVM Study requires consideration of a wide range of issues in order that the analysis is fair. These are considered below.

Exclusions from the RVM Study Analysis

6.4.2 The RVM analysis of programme and project management was predicated on consideration of savings which could accrue from synergies and benefits from the rail industry working more closely together, using “whole system programme management”. One of the questions we have been remitted to consider is whether there is scope for NR to make similar savings on portfolios which are less dependent upon other industry parties.

6.4.3 The Atkins and RVM work discounted infrastructure renewals and *Reduced Overspends*, but we have reviewed those decisions in order to fulfil our remit. We accept that infrastructure renewals are subject to less influence from other industry parties than enhancement projects. Nevertheless, we consider that there are potential net benefits, albeit of a lower magnitude, to be gained from *Increased Early Effort*, thereby reducing unexpected cross-functional interactions and improving the quality of some planning and design assumptions.¹³⁷ This is because infrastructure renewals are specified and delivered by asset-focussed teams (although Project DIME will move away from delivery teams managed on that basis).

¹³⁷ For example, by eradicating ‘emergent’ scope, reducing the incidence of ‘preferential’ scope and improving design coordination and integration observed in the case study examples examined at Section 5.

Infrastructure Renewals

- 6.4.4 We observe that NR manages infrastructure renewals by means of portfolios of asset-based projects,¹³⁸ and that those portfolios are managed to annual budgets, with individual renewals projects being:
- delivered;
 - partly delivered;
 - deferred to future years in whole or in part due to revised priorities;
 - slipped to future years in whole or in part due to delivery short-falls; or
 - advanced into the year in question to account for revised priorities or for other reasons – possibly in association with a balancing deferral or slippage.
- 6.4.5 NR forecasts that the overall delivery of infrastructure renewals for 2011/12 will be 92% in cost terms (i.e. NR will spend 8% less than its planned budget for the year).¹³⁹ Some of that under-spend is due to efficiency and some is due to short-falls in delivery, but the situation is very complex, given the difficulty of deriving a comprehensive and consistent method of measuring physical progress, as discussed above in section 5.6.23. In order to measure progress sufficiently to gauge value for money or efficiency, it is necessary to have measures of both physical and financial progress.
- 6.4.6 Partly as a result, and partly to facilitate the derivation of unit rates which can be used to feed-back outturn costs to estimators and to measure efficiency over time, NR tends to measure the physical progress of infrastructure renewals by using standard measures of “volume” such as “composite kilometres” (a weighted average renewing track to various specifications), “square metres” (a standard unit based on the surface area of a bridge deck or other structure) and “signalling equivalent units” (a standard based on a representative amount of signalling renewal). Such standard units are of most assistance in the context of measuring physical progress when the portfolio is predominantly made up of works (known as Repeatable Work Items; RWIs) which can be expressed in such terms. There is a risk of inadequately reporting physical progress if the portfolio contains a significant proportion of works which cannot be expressed in terms of standard measures of volume.
- 6.4.7 In track renewals, the percentage of RWIs is highest, and thus volumetric measurement is the most robust of the asset classes. The full year forecast (measured in terms of volume) for 2011/12 is that 102% of plain line renewals will be delivered for 100.2% of the budgeted cost and 94% of S&C renewals will be delivered for 99% of the budgeted cost, but we have not seen NR’s analysis on a volumetric basis of how much of that performance is represented by efficiency and how much by slippage.

¹³⁸ Interviews with Chris Sills of Buildings & Civils (17 November 2011), Andrew Shaw of Signalling, Power and Communications (17 January 2012) and Nick De Bellaigue of Track (5 December 2011).

¹³⁹ “120109 Tab 8 20111121 Track Asset Report P09”, “IP B&C ERM Period 9” and “SPC ERM P8 v5”

The unit rate for S&C is predicted to be 97% of budget but the plain line figure has not been computed for the organisation as a whole.¹⁴⁰

- 6.4.8 In Buildings and Civils renewals, NR's reporting showed physical progress only measured by compliance with milestones and we were told that slippage and deferrals were expected on about 10% of projects,¹⁴¹ whereas in Signalling, Power and Communications renewals, that figure was 37.5% year-to-date and 10% was the year-end forecast.¹⁴²
- 6.4.9 NR reported an expected under-spend to the end of 2011/12 in Investment Projects (including enhancements and asset renewals except those in track) of £300m, of which £143m (at 2009/10 prices) was due to efficiency.¹⁴³ It is not clear from that report whether the remaining under-spend is forecast to come from further efficiencies in excess of the plan, or as a result of slippage of work.
- 6.4.10 The picture for 2011/12 can be compared to that reported by Arup¹⁴⁴ for 2010/11, in that 43% of the total scope of infrastructure renewals (measured as a percentage of the budget cost for the year) was able to be described in volumetric or Renewals Unit Costs (RUC) terms.¹⁴⁵ The purpose of Arup's work was to assess improvements in efficiency over time in terms of volumes and unit costs. However, RUCs can only be derived where diverse works can be expressed in RWIs, as described above at paragraph 6.4.5.
- 6.4.11 Owing to the diversity of renewable assets, RUCs can only be compared to RUCs for assets in the same class of RWI – it is not practicable to compare Signalling Equivalent Units with composite kilometres, for example, as to do so would be like comparing the value for money of “apples and pears”. The corollary of the statistic at paragraph 6.4.9 above is that it has been found impracticable to date to express physical progress in terms of volumes for 57% of the total scope of infrastructure renewals (in cost terms). As described in at paragraph 6.5.10 below, an indicator of physical progress is a vital component of understanding the status of programmes, portfolios and projects, and without such an indicator, value for money cannot be analysed. Arup commented that there were several areas of uncertainty in the NR data and its report, but the coverage of the physical progress data in volumetric terms is broken down in Figure 6.5.

¹⁴⁰ “IP B&C ERM Period 9”

¹⁴¹ Interview with Chris Sills and Simon Offley, 11 January 2011

¹⁴² “SPC ERM P8 v5”

¹⁴³ 2011-12 P07 IP Executive Report v 1.1

¹⁴⁴ Arup, *ORR Mandate AO/011: Network Rail Regulatory Accounts Data Assurance Final Report* (v 1.0, ORR, September 2011)

¹⁴⁵ Arup, *ORR Mandate AO/011: Network Rail Regulatory Accounts Data Assurance Final Report* (v 1.0, ORR, September 2011)

Asset class	Slippage (volume planned minus volume achieved as a %age of volume planned)	Budgeted cost of Repeatable Work Items as %age of 10/11 budget
Plain line track	17.3% slippage	92%
S&C track	1.2% over-delivery	
Civils	33.1% slippage	69%
Signalling	13.8% slippage	36%

Figure 6.5: Slippage in volumetric terms (from Arup)

6.4.12

Arup found that for that element of the portfolio where Repeatable Work Items could not be used because the works could not be described in such terms, the final cost for 2010/11 was 78% of the budget of that element. Similarly, it is not possible to use this methodology to draw any conclusions about the physical progress with, or the efficiency of, those parts of the infrastructure renewals budget which are not composed of Repeatable Work Items.

Ref.	Critical Issue	Change Causation
22	We observe that whilst NR maintains change control logs for individual projects, it does not undertake change causation analysis.	
	Recommended Action	Responsible – Network Rail
	NR should undertake change causation analysis in order to help it address those underlying reasons which could be preventable, on order to: <ul style="list-style-type: none"> a) assist in distinguishing under-spends due to efficiency from those due to other causes; and b) improve accountability, not only within NR but also across the whole railway system. 	

Ref.	Critical Issue	Measuring physical progress of infrastructure renewals
23	We observe that there is inappropriate reliance upon volumetric measures as a means of reporting physical progress with infrastructure renewals owing to the absence of a parameter which can be adapted pragmatically to the wide variety of work types and circumstances.	
	Recommended Action	Responsible – Network Rail
	NR should develop better ways to measure physical progress and seek the agreement of the ORR to their common use.	

Ref.	Critical Issue	Measuring efficiency
24	We observe that there is lack of certainty and transparency around the calculation of efficiency savings.	
	Recommended Action	Responsible – Network Rail
	NR should develop better ways to distinguish between efficiency and: <ul style="list-style-type: none"> a) the release of contingency and over-accrual (which in overall terms are more properly characterised as consequences of over-estimation of risk); and b) under-spending due to problems with delivery (which may not be visible due to difficulties in reporting physical progress, which mask net slippage). 	

- 6.4.13 We also observe that NR is implementing the Cost Analysis Framework (CAF) process to capture cost information at the ends of GRIP Stages 4 and 7,¹⁴⁶ but that it does not yet consider that such information is sufficiently widespread to inform estimating decisions. In particular, cost information at GRIP 1 is not captured for analysis, although it remains on file within business cases. Oracle Projects overwrites historical project budgets with the latest authorised sums, but in so doing an opportunity is lost to provide data on the level of optimism bias which is built into initial scheme estimates. However, NR has recognised the benefits to estimators which would result from widening data capture to include data from other GRIP Stages, and is developing procedures to that end.¹⁴⁷

Ref.	Good Practice	Cost History
25	We observe that NR has made significant advances on providing feed-back from completed projects to estimators, and recognises that more needs to be done to make the practice widespread and, in particular, to extend the process to capture cost data at those GRIP Stages where it is practicable to do so.	
	Recommended Action	Responsible – Network Rail
	More needs to be done to implement the benefits of capturing cost data at all GRIP Stages where it is practicable in order to: <ul style="list-style-type: none"> a) reduce levels of optimism bias; b) help to clarify the difference in expectations at Control Period Determinations and those when projects have been developed to GRIP 4; and c) assist in the management of contingency provisions. 	

Addressing Double-Counting with NR's Initiatives

- 6.4.14 The Atkins Study assessed that £80m could be saved from Enhancements in 2018/19 at 2009/10 prices in respect of improved overheads, but the RVM report did not carry this figure distinguishably forwards following the application of adjustments that were made to avoid double counting, amongst other things. At Period 6 2011/12, NR forecast of gross savings from the Efficient Infrastructure Delivery initiatives which

¹⁴⁶ C&P Assurance Card Periodic Report Period 7 October 2011

¹⁴⁷ Telephone interview with Stephen Blakey, 22 February 2012.

met their efficiency savings target for Control Period 4, and which included initiatives which we would expect to overlap with *Increased Early Effort* and *Increased Efficiency*.¹⁴⁸ However, we are not sighted upon either the forecasts which Atkins based its findings, or any changes between those forecasts and the ones we have seen. We have sought to address potential double-counting at Section 6.10 below.

Addressable Costs

- 6.4.15 We have up-dated the predictions of addressable costs on uncommitted projects with reference to both the Initial Industry Plans (IIP's)¹⁴⁹ and NR's submissions to the ORR.¹⁵⁰ We have also reviewed the IIP's to assess the level of whole system benefits which are likely to accrue to various components of the addressable costs. We have not included the Innovation Fund in the summation of addressable costs, and have treated the NR Discretionary Fund and the Performance Fund as addressable costs over which NR has significant control. Those costs are therefore not subject to savings arising from whole system considerations for the purposes of this study. We have included other Funds identified in the IIP's as addressable costs, since they are amenable to whole system savings.
- 6.4.16 We have not included renewals which are part of NR's plans, but not strictly associated with NR's operational infrastructure, such as IT, wheeled plant and office accommodation. Arguably, savings could be applied to some of those cost heads too, but we have not done so here because of the conclusions we have reached about the potential for savings on infrastructure renewals.
- 6.4.17 We note that there are likely to be *Increased Early Effort* and *Efficiency* savings arising from consideration of the infrastructure systems as a whole, for example the interfaces between track and signalling systems. Such savings would be applicable to infrastructure renewals and to Funds described in the IIP's over which NR has significant control, but would be of a lower order of magnitude to those arising from whole (railway) system considerations. Again, we have not considered them further here because of the conclusions we have reached about the potential for savings on infrastructure renewals.

Treatment of Reduced Overspends

- 6.4.18 We support Atkins' conclusions that *Reduced Overspends* are intangible, since they are amenable to correction by management action and in any case are only applicable to the 60% of project budgets which are "in-the-ground". We discuss later, at paragraph 6.7.4 whether that percentage is accurate. We also note the significant work on the feed-back from delivered costs to the estimating process which NR has started by means of the Cost Analysis Framework, and consider that this lays the foundation for

¹⁴⁸ Spreadsheet entitled "EID Initiatives_12012012"

¹⁴⁹ RFA, RIA, ATOC & NR, *Initial Industry Plan England & Wales Proposals for Control Period 5 and beyond* (September 2011) and RFA, RIA, ATOC & NR, *Initial Industry Plan Scotland Proposals for Control Period 5 and beyond* (September 2011) and NR, *PR13 Initial Industry Plan Supporting Document, Definition of Proposed CP5 Enhancements* (September 2011)

¹⁵⁰ Spreadsheet entitled "IIP Enhancement Numbers Oct 11" submitted by ORR on the basis of NR's submission dated July 2011.

more effective estimation and management of risk provisions in the longer term. The IUK report said:

“ There is no single overriding factor driving higher costs. However, the investigation has identified that higher costs are mainly generated in the early project formulation and pre-construction phases and provided evidence of a number of contributing factors including:

....

- The management of large infrastructure projects and programmes within a quoted budget, rather than aiming at lowest cost for the required performance. If the budget includes contingencies, the higher total becomes the available budget;

....¹⁵¹

6.4.19 We have examined NR’s procedures for managing estimating uncertainty and contingency provisions, and consider that NR’s work with CAF data presents a significant opportunity to clarify those procedures and thereby to develop a virtuous circle of feed-back. Successful management of uncertainty and risk in order to make better budgeting and project control decisions is a goal which applies not only to expenditure on enhancements, but also, in principle, that on infrastructure renewals.

6.4.20 In the following sections, we shall not consider *Reduced Overspends*, but we shall deal with the potential effects on both enhancements and infrastructure renewals arising from:

- *Estimating Uncertainty and Contingency* (which is where provisions for potential over-spends are made);
- *Increased Early Effort* (which is where the potential for overspends can be reduced);
- *Increased Efficiency*; and
- *Other initiatives*.

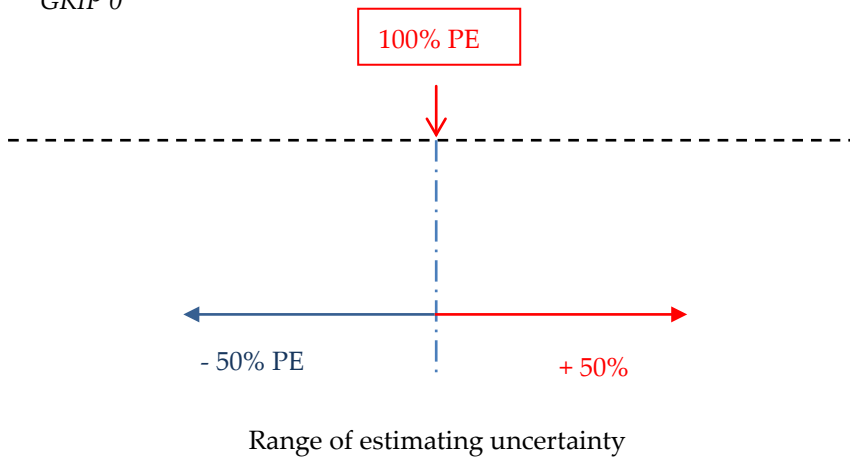
¹⁵¹ HM Treasury & Infrastructure UK, *Infrastructure Cost Review: Implementation Plan* (HM Treasury, March 2011), 5.

6.5 Estimating Uncertainty and Contingency

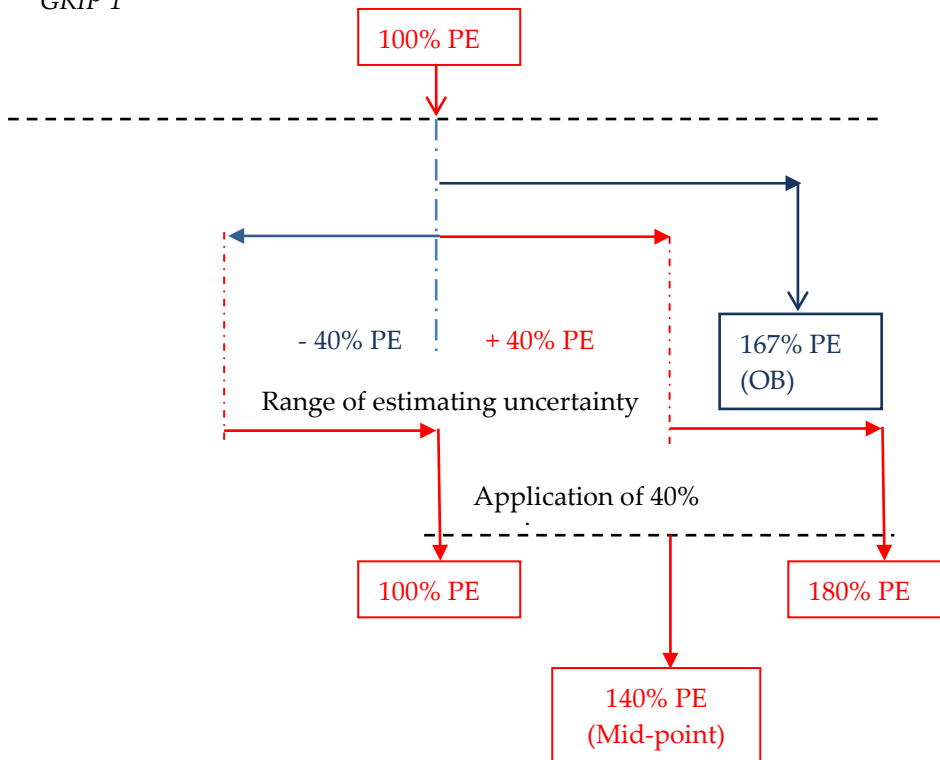
Introduction

- 6.5.1 We have reviewed NR's estimating practices and its processes for the management of contingency provisions, to see whether project budgets include appropriate provisions for the risk of costs over-running. There are four principal means of incorporating provisions for risk and uncertainty into project estimates:
- Estimating tolerance;
 - Optimism Bias;
 - Contingency provisions stated explicitly following risk analysis;
 - Contingency provisions built-into base / point estimates.
- 6.5.2 Accepted practice is for a tolerance to be applied to any initial estimate (known as a point estimate to distinguish it from an estimate to which tolerances and contingencies have been applied), to allow for the potential inaccuracy of defining the scope and the risks which may or may not come to pass, together with that of understanding the most likely cost of each work element within the scope. In early stages (typically GRIP 0 – 2), scopes are ill-defined and estimates have been found from experience to understate the final cost, and that has led to the application of a percentage for optimism bias to be applied to estimates used in appraisals or budgeting.
- 6.5.3 Cost rates and tolerances used in estimating, and allowances for optimism bias, tend to be derived statistically, from as many previous projects as possible where the scope was similar to that under consideration. Contingency provisions, on the other hand, tend to be derived both by consideration of feed-back from previous work and by risk assessments of the project in question. For significant projects, formal methods of quantitative cost risk assessments are undertaken. Optimism bias is an independent procedure, used instead of, not in addition to, estimating tolerance and contingency provisions.
- 6.5.4 As a project progresses through the GRIP stages, it becomes better defined and the risks are better understood. Estimating tolerances and contingency provisions thus normally decrease (when expressed as percentages of the estimate) as time goes by. The estimate is likely to vary from the point where it started, but (hopefully) the range of likely costs represented by the current estimate plus or minus the sum of the contingency provision and the estimating tolerance applicable to the stage in question remains within the range represented by the result of the similar calculation applied to the original figures. Figure 6.6 shows how the application of NR's procedures might develop for a project.

GRIP 0



GRIP 1



GRIP 4

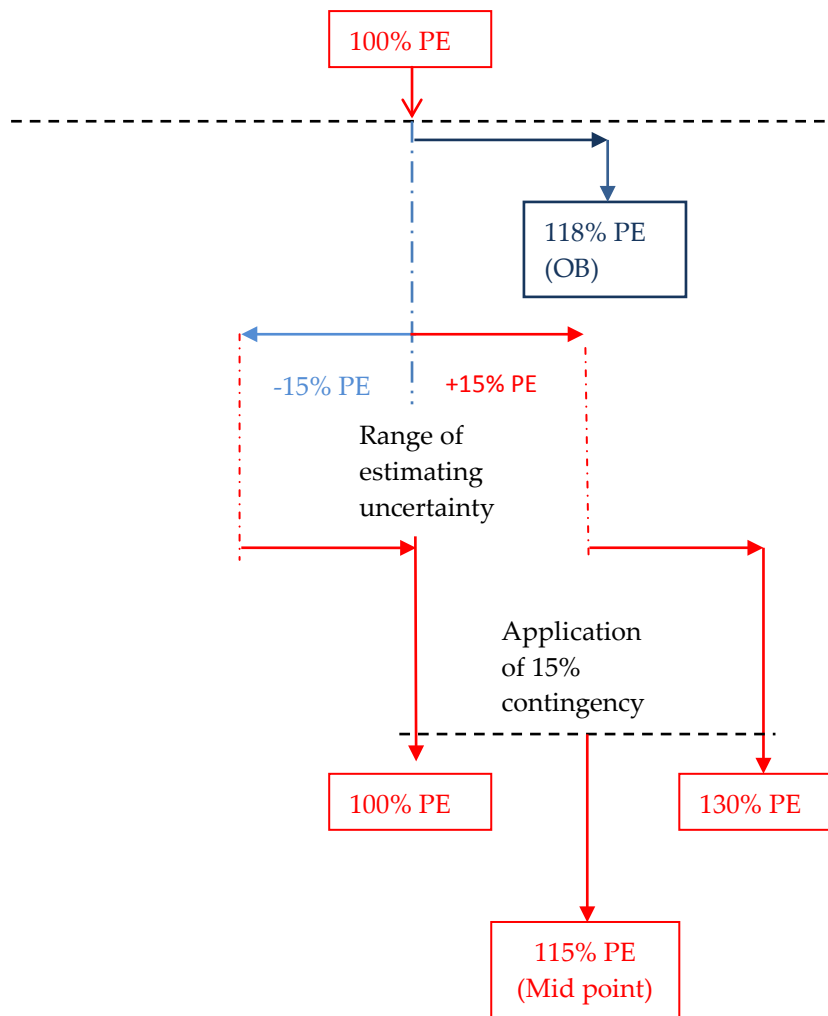


Figure 6.6: Effects of estimating tolerance and contingency on individual projects (PE = Point estimate)

- 6.5.5** The mid points shown in Figure 6.6 would form the mean result if the probability of the risks coming to pass was distributed normally. However, on occasions, this is not the case, and the most likely outcome could be skewed to one end or the other of the range. More sophisticated quantified cost risk assessments can also derive figures which have probabilities of (say) 50% or 80% of not being exceeded.
- 6.5.6** When more than one project is being undertaken by an organisation which holds the budget for all of them, there is a chance that some of the risks allowed for in each project come to pass in some but not in others. Similarly, point estimates may be bettered or exceeded across the portfolio. This “portfolio effect” may be influenced by the eventuation or otherwise of risks which are common to all the projects. Sophisticated governance arrangements such as those found in NR take this effect into account, and limit the delegations of authority to draw-down contingency provisions within project budgets, so that control of those provisions can be exercised to the best overall effect.

- 6.5.7 The portfolio effect just discussed is to be distinguished from the portfolio effect which can bring economies of scale through procurement of goods, works and services which are common to several projects in the portfolio. The former is, in our view, within the scope of programme and project management as defined by the RVM Study, whilst the latter is in procurement.
- 6.5.8 To the extent that procurement strategy is influenced by project management policy, this study has to consider the effect of contractual allocation of risk. Some forms of contract seek to pass all risks to the contractor, with a likely result that the contractor prices on the basis that the risks occur, to the extent that he judges that competition will allow. In such cases, to the extent that the contractor has priced all the risks in that way, then the client will pay for the risk whether it comes to pass or not. If competitive pressure holds contract prices down so that a contractor has to retain the costs of a risk, then he may make a loss on the contract or even become insolvent.
- 6.5.9 Some clients prefer cost certainty to the lowest cost, and this may influence their choice of risk allocation between them and their suppliers. Through NR's move towards more collaborative forms of supply chain engagement, NR should be developing ways of working with contractors and suppliers to minimise the duplication of contingency provisions in different parts of the supply chain, and to share the rewards for successful project outcomes. Such initiatives will influence project management practice.
- 6.5.10 In the following sections, we examine the balance which NR has struck in the tension between providing and managing sufficient budgetary provision for estimating uncertainty and risk so as to avoid both over-spending on the one hand and under-spending and/or denying other opportunities effectively to spend money (by retaining excess contingency provisions) on the other. This balance is just one of those which has to be managed in the context of delivering projects, portfolios and programmes within cost and schedule targets, and at acceptable quality, all whilst maintaining stakeholder confidence. Thus cost performance should not be considered in isolation from those other factors.

Enhancements

- 6.5.11 Estimators for Enhancement schemes follow the guidance shown in Project Work Instruction: "Implementing Cost Risk Management (GRIP 4 to 8) Preparation for Implementation Authority",¹⁵² [underlined emphasis added]:

" 8.1.7 Estimating Uncertainty

Uncertainty around the estimating shall only be included in the risk register if agreed by the estimator and the RA. Before deciding on the level of uncertainty to apply to the estimate they shall take into account their combined experience of the type of project it is and all available historical records.

The usual practice is for the uncertainty (a range of outcomes) to be referred to as a percentage increase and a decrease on the point estimate based on a 100% probability of occurrence.

¹⁵² Version 2, September 2011.

This shall be recorded and modelled in the “Yellow Sheet” and input manually into ARM as a specific estimating uncertainty record by the RA.

As a guide the table below highlights the Estimating Confidence at different GRIP stages

GRIP Stage	Estimate Type	Tolerance Level
Pre-GRIP	Rough Order of Magnitude estimate	+ / - 50%
Stage 1	Order of magnitude estimate	+ / - 40%
Stage 2	Outline budget estimate	+ / - 30%
Stage 3	Quantified estimate	+ / - 20%
Stage 4	Definitive estimate	+ / - 15%
Stage 5	Detailed estimate	+ / - 10%

“

6.5.12 We observe that, whilst there is ambiguity between the words in single underscore, which infer that estimating uncertainty and risk are usually to be treated as independent, and the words in double underscore, which could be interpreted as meaning that to achieve a 100% probability of occurrence of a cost outcome, the highest figure in the range would need to be selected for budgetary purposes. There is also a possibility that estimating tolerances and risks might duplicate each other in estimates at early GRIP Stages, with the result of upsetting the statistical model.

6.5.13 The procedure follows the common practice of applying a “funnel” of reducing tolerances (also called by the NR procedure “Estimating Confidence”) which reflects the increasing certainty of estimates as the scope hardens and better information about risks emerges.

6.5.14 NR often uses prospective contract sums as the basis of re-authority immediately before the start of project implementation. With respect to estimates at earlier GRIP Stages, NR has made the following statement:¹⁵³

“

- optimism bias: there is well accepted research that reveals a systemic optimism bias in estimating the cost of projects compared to their outturn costs. A review specifically of Network Rail’s projects revealed that the degree of bias can be sensitive to the type of project and asset mix. There is therefore a choice to be made as to the level of risk to be included in the overall project estimate and at early GRIP stages this is a qualitative judgement;

”

6.5.15 The DfT’s recommendation for optimism bias are shown in Figure 6.7,¹⁵⁴ and are figures which Halcrow previously recommended should be reviewed in 2012 to

¹⁵³ NR, *PR13 Initial Industry Plan Supporting Document, Definition of Proposed CP5 Enhancements* (September 2011), 6

¹⁵⁴ Halcrow Group Ltd, *Updated Optimism Bias Study Draft Report* (DfT, London, May

benefit from experience. The CAF process, although still not fully implemented, could provide useful input to such a review (see Good Practice Observation ref. 25).

GRIP Stage	Optimism Bias, %
1	67
2	55
3	30
4	18

Figure 6.7: Recommended Optimism Bias Values (Halcrow) & NR mid-points from Figure 6.10

6.5.16 Quantified cost risk analysis is undertaken in order to arrive at contingency provisions (in terms of cost) which, if authorised, are then managed by the Sponsor and the Programme and/or the or Project Manager according to the level of complexity of the scheme.¹⁵⁵ Contingency thresholds (using the term as NR does in its procedure) are used to challenge the results of QCRA's and are shown in Figure 6.8.¹⁵⁶

GRIP Stage	Contingency threshold used in Enhancements, %
1	40
2	30
3	20
4	15
5	12.5
6	10

Figure 6.8: Contingency thresholds for enhancements¹⁵⁷

6.5.17 The illustrative risk profiles shown in Figure 6.9 show how risks and contingency provisions become clearer as projects progress, the illustration does not take account of changes to the size of the "pie" as an when the project is reauthorized. Furthermore, the category named "Technical" includes risks of errors, omissions and technical standards, all of which could be classed within estimating tolerance.

2010), Table 3.3

¹⁵⁵ Contingency Management Principles v 3r version 3.1, April 2011 Projects Work

¹⁵⁶ 2011 Projects Work Instruction: Implementing Cost Risk Management (GRIP 4 to 8) v 2 September 2011 [8.1.7]

¹⁵⁷ Projects Work Instruction: Implementing Cost Risk Management (GRIP 4 to 8) v 2 September 2011 [8.3]

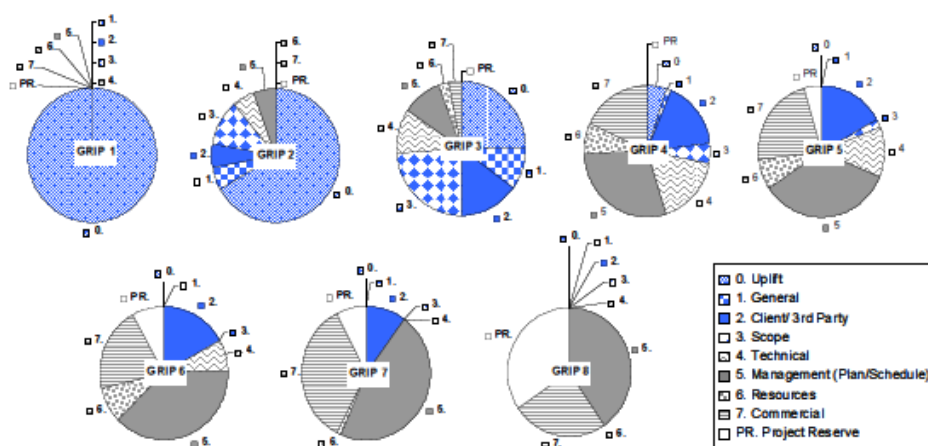


Figure 6.9: Illustrative Project Risk Profiles¹⁵⁸

6.5.18 The second column of Figure 6.10 shows the effects of taking both estimating tolerance and contingency provisions into account, calculated by adding each of the limits on the range on the estimate (e.g. 0.85 to 1.15) to the level of contingency (e.g. 0.15), resulting in a range of 1.00 to 1.30, the mid-point of which is 1.15, or an up-lift of 15%. The third column shows the mean result if all the probabilities of occurrence are normally distributed, whereas the fourth column shows what would happen if the negative part of the range of estimating uncertainty were to be ignored (calculated by adding the estimating uncertainty shown in the table in paragraph 6.5.2 to the contingency threshold shown in Figure 6.8).

GRIP Stage	Up-lift in Enhancements if applied by multiplication (%)	Mid-point of Up-lift range (%)	Estimating uncertainty plus contingency threshold (%)
1	100 – 180	40	80
2	100 – 160	30	60
3	100 – 140	20	40
4	100 - 130	15	30

Figure 6.10: Effect of Estimating Tolerance and Contingency Provisions on point estimates

6.5.19 We understand that the procedures cited here are being developed to address market forces, project outturns and local practices.¹⁵⁹ For example, two or three years ago it was the practice for some local offices to apply uplifts to estimates to reflect local market forces, where tender prices were leading NR to expect final contract sums in excess of their estimates. Perpetuation of this practice can lead to estimates being unduly high. NR is developing ways of feeding back market prices into the estimating process and a further reinforcement to procedures is planned to reverse a

¹⁵⁸ From Contingency Management Principles v 3r version 3.1, s6 April 2011.

¹⁵⁹ Telephone interview with Stephen Blakey, 22 February 2012

practice whereby inflators are applied to contingency provisions in order to apply stretch targets.

Ref.	Good Practice	Feed-back of market conditions to estimators
26	We observe that NR is developing ways of feeding back market forces to estimators, and that this would fulfil Halcrow’s recommendation that optimism bias should be reviewed two years after its 2010 report. ¹⁶⁰ Market conditions change over time, and feed-back is essential to reduce estimating uncertainty.	
	Recommended Action	Responsible – Network Rail
	NR is tightening its procedures to control local practices which might lead to sub-optimal results in estimates. NR should consider reviewing levels of optimism bias to be used in estimates for enhancements for CP5.	

6.5.20 NR has recognised that there is a ‘portfolio effect’ which can improve the effective management of contingency provisions,¹⁶¹ and such processes are already in place on mega-programmes such as NR’s contributions to Crossrail and Thameslink:¹⁶²

“

- portfolio risk benefits: there are risks that are low probability but high impact that can materially impact the estimate of any single project but when delivering a portfolio of projects this risk can be spread across the portfolio such that costing the projects as a portfolio is less than the sum of the individual projects; “

6.5.21 It is not clear to what extent enhancement projects other than mega programmes are able to deploy the portfolio effect to assist in the management of contingency provisions.

Ref.	Secondary Issue	Portfolio Risk
27	We observe that NR is applying concepts of portfolio risk management to mega-programmes, more effective risk management is possible through improved governance on other types of enhancement works and should also, in time, feed back to estimating. Some benefits can arise from procurement initiatives such as alliancing, whereby provisions made for the same risk at different levels of the supply chain, and we assume that such benefits will be accounted for in other studies.	
	Recommended Action	Responsible – Network Rail
	NR should undertake a detailed review of contingency provisions made at the various levels within NR (and in the supply chain) and apply portfolio risk management principles more widely, wherever they will add value.	

¹⁶⁰ Halcrow Group Ltd, *Updated Optimism Bias Study Draft Report* (DfT, London, May 2010).

¹⁶¹ NR, *PR13 Initial Industry Plan Supporting Document, Definition of Proposed CP5 Enhancements* (September 2011), 6

¹⁶² Interview with Huw James, Jeremy Harrison, Raj Chohan and Alistair Forbes, 30 November 2011.

6.5.22 “Contractors have stated that it is not uncommon to build in a minimum of 10% contingency cost when bidding fixed price for a project.”¹⁶³ Is the overall position optimised, or could overall costs be reduced if NR accepted more risk?

Ref.	Critical Issue	Commercial risk
28	<p>We observe that risk is shared between contracting parties, and that any risk transferred down the procurement chain results in the supplier adding a contingency provision, which (depending on the form of contract) may result in the employer paying for the risk whether it comes to pass or not. A common procurement convention is to allocate the risk contractually to the party best able to manage it, and incentivise that party to mitigate it as far as practicable. However, such a practice may be forestalled if the paying party has an over-riding objective, such as cost certainty, and he is prepared to pay for it. Thus, a contract rate viewed in isolation may not be the most cost-effective measure of overall efficient working.</p>	
	Recommended Action	Responsible – ORR and Network Rail
	<p>The ORR and NR should apply commercial considerations with regard to the risks and incentives to all parties when considering the potential savings associated with risk control, in order to be clear that the optimal risk allocation has been used, subject to any over-riding objectives the paying party may have. Thus, the Periodic Review Determination should take cognisance of the proposed form of procurement amongst other factors.</p>	

¹⁶³ WS Atkins, *Rail Value for Money Study: Asset Management & Supply Chain Management of GB Rail* (Issue 1.1, 25 May 2011)

6.5.23 In terms of application, we consider that savings in respect of *Estimating Uncertainty and Contingency* are potentially applicable to estimates at GRIP stages 0 to 3 for Enhancement projects.

Ref.	Critical Issue	Potential savings from Estimating Uncertainty and Contingency: Enhancements
29	<p>We observe that, subject to commercial considerations and detailed review and analysis of a significant number of projects, NR could achieve increasing benefits from reduced cumulative levels of estimating tolerances and contingency provisions. Although NR’s confidence in its estimating practices has significantly improved since the Optimism Bias study in 2010, it still retains significant levels of up-lift (comprising estimating tolerance and risk provisions) in GRIP Stages 1 to 2, and there is potential for local practices to incorporate up-lifts which are higher than necessary.</p> <p>We also observe that without systemic capture of data to build up a statistically significant sample of the tens of thousands of diverse projects under NR’s management, it is impracticable to come to a robust conclusion about the size of potential savings in this area. We also observe that NR has recognised this, and is taking steps better to collect data at appropriate stages in project life-cycles.</p>	
Recommended Action		ORR and NR
<p>Subject to the qualifications made elsewhere in this report about double counting benefits with other studies, and noting the steps that NR has already made to this end, we recommend that NR:</p> <ul style="list-style-type: none"> a) implement the analysis of project outturns and final costs anticipated at early GRIP stages, which it has started to do under the CAF process, so as to cover a significant body of projects and feed back the results to estimators; b) review the procedures for estimating tolerances and contingency provisions and the practices of its staff in fulfilling those procedures; and c) develop the use of portfolio governance procedures; <p>with a view to starting a virtuous circle of reductions in levels of contingency.</p>		

Infrastructure Renewals

GRIP Stage	Signalling, %	E&P, %	Telecom, %	B&C, %	Buildings, %	Track, %
1	404	33	35	35	40	35
2	30	22	25	25	30	25
3	20	12	15	15	20	15
4	10	8	8	10	10	10
5	8	5	5	7.5	7.5	7
6	5	5	5	5	5	5

Figure 6.11: Contingency thresholds for infrastructure renewals¹⁶⁴

- 6.5.24** Track renewals projects are estimated for inclusion in annual plans on the basis of contract rates, with a contingency of 1.5% for plain line¹⁶⁵ instead of the standard figure of 5%, shown in Figure 6.11. We consider that these figures are tight, and that contingency may be being provided either within the contract rates or by slippage. In any case, the thresholds in Figure 6.11 are significantly less than for their counterparts within enhancements, reducing the scope for savings under this heading (*Estimating Uncertainty and Contingency*).
- 6.5.25** Infrastructure renewals are currently managed (pre-Devolution and DIME) by means of asset-led portfolios of projects prioritised into annual budgets which tend to under-spend, although the reasons are not clear, and it may be that individual renewals projects overspend. We understand, however, that contingency provisions are managed locally by the respective project managers, who tend to manage portfolios of local projects. More effective management of contingency could be achieved by transferring to a higher tier of management the control of those risks which are beyond the immediate control of the project managers. We have discussed at paragraph 6.4.10 above the limited visibility of physical progress with infrastructure renewals.

¹⁶⁴ Projects Work Instruction: Implementing Cost Risk Management (GRIP 4 to 8) v 2 September 2011 [8.3]

¹⁶⁵ Interview with Joan Heery and Nick De Bellaigue, 11 January 2012

Ref.	Critical Issue	Potential savings from Estimating Uncertainty and Contingency: Renewals
30	We observe that the same principles which were discussed in relation to enhancements apply to renewals too, but that there is presently significant uncertainty regarding the level of net slippage. This makes real levels of efficiency hard to measure.	
	Recommended Action	Responsible - Network Rail
	We recommend that it would be more productive, at least in the latter years of Control Period 4, to improve the measurement and certainty of delivery of infrastructure renewals within the constraints of the track access process, rather than to seek savings under this heading. Once more confidence has been achieved over the measurement of the results, feed-back to the estimating process could be used to identify deliverable savings that would not jeopardise the overall asset condition.	

6.5.26 Present track renewals contracts see NR absorbing the risk for late or cancelled possessions, or for the incorrect presentation of materials trains. As a result, contract prices reduced significantly, to a point where the supply chain was showing signs of distress, with some sub-contractors struggling to deliver the work for the price.¹⁶⁶ On the other hand, NR proposes to shift the balance of such risks back towards the contractors in the next round of contracts whilst still aspiring to significant further savings from productivity improvements (which we discuss later at paragraph 6.8.1).¹⁶⁷

Ref.	Secondary Issue	Market conditions
31	We observe that NR has made savings from favourable market conditions in the supply chain.	
	Recommended Action	Responsible – Network Rail
	NR and the ORR should consider who bears the risk, as between HM Government and NR, if market conditions alter. If the risk is NR’s, what level of contingency provision should they make?	

¹⁶⁶ Interview with Joan Heery and Nick De Bellaigue, 11 January 2012

¹⁶⁷ Presentation entitled “111116 Track efficiency & benchmarking (redacted) – ORR”

6.6 Increased Early Effort

Enhancements

6.6.1 We support the reasoning in the RVM and Atkins studies that Enhancements would benefit from *Increased Early Effort*, and we have adopted their findings about the level of possible savings, and have applied them to up-dated addressable costs. As discussed above, we have not included in the addressable costs those Funds where NR retains autonomy over the scope and specification of the enhancements in question, nor have we included the Innovation Fund or proposed budgets for enhancements which are not directly associated with NR’s infrastructure.

6.6.2 The savings which the RVM has indicated are subject to new governance arrangements, involving the industry parties concerned. The Infrastructure UK report emphasised that good governance is one of the keys to success:¹⁶⁸

“

2.29 Within the Olympics programme, there is a very clear delineation of accountability for cost control and the management of contingency budgets. All contingency is clearly identified as either ‘project’ or ‘program’ and either ‘in-scope’ (available to the project) or out of scope (funder’s contingency is not viewed, as is often the case, as available budget). A strong governance structure is built around the process for allocating contingency which, combined with effective incentivisation at all levels, has instilled a culture of cost awareness and accountability. The achievement of cost and risk reductions at the delivery level frees contingency for reassignment within the programme, subject to justification and approval by the Government Olympic Executive (GOE). Success has in part been driven by the clarity of decision making and by the commitment to ensuring that the GOE was set up as an effective and properly empowered client organisation.

”

Ref.	Critical Issue	Governance
32	We note that the IIP provides for new governance arrangements to be applied for most of the Funds, and that major projects should be subject to whole-system arrangements too. However, the potential for savings will be lost if the industry does not change its approach.	
	Recommended Action	Responsible – ORR
	The ORR should press the industry to prepare – and monitor the suitability of – empowered client organisations and effective governance procedures for infrastructure enhancements, for the approval of DfT and the ORR in order to clarify the impact of change on total project costs. In particular, those arrangements should provide for incentives for all participants not to alter project specifications and scopes after approval, and for clear accountability where change is unavoidable. Subject to this proviso, we support the savings identified by the Atkins and RVM Studies.	

¹⁶⁸ HM Treasury & Infrastructure UK, *Infrastructure Cost Review: Main Report* (HM Treasury, December 2010).

Infrastructure Renewals

6.6.3 We recommend that *Increased Early Effort* in the management of infrastructure renewals would provide greater certainty of achieving the plan and improve the transparency of efficiency savings, and that only after a further period during which the results have been analysed in more detail should consideration be given to reducing the budgets. We observed that considerable effort is already expended to plan and re-plan works within each function, in response to changing priorities, shortfalls in delivery (whether as a result of factors under the project managers’ control or not), or other causes.¹⁶⁹

6.6.4 The track access planning regime and the number of staff available are but two factors which constrain the ability to re-plan works within each budget year. We observe that 92% delivery represents an under-spend of £99m¹⁷⁰ and recommend that steps are taken to reduce the under-spend in relation to unplanned slippage.

Ref.	Secondary Issue	Mix of Opex to Capex expenditure
33	We observe that NR’s renewals teams are managed to head-count targets which may be constraining NR’s ability effectively to achieve its renewals programmes.	
	Recommended Action	Responsible – Network Rail
	Subject to other constraints such as the track access planning regime, NR should consider whether there is benefit in increasing head-count in delivery teams in order to reduce under-spending of the Capex budget and net slippage of renewals portfolios.	

6.6.5 Better cross-functional liaison and design in the early stages of planning could result in benefits for renewals as well as enhancements, but we estimate these to be of a lower order of magnitude than the benefits which would accrue from whole-system considerations, and are concerned that the low number of samples in the case study render this conclusion unreliable.

Ref.	Critical Issue	Renewals savings
34	We observe better value for money would accrue from <i>Increased Early Effort</i> in planning and designing asset renewals.	
	Recommended Action	Responsible – Network Rail
	We recommend that NR consider what improvements in effectiveness can be achieved in renewals projects, and increase Opex expenditure and headcount in order to deliver at least the same amount of reduction to Capex. The ability to deliver is likely to be constrained by track access and resource limitations, so we recommend no net savings in this study in this regard. However, we consider that this subject is worthy of further attention by NR and ORR.	

¹⁶⁹ Interviews with Chris Sills (17 November 2011), Andrew Shaw, Nick De Bellaigue (5 December 2011)

¹⁷⁰ “120109 Tab 8 20111121 Track Asset Report P09”, “IP B&C ERM Period 9” and “SPC ERM P8 v5”

6.7 Increased Efficiency

General

- 6.7.1 Paragraphs 4.6.16 to 4.6.20 above described how NR forecasts resource demands and manages the sizes of its teams which and manage enhancements and infrastructure renewals. NR is currently preparing its plans for Project DIME, and is implementing Devolution. NR has stated that Project DIME will result in a saving of 10% of headcount in the Investment Projects Directorate (which does not include track renewals). However, owing to the developing situation, we have not been able to see definitive supporting information.
- 6.7.2 NR has implemented the recommendations of the Hackett Study, and has reduced its headcount in the Commercial and Procurement Section. Those savings are not reflected in the summary of headcount shown in Figure 6.12, in which Track Renewals does not feature as it is part of the Asset Management Directorate. Both Comparator A and Comparator B are client organisations who are most aligned to B&C in the list of departments in Figure 6.12. However, it should be noted that the structural differences between the comparators and NR (and between the different functions represented in Figure 6.12) render comparisons interesting and indicative only.

Group of Staff	Capex / head £m / head	Opex / Capex %
Track (not part of IP)	Not available	4
Thameslink	1.059	7.5
Enhancements	0.814	8.1
S&E	0.678	10.2
B&C	1.395	4.7
FTN/GSMR	0.601	12.0
Total IP (excluding Crossrail & HQ)	0.890	8.0
Total IP (excluding Crossrail but including HQ)	0.960	7.5
Comparator A	2.520	Not available
Comparator B	2.900	1.6

Figure 6.12: Investment Projects Department (& Track renewals) Headcount indicators¹⁷¹

¹⁷¹ Spreadsheet entitled "IP PM costs-Halcrow 12 Dec 11", interview with Joan Heery and Nick De Bellaigue and benchmarking questionnaires A and B

- 6.7.3 The ORR prepared a table¹⁷² which showed that Opex : Capex ratios ranged between 4.7% and 25.3%, excluding outliers, for about 30 projects. We consider that the figures in Figure 6.12 are more statistically significant, and compare well with a US study¹⁷³ which placed the ratio of soft costs (adjusted to be broadly the same as Opex costs as used in NR) to hard costs (adjusted to be broadly equivalent to Capex costs as used in NR) as between 5% to 30% over about 50 rail projects.
- 6.7.4 Atkins assumed that the percentages of “in-the-ground” to “not-in-the-ground” costs was 60 : 40. We have noted at paragraph 4.5.14 (and Critical Issue 11) that the cost conventions used by NR are not sufficiently robust to permit an accurate measure of soft costs in the way undertaken in the US study. The term “Opex costs” is used by NR to reflect staff costs and overheads, so the percentages in Figure 6.12 are significantly lower than both Atkins assumptions and the US study figures. In view of the uncertainty, we have continued to use Atkins’ assumptions about this split.
- 6.7.5 Investment Project costs include staff overheads of approximately 14% and business overheads of approximately 29%.¹⁷⁴ We anticipate that the tensions from Project DIME, in which business unit leaders will put their share of overhead costs under scrutiny, will cause these costs to be optimised.

Enhancements

- 6.7.6 We observe that Atkins identified £80m in 2018/19 (at 2009/10 prices) that could be saved as a result of reduced overheads and Opex costs associated with enhancements, but we understand that this was subsumed within the exercise to eliminate double counting and within other adjustments.

Ref.	Critical Issue	Potential savings from Efficiency
35	We observe that there is a tension between the <i>Increased Early Effort</i> head of saving and a reduction to staff Opex that might be deployed on such works.	
	Recommended Action	Responsible – ORR and Network Rail
	Nevertheless, we support in principle the application of an allowance for efficiencies which the RVM and Atkins studies applied to the addressable costs for enhancements.	

Infrastructure Renewals

- 6.7.7 For the same reasons discussed above, we consider that efforts in infrastructure renewals should be focussed on increasing the effectiveness of delivery. From a project and programme management perspective we therefore identify no saving at this time. Savings may accrue under other initiatives such as Asset Management and Supply Chain Management.

¹⁷² Project Management Costs analysed September 2011 v 1

¹⁷³ Derived from Transport Cooperative Research Program *Report 138 Estimating Soft Costs for Major Public Transportation Fixed Guideway Projects* (Transport Research Board of the National Academies, Washington, D.C., 2010) Part 1, Exhibit 10.

¹⁷⁴ Extrapolated from spreadsheet entitled “B&C Opex Budget Input 2011-12”

6.8 Other initiatives

6.8.1 We observe that NR is pursuing benchmarking and is learning lessons from other railway administrations, but NR has not shared any findings with us as they consider that they are not yet developed sufficiently. However, we note that in track renewals, initiatives exist to reduce costs by varying the risk allocated to its suppliers, and by improving the deployment and training of skilled labour.¹⁷⁵ As a result, NR is planning to deliver savings of at least 30%, although, as we have indicated above, there may be commercial risks to achieving that figure. Since this initiative will be realised through the supply chain, we have not accounted for it in the savings set out below, but we consider that the principle is worth considering for wider application.

Ref.	Good practice	Multi-skilling and deployment of staff
36	We observe that NR’s track renewals team is considering the benefits from facilitating better deployment of personnel across the days of the week, leading to more continuity of employment for individuals, less dependence upon labour-only sub-contractors and a greater incentive for contractors to invest in staff training to achieve multi-skilling. Whilst this is presently thought of as an initiative for the track renewals supply chain, there is also potential benefit for the deployment of NR’s directly employed staff, albeit that Industrial Relations issues may arise. There is also potential benefit for other engineering functions.	
	Recommended Action	Responsible - Network Rail
	Whilst this is principally a matter for the Civity study into the supply chain, we recommend that the initiative is spread across all engineering functions, as project management considerations inter-relate with procurement options. We also observe that this initiative sprang from initial benchmarking against European railways, and that NR is actively pursuing such initiatives, even though at this stage it declined to share other results with us.	

6.8.2 We have observed that NR has made good progress with its Efficient Infrastructure Delivery initiatives, and note that the benefits of these are targeted upon the delivery of its CP4 obligations. We are also aware of other studies proceeding in parallel with this one, particularly that conducted by Civity in respect of supply chain management.

Ref.	Critical Issue	Double counting
37	We observe that the RVM Study made allowances for double-counting with other initiatives, and that other studies are proceeding in parallel with this one.	
	Recommended Action	Responsible – ORR
	We recommend that ORR makes adjustments to the cost savings identified in this study in consultation with NR, in order to avoid either double-counting or the omission of potential savings.	

¹⁷⁵ Presentation entitled “11116 Track efficiency & benchmarking (redacted) – ORR”

6.9 Calculation of potential cost savings

- 6.9.1 We are not fully sighted on the recommendations of other studies which are in hand contemporaneously with this one. We therefore recommend that the ORR accounts for any double-counting.
- 6.9.2 The data in the following figures are based on the Atkins' RVM study methodology, having applied the rationale described in the previous sections, and take no account of double counting with other RVM cost savings. Please see Critical Issue No. 37. The algorithms in Figure 6.13 have been used together with the data from Figures 6.15 to 6.18 in a spreadsheet developed to compute the high and low limits of a range of potential savings under the respective headings, shown in Figures 6.19 and 6.20.

$$HPS_{i,y} = HD_y \times H_i \% \times \sum_{j=1}^{j=7} (F_{i,j} \times AC_{j,y})$$

$$LPS_{i,y} = LD_y \times L_i \% \times \sum_{j=1}^{j=7} (F_{i,j} \times AC_{j,y})$$

Where

$HPS_{i,y}$	is the total high potential saving for Case i in Year y
$LPS_{i,y}$	is the total low potential saving for Case i in Year y
HD_y	is the discount factor for high potential savings derived from the RVM Study for year y (identified in Figure 6.16) (accounting for the build up to achieving the full potential savings in Year 2018/19)
LD_y	is the discount factor for low potential savings derived from the RVM Study for year y (identified in Figure 6.16) (accounting for the build up to achieving the full potential savings in Year 2018/19)
H_i	is the higher value of potential saving for the case in question (from Figure 6.15)
L_i	is the lower value of potential saving for the case in question (from Figure 6.15)
$F_{i,j}$	is the Factor (0 or 1) from Figure 6.18 determining whether or not the type of addressable cost is addressable for the case in question
$AC_{j,y}$	is the addressable cost in question for Year y (from Figure 6.17)
i	varies between 1 and 3 and relates to the number of the Case in question (identified in Figure 6.18)
j	varies between 1 and 7 and relates to the type of addressable cost in question (identified in Figure 6.18)
y	is the Year in question, and varies between 2012/13 and 2018/19
\sum	is the sum function which, in respect of Case i and Year y (identified in Figures 6.17 and 6.18), returns the result of adding the products of the terms inside the brackets for each value of j

Factorisation for Cases 3 and 6 were extrapolated from those in the RVM Study but have not been included in this report since those cases have not, in the end, been taken forward.

Cases 3 and 6 have been retained in the spreadsheet, the algorithm and the tables in order to provide flexibility for use in the future in the event that sufficient data is forthcoming.

Figure 6.13: Algorithm used to calculate potential savings

Type	High %	Low %
Efficiency	10*	4*
Increased Early Effort	20	10
Avoided Costs	18	6

Note: %ages for Efficiency are reduced from those stated in the RVM Study (25% and 10% respectively) to account for the assumption that they are only applicable to 40% of the addressable costs representing the “not-in-the-ground” costs.

Figure 6.14: Percentage savings (Atkins) (Avoided Costs were not taken forwards by the RVM Study)

Type	High %	Low %
Efficiency	10	4
Increased Early Effort	20	10
Estimating Uncertainty & Risk	0	0

Note: We have repeated the reduction of the %ages for Efficiency from those stated in the RVM Study (25% and 10% respectively) to account for the assumption that they are only applicable to 40% of the addressable costs representing the “not-in-the-ground” costs.

Figure 6.15: Percentage Savings applied here (Avoided Costs have not been considered)

CP	CP4		CP5					
Year	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	Average
High Savings in year	36	144	201	448	629	827	1050	631
%	3	14	19	43	60	79	100	
Low savings in year	30	123	138	335	452	590	740	451
%	4	17	19	45	61	80	100	

Figure 6.16: Factorisation of savings for cases 1, 2, 4 and 5 (from RVM Study, Table 4.6)

Type of Cost	£m, 2011/12 prices								
	Total Cost (High)	Potentially Addressable Cost	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
Committed Projects	4891	0	0	0	0	0	0	0	0
Uncommitted Projects	4159	4159	134	275	485	1,109	1,030	844	691
Funds under NR control *	413	413	153	184	92	72	75	82	92
Funds not under NR control *	2110	2110	521	406	406	431	452	418	403
Options	1657	0	0	0	0	0	0	0	0
Infra Renewals (excl. Track)	8194	8194	1666	1486	1646	1706	1645	1645	1552
Track Renewals	3295	3295	792	844	659	659	659	659	659
	CP5 Figures		CP4 Figures		CP5 Figures				

Options are mentioned in the IIP's but there is significant overlap with the list of uncommitted projects in the "Definition of Proposed CP5 Enhancements". All Options are included in the list of uncommitted schemes in Scotland. Options are therefore ignored as Addressable Costs in the light of the following conclusion, which results in numbers higher than those in the IIP's.

Total spend on Enhancements in CP5 shown in the IIP's (Scotland and England & Wales) is £10,495m.

Total spend on Enhancements in CP5 shown in the table above (excluding Options) is £11,573m.

The difference is that between the Definition of Proposed CP5 Enhancements and the ORR's spreadsheet "IIP Enhancement Numbers Oct 11", +/- £50m. MML Electrification rose by 20% and three new schemes were introduced and one removed. Most schemes increased in price by 4 - 10%.

Renewals and Funds in CP4 are as per "NR Control Period 4 Delivery Plan Update 2011"

Asset renewals in CP5 are as per "ICM Output to Halcrow", received 20 January 2012 from NR

* Not including the Innovation fund, which is not addressable.

Figure 6.17: Addressable Costs

Algorithm variables	i	1	2	3
j	Type of cost	Included in Case 1	Included in Case 2	Included in Case 3
1	Committed Projects	0	0	0
2	Uncommitted Projects	1	1	1
3	Funds under NR control *	1	0	1
4	Funds not under NR control	1	1	1
5	Options	0	0	0
6	Infrastructure renewals (excluding track)	0	0	0
7	Track Renewals	0	0	0

Case 1: Addressable by Efficiency on “not-in-the-ground”, high costs
Case 2: Addressable by Increased Early Effort, high costs
Case 3: Addressable by Estimating Uncertainty & Risk, high costs
Cases 4 – 6 As Cases 1 – 3 but low costs

0: Not addressable in this case
1: Addressable in this case

Funds under NR control: Performance Fund & NR Discretionary Fund
Funds not under NR control: All other Funds except the Innovation Fund, which has been excluded from this exercise as it would be counter-productive not to do so

Figure 6.18: Cases considered here as applied to different Addressable Costs (as identified in Figure 6.17)

Case	£m, 2011/12 prices						
	2012/13 High	2013/14 High	2014/15 High	2015/16 High	2016/17 High	2017/18 High	2018/19 High
1	3	12	19	69	93	106	119
2	4	19	34	131	178	199	219
3	0	0	0	0	0	0	0
1 + 2	7	31	53	200	271	305	337
1 + 2 + 3	7	31	53	200	271	305	337
CP4			CP5				

Figure 6.19: Potential High Savings (without adjustment for possible double counting)

Case	£m, 2011/12 prices						
	2012/13 Low	2013/14 Low	2014/15 Low	2015/16 Low	2016/17 Low	2017/18 Low	2018/19 Low
4	1	6	7	29	38	43	47
5	3	11	17	70	91	101	109
6	0	0	0	0	0	0	0
4 + 5	4	17	24	99	129	143	157
4 + 5 + 6	4	17	24	99	129	143	157
	CP4			CP5			

Figure 6.20: Potential Low savings (without adjustment for possible double counting)

- 6.9.3** Subject to consideration of the possibility of double-counting, we consider that there is potential for NR to save between £157m and £337m¹⁷⁶ (in 2011/12 prices) per annum from 2018/19 from the *Increased Efficiency* and *Increased Early Effort* initiatives identified. We have also adopted the factorisation used by the RVM Study to predict how progress in earlier years could build up to those savings.
- 6.9.4** As discussed above, we also consider that further savings could be made – in respect of infrastructure renewals and consideration of estimating tolerance and contingency – but we have not been able to quantify them owing to the present shortage of data, which NR is addressing.
- 6.9.5** NR has stated that the choice of portfolios for both enhancements and renewals will have an impact on making savings arising from the portfolio effect described in section 6.5 above, and that potential savings could be as much as £524m for Enhancements alone as derived at Figure 3.7 and discussed at paragraph 3.3.13 above.¹⁷⁷ The process of moving towards a determination for Control Period 5 should address the necessary considerations to bring focus to the current range of estimates. This range would appear to be additive to the savings identified by the RVM study as revised by this study.

Ref.	Critical Issue	Portfolio effects
38	We observe that the choice of the programmes, portfolios and projects selected for execution in CP5 will have a bearing on the savings which NR could make by capitalising on synergies arising from geographical and timing factors etc.	
	Recommended Action	Responsible – NR, ORR and Funders
	We recommend that ORR provides scope within the process of arriving at the Control Period 5 determination to enable this effect to be maximised. NR has itself identified the potential for significant savings but these savings will only be realised with the co-ordinated effort of the industry.	

¹⁷⁶ In terms of the algorithms in Figure 6.13, HPS_{18/19} is £337m and LPS_{18/19} is £157m

¹⁷⁷ See Figure 3.7 of this report. Data derived from *PR13 Initial Industry Plan Supporting Document, Definition of proposed CP5 Enhancements*, Network Rail, September 2011.

6.10 Comparison with RVM Savings Range

- 6.10.1 At paragraphs 6.3.6 to 6.3.8 above we observe the derivation of the RVM Whole System Programme Management range of £40-100m in 2018/19 from the Atkins' estimated range of £160-320m (pre-overlap with NR initiatives). As stated at 6.3.6 above we are not sighted on either the full derivation of the Atkins' range taking account of overlaps with NR initiatives or the final RVM derivation. However, the RVM range is approximately 20% of the Atkins' range.
- 6.10.2 Our range of £157m to £337m is the total savings up to and including 2018/19; it is therefore not directly comparable to the RVM range of £40-100m. Thus, our comparable range with the RVM range is 20% of our range - £31.4m to £67.4m.
- 6.10.3 We expect that the top end of this savings range to be achievable by NR in full on the basis that:
- Our range does not take account of any PPM savings pertaining to infrastructure renewals. Although the RVM Study concluded that Renewals savings were primarily achievable from Asset Management and Supply Chain Management initiatives we consider that there is some room for savings through better programming of work. The opportunity here lies in making better use of the available access to the railway. Until the effectiveness of spending existing budgets (distinguishing between efficiency and slippage) is addressed it is difficult to assess the efficiency gap in relation to renewals which might be derived from an improved approach to PPM;
 - NR has stated that the choice of portfolios for both enhancements and renewals will have an impact on making savings arising from the portfolio effect. NR's estimate range for Control Period 5 Enhancements stated in the Initial Industry Plan suggests that there is potential to save £524m (the difference between the top-end of the range based on individual project estimates and the bottom-end portfolio estimate) but this will depend on the refined requirements of funders, ORR and a range of other factors. The process of moving towards a determination for Control Period 5 should address the necessary considerations to bring focus to the current range of estimates. This range would appear to be additive to the savings identified by the RVM study as revised by this study. If distributed evenly across Control Period 5 this might add a further £100m to the top and bottom of the potential savings range.
- 6.10.4 NR is demonstrating industry leadership in improving cooperation from its customers, funders and the ORR to achieve the desired savings. In our opinion improved value for money will flow from single-point accountability for achieving the requisite savings against a clear mandate. In this regard ORR and funders should consider the arrangements for ensuring that NR is given the authority to achieve the savings. All industry parties must also recognise that savings cannot be considered in isolation. Capacity, performance and disruption to the railway are all competing objectives with cost and a balanced view must be taken overall. Any savings range must therefore be assessed in this wider context.



Appendix A

Study Remit

Appendix A Study Remit

(ii) Statement of Requirement

Background to the project

The Office of Rail Regulation (ORR) wishes to conduct a review of Network Rail's project and programme management capability with a view to informing the ORR of its current processes and procedures from planning to implementation phases. This work will ultimately contribute to the overall body of knowledge in support of the upcoming PR13 determination.

Network Rail manages a large number of significant projects at any one time and it has built up a substantial in-house capability to oversee and implement these multi-million pound investments. In the light of the Value for Money study which was recently published by Sir Roy McNulty the key findings have reinforced the importance of driving down costs and delivering efficiency savings.

Given the scale of investment where the value of renewals and enhancements combined accounts for over £4bn per annum the ORR wishes to examine the potential for savings from the management of this programme of work over the next control period (CP5 which runs from 1st April 2014 - 31st March 2019).

In reviewing Network Rail's project and programme management capability we wish to compare Network Rail's approach against other leading rail and non-rail organisations who manage large infrastructure investment programmes. The ORR would also like to understand how Network Rail compares against best practice including recognised project management standards and excellence frameworks.

It is important to learn of best practice from other European comparators and from around the world in order to understand what lessons can be learned and applied in the UK rail industry in order to improve efficiency.

The ORR would also like to understand the extent to which the existing processes and procedures are fit for purpose and able to support the business objectives both in terms of current and future business demands of the business. It is vital to ensure that processes are joined up and that there is a clear 'line of sight' from the planning phase right through to hand over to operations and maintenance.

Network Rail uses its "GRIP" process (Governance for Railway Investment Projects) which divides a project into eight distinct stages. The overall approach in GRIP is product rather than process driven, and within each stage an agreed set of products are delivered.

The 8 GRIP Stages are

1. Output definition
2. Pre-feasibility
3. Option selection

1. Single option development
2. Detailed design
3. Construction test & commission
4. Scheme hand back
5. Project close out

Formal stage gate reviews are held at varying points within the GRIP lifecycle. The stage gate review process examines a project at critical stages in its lifecycle to provide assurance that it can successfully progress to the next stage.

With the various changes and challenges that the rail industry is currently facing including 'devolution' it is fundamental to review how the current organisation compares to world class in terms of size, structure, culture, systems, management approach and skills.

From 2012 Network Rail will be implementing a new programme of work called 'Project Dime' which should significantly change Network Rail's approach to project development and delivery and the consultant should take this work into consideration as part of this study.

Scope of the project

The consultant is required to carry out a comprehensive review of Network Rail's project and programme management approach including the following:

- All aspects of the project management process associated with the engineering renewals / asset groups including track, signalling, telecoms, electrification and plant, structures and operational property.
- The review of programme management shall focus on the process through which renewals projects are combined with the planning and delivery of other works, e.g. enhancements, performance improvements, maintenance work etc, in order to form route-wide improvement programmes that help deliver NR's corporate objectives.
- Review of existing literature and consultants' reports on existing management (for example the work undertaken as part of the McNulty Review <http://www.rail-reg.gov.uk/server/show/ConWebDoc.10420>).
- Identify a best practice framework using for example the OGC MSP model, PRINCE2 methodology or other recognised models against which to compare Network Rail processes and practices.
- Examine the fitness for purpose of the current systems, processes and procedures for managing the projects including: GRIP process, scoping, strategy and planning, contracting approach (communication between procurement, projects team and contractors), delivery, organisation structure and competence management.
- Consider the extent to which a RAMS (reliability, availability, maintainability and safety) and WLCC (whole life cycle cost) approaches are being applied in practice in terms of the scoping phase to ensure that a solution is optimal for the asset life cycle (fitness for purpose, creation, operation, maintenance and disposal).
- Evaluate the size and structure of the project and programme management function within Network Rail and benchmark this against other leading rail and non-rail organisations.
- Consider the costs (including overheads) and the services provided by the project and programme resources in terms of effectiveness and efficiency.
- Evaluate the size of the efficiency gap between Network Rail and best practice organisations and to what extent Network Rail is taking measures to close the gap. Specifically the consultant will examine the following:
 - a. The size of the current efficiency gap

- a. The extent to which Project Dime/CP4 changes will address the gap
 - b. The remaining gap that is left over CP5
 - c. The extent that devolution could be a risk or opportunity for improving efficiency
- Consider whether the size of the organisation is appropriate for the delivery of its capital programme. We would expect to see a significant proportion of this work based on a quantitative assessment.
 - Review 20 renewals and enhancement case studies across different asset groups to consider out turn vs budget, whether the solution was fit for purpose, represented good value for money, there is a clear 'line of sight' from the requirement to procurement, delivery, operations and maintainability on the ground. After completion consider whether there is a feedback mechanism to improve the process for subsequent projects.
 - Review the effectiveness of the management of contactors in terms of the level of communication and engagement in planning, developing, scoping, types of contracts, managing variations, construction assurance etc.
 - Examine the working relationship between Network Rail and its suppliers and consider the key opportunities to unlock potential benefits.
 - Explore how business risks are evaluated and mitigated and whether all options are fully considered. For example is there sufficient dialogue between the parties prior to letting contracts to ensure that solutions are optimised up front.
 - Propose a realistic set of recommendations for improvement with clear timescales and the size of the benefits that could be realised during CP4 and CP5.

Methodology

- Attend a start up meeting with the ORR to ensure a common understanding of the scope of the work and to agree engagement.
- Undertake a literature review including past reports, Network Rail's delivery plans etc in order to gain an understanding of relevant issues and recommendations.
- Organise a series of meetings in order to interview key Network Rail resources to gain an understanding of current systems, processes and work practices.

- Develop a suitable framework in order to enable the consultant to analyse Network Rail's current practices against best practice.
- Review of other rail organisations and cross-industry best practice which could be applied to Network Rail's operations. This will include but not be limited to planning and scoping, procurement, contracting strategy, delivery and benchmarking activities.
- Analyse on a quantitative basis that size of the gap between Network Rail's current practices against best practice. Evaluate to what extent the size of the organisation is optimal to deliver the capital programme.
- Provide a monthly report on progress, current issues and emerging findings.
- Provide an interim presentation of the draft report to the ORR at a workshop the date to be agreed.
- Produce a final report which incorporates comments and amendments as instructed by ORR.

Specific Outputs and Deliverables

In order to meet the project requirements outlined above, ORR requires the following assigned deliverables and outputs:

- Interim presentation of emerging findings
- Draft report for comment which details the findings, conclusions and recommendations.
- Final report which incorporates the amendments from the ORR
- A presentation of the findings and recommendations to the ORR

Please note the ORR will own the Intellectual Property Rights in any report produced under this contract. Reports may be published and should be drafted in a matter which does not require any re-working for publication.

Please note the maximum budget for this review is £80,000 (excluding VAT).

Project Timetable

The provisional project timetable is as follows:

- Start up meeting and commencement of work September 2011.
- Monthly updates on progress and any issues
- Interim findings 20th October 2011 (or as agreed)
- Draft report by 25th November 2011.

Final report by the 16th December 2011.



Appendix B

Meetings Schedule

Appendix B Meetings Schedule

No.	Timing	Purpose	Participants			
			NR	ORR	Other	Halcrow
1	31/10/11	Initial discussion	Ian Hodgins	-	-	Grant Biggam
2	06/10/2011	Commencement meeting with ORR and NR	Tania Chuda, Katie Glover, Ian Smith	Marius Sultan	-	Grant Biggam, Bob Crease
3	02/11/2011	Mobilisation meeting	Tania Chuda, Katie Glover, Paul Johnson, Martin Arter, Andy Kirwan, Mark Harrison.	-	-	Grant Biggam
4	10/11/2011	Oracle overview	Alan Thomas (IP)	-	-	Grant Biggam
5	15/11/2011	CITI / re-sizing	Paul Johnson (IP), Jason Wenham (IP)	-	-	Grant Biggam, Bob Crease
6	15/11/2011	Maturity assessment	Paul Johnson (IP), Katie Glover (IP)	-	-	Grant Biggam, Bob Crease
7	16/11/2011	General discussion (NR/Halcrow/ORR)	Eliane Algaard, Tania Chuda, Helen McAllister (Planning), Katie Glover (IP)	Marius Sultan	-	Grant Biggam
8	16/11/2011	High-level overview (Enhancements)	Ian Hodgins (Programme Controller)	-	-	Grant Biggam, Bob Crease

No.	Timing	Purpose	Participants			
			NR	ORR	Other	Halcrow
9	17/11/2011	High-level overview (B&C)	Chris Sills (Programme Controller), John Willis (Snr. Programme Manager) (both IP), Dan Athol(Head of Civils), Simon Johnson (AM),	-	-	Grant Biggam, Bob Crease
10	18/11/2011	Project DIME	Gordon Williams (IP)	-	-	Grant Biggam, Bob Crease
11	18/11/2011	Commercial	Stephen Blakey (IP)	-	-	Grant Biggam, Bob Crease
12	18/11/2011	Resource Scenario Model	Paul Johnson (IP), Michael Heaney (IP)	-	-	Grant Biggam, Bob Crease
13	21/11/2011	Programme Management	Martin Arter (IP)	-	-	Grant Biggam, Bob Crease
14	23/11/2011	High-level overview (SP&C) - IP	Andrew Shaw (IP)	-	-	Grant Biggam
15	23/11/2011	Resource Scenario Model follow-up	Michael Heaney (IP)	-	-	Grant Biggam
16	28/11/2011	RSM vs. Finance numbers - telephone call	Andy Tappern (Finance)	-	-	Grant Biggam
17	29/11/11	Efficient Infrastructure Delivery	K Glover, T Chuda, Jack ?	-	Frank Zschoche (Civity)	Grant Biggam
18	30/11/2011	High-level overview (SP&C) - AM	Ben Edwards (AM)	-	-	Grant Biggam
19	30/11/2011	Planning and Programme Controls	Huw James, Jeremy Harrison, Alastair Forbes and Raj Chohan	-	-	Grant Biggam, Bob Crease

No.	Timing	Purpose	Participants			
			NR	ORR	Other	Halcrow
20	02/12/2011	Review meeting 1 (Halcrow/NR)	Tania Chuda (Planning), Katie Glover, Paul Johnson (IP)	-	-	Grant Biggam
21	05/12/2011	High-level overview (Track)	Joan Heery (Head of Design), Nick De Bellaigue (Programme Controller)	-	-	Grant Biggam, Bob Crease
22	09/12/2011	Review meeting 2 (Halcrow/NR)	Tania Chuda (Planning), Michael Heaney, Paul Johnson (IP)	-	-	Grant Biggam
23	12/12/2011	ORR update	-	Marius Sultan, Andrew Wallace	-	Grant Biggam, Michael Jamieson
24	12/12/2011	ORR update	Tania Chuda (Planning), Eliane Algaard, Paul Johnson (IP)	Marius Sultan, Andrew Wallace	-	Grant Biggam
25	15/12/2011	Programme Controls	Alistair Forbes, Neil Arnold, K Glover	-	-	Grant Biggam
26	16/12/2011	OPEX Costs	Andy Tappern (Finance), P Johnson	-	-	Grant Biggam
27	18/12/2011	Discussion with Civity and ORR	-	Marius Sultan, Andrew Wallace	Frank Zschoche, Stefan Wiedmer (both Civity)	Grant Biggam, Michael Jamieson
28	06/01/2012	Risk & Value Management	Jeremy Harrison (Head of Risk & Value)	-	-	Grant Biggam

No.	Timing	Purpose	Participants			
			NR	ORR	Other	Halcrow
29	10/01/2012	Enhancements	Ian Hodgins	-	-	Grant Biggam
30	11/01/2012	Buildings & Civils	Chris Sills, Simon Offley	-	-	Grant Biggam, Bob Crease
31	11/01/2012	Track	Joan Heery (Head of Design), Nick De Bellaigue (Programme Controller)	-	-	Grant Biggam, Bob Crease
32	12/01/2012	Sponsorship	Anit Chandarana	-	-	Grant Biggam
33	13/01/2012	Comparator 1		-	-	Grant Biggam, Bob Crease
34	17/01/2012	Signalling, Power and Communications (SP&C)	Andrew Shaw, Mark Woodhouse	-	-	Grant Biggam
35	18/01/2012	McNulty RVM Study	-	Marius Sultan, Andrew Wallace	Jon Elphick (Atkins)	Grant Biggam, Bob Crease
36	19/01/2012	Initial Thoughts	-	Marius Sultan, Andrew Wallace	-	Grant Biggam, Bob Crease
37	25/01/2012	Cost and Schedule Adherence (telecon)	Andrew Lyons	-	-	Grant Biggam
38	15/02/2012	Case Study clarifications (telecon)	Ian Hodgins	-	-	Grant Biggam
39	22/02/2012	Estimating uncertainty and contingency clarifications (telecon)	Stephen Blakey	-	-	Grant Biggam, Bob Crease
40	27/02/2012	Estimating uncertainty and contingency clarifications (telecon)	Jeremy Harrison	-	-	Grant Biggam, Bob Crease

No.	Timing	Purpose	Participants			
			NR	ORR	Other	Halcrow
41	28/02/2012	Business case (telecon)	Anit Chandarana	-	-	Grant Biggam
42	30/03/2012	ORR feedback meeting	-	Marius Sultan Andrew Wallace (part)	-	Grant Biggam Bob Crease



Appendix C

Summary of Issues and Recommendations

Appendix C Summary of Issues and Recommendations

Primary Issues

Ref.	Title	Issue	Recommended Action	Responsible
1	Organisation	<p>In Control Period 4 NR has already appointed several delivery partners to assist with the deliver of major projects and programmes, but the Alliance arrangements proposed for Control Period 5 suggest new territory for both NR and its supply chain which will have to be handled well if efficiency improvements are to be achieved.</p> <p>Comparator organisations have made significant strides in closer integration with their supply chains to produce good results. Precursors for success have been to achieve commercial incentives aligned to regulated outputs; the ability to set outcome-based specification requirements which give the supply chain room to innovate within without overburdening assurance requirements (which have the potential to reduce innovation); and, fostering the right culture and attitude.</p>	<p>NR must prepare for this future approach adequately by creating clear output specification requirements and genuinely engaging with and incentivising its supply chain. If these requirements are not met alliancing / partnering approaches can increase risk of non-delivery.</p>	Network Rail

Ref.	Title	Issue	Recommended Action	Responsible
3	Devolution / DIME	Details of Devolution and DIME will emerge when NR's development has progressed and have been the subject of safety validation and staff consultation. Doubtless NR is working-through the risks and opportunities of re-aligning on a Route rather than an asset basis. A number of matters will require attention to ensure that the transition is assured and does not lead to a drop in performance in the short-term and potential cost escalation on the medium term. As NR is aligning itself to the needs of its customers it may open itself to internal decision-making tensions which do not currently exist.	<p>Key issues which require careful consideration by NR in its details Devolution / DIME proposals include:</p> <ul style="list-style-type: none"> • The ability of the new NR Route Client organisation to specify on an output basis at an early stage in the GRIP process (GRIP 2/3 instead of GRIP 4/5). The new NR Client organisation should have its own capability to specify and procure if 'Newco' is to be truly separated for the purposes of contestable works; • Tension between NR Routes for available funding as they come under more direct customer scrutiny. A mechanism for balancing expectations and requirements across NR will be required; • In preparation for the Control Period 5 Determination NR should prepare its proposals to ORR on a Route basis to allow the alignment between Route outcomes, proposed solutions, cost and affordability to be checked. We consider that this should also take account of railway-wide whole-life asset management decision-making. 	Network Rail
4	Control Period 5 Determination	<p>The restructuring of NR on a Route basis under Devolution presents the question of how the Control Period 5 Determination will be made; either as one Determination or ten separate Determinations. This is important in promoting an 'organisational governance' perspective as ORR's decision will drive NR's pricing of Control Period 5 obligations.</p> <p>The Route-based alignment might also raise questions for DfT and Transport Scotland in respect of future franchise decisions which in-turn affect NR's ability to gain alignment with its customers. Again this is an organisational governance matter which might affect NR's ability to scope and price solutions to expected Control Period 5 outcomes.</p>	<p>ORR must consider whether it will make one Control Period 5 Determination or ten (or some other number to be agreed depending on the treatment of multi-Route programmes). Regardless of the approach we consider that Route-specific outcomes should be addressed in order that these can be appropriately funded and subsequently monitored.</p> <p>DfT might need to consider the commercial arrangements for incumbent and future TOCs in order that appropriate incentives and behaviours feed-into the Control Period 5 Determination process and its execution.</p>	ORR, DfT and Transport Scotland

Ref.	Title	Issue	Recommended Action	Responsible
5	Programme Management Lifecycle Methodology	GRIP is founded in the management of <i>projects</i> rather than <i>programmes</i> and has focused attention on the sequential achievement of progressive Stage Gates. Although this control at project level is still required the RVM recommendations require the industry to take a more holistic view of programme delivery and NR – with its industry partners – must devise suitable governance arrangements and control frameworks (suitable to each case) – which will drive the efficiencies sought.	Although much of NR's approach is scalable and flexible to meet the demands of different projects – and programmes – we consider that the link between business benefits and front-end decision making should be made explicit in NR's approach and this should incorporate its closer ties with its customers. By integrating industry partners into a programme management approach rather than arms-length relationships NR might encourage the alignment and improved value for money sought. NR will require the co-operation of its industry partners to achieve this and the approaches adopted will vary depending on the depth of the integration with its customers and suppliers.	Network Rail
10	WLCC and RAMS	NR does not explicitly address WLCC or RAMS through its project management framework. Although the latter is probably embedded within NR's policies and standards decisions concerning whole-life costs for new assets should be explicit to ensure that the right solutions are being selected for the railway. The lack of explicit analysis may be preventing long-term cost saving opportunities to be taken at the expense of cheaper solutions which are attractive for the purpose of achieving short-term efficiency targets.	Explicit WLCC and RAMS analysis should be undertaken for programmes (either enhancements or renewals) which attract either major capital expenditure or present potential significant risks to the operation of the railway for the creation of new assets. We understand that NR is undertaking similar analysis for existing assets, but this should be extended to ensure that long-term cost reduction and performance improvement opportunities are not lost at the expense of short-term 'efficiency' gains. ORR and NR should agree a mechanism for achieving this through the forthcoming Periodic Review 2013 process.	Network Rail and ORR

Ref.	Title	Issue	Recommended Action	Responsible
11	Cost Transparency	The ability to compare heads of cost both internally and externally is hampered by the way costs are presently captured. We observe that NR does not apply consistent cost categorisation for project management and design staff, and that this obscures the comparison of project team sizing across projects which are procured through alliances and those which are not.	<p>This should be resolved in order that NR can demonstrate the benefits of its Devolution and DIME initiatives in relation to its current performance.</p> <p>NR should review its cost categories and institute a more rigorous cost convention that would facilitate both internal and external benchmarking.</p> <p>External benchmarking is of little use if costs cannot be readily compared between administrations which apparently execute similar projects. This is obviously harder for NR to achieve itself but NR's proposed Railway Standard Method of Measurement is a sign of positive action and the US Federal transit Authority has demonstrated what can be achieved through focussed co-ordination between benchmarking partners.</p>	Network Rail
13	Contingency and Optimism Bias	We are advised by NR that the application of optimism bias is being considered in relation the Control Period 5 Determination. The IIP provides a start to the industry decision-making but this must now be refined in order to confirm outputs and allow estimating to be refined. If not, there is the potential for less-well defined schemes to proceed on the basis of immature estimating. This increases the potential for increasing CP5 costs at worst and over-funding CP5 at best.	<p>Where there is the ability to estimate base cost and risk on a better basis this approach should be adopted to avoid a lack of robustness in early decision-making. NR has increasing ability – through better understanding of base cost and learning from the categorisation of contingency – to improve pricing for the purposes of Control Period 5. However, the price will depend on the range and definition of the projects selected to proceed. This will largely be driven by the ability of the industry to make informed investment decisions in a timely manner.</p> <p>In turn, NR should prepare a fully transparent estimate both at project and programme level in order to articulate the benefits of a programme approach (geographical, procurement vehicle, etc).</p>	Network Rail, ORR and DfT

Ref.	Title	Issue	Recommended Action	Responsible
17	Increased Early Effort	We observe that disruption would have been avoided in three of the cases studied if earlier effort had been made to consult adjacent landowners, facilitating surveys and investigations on site to identify factors which were incidental to the permanent works but which were significant risks to successful delivery. We also observe that NR already has an initiative in place called “Workbank Planning”, which aims to “lock down” estimates for renewals three or four years prior to the budget year in question, from which £385 million (at 2009/10 prices) was planned to be saved during CP4 by building up to a level of about 70% of schemes being locked down in that way.	We consider that this supports the conclusion that <i>Increased Early Effort</i> would benefit renewals works, which are not subject to whole (railway) system factors, but note that statistically such a conclusion may not be robust, given the few cases studied. We also note that NR has already made significant steps to achieving this aim in B&C.	Network Rail
20	Efficiency v Slippage	We observe that unused contingency on the HO Campaign has been declared as an efficiency, whereas the reason for net under-spend is not clear to us, given the large swings in cost components and the unexplained re-charge and the apparent 5% shortfall in delivery by volume.	We recommend that the definition of efficiency is clarified and consistently applied to distinguish it from slippage or other causes of under-spend.	Network Rail
21	Justification of solutions underpinning PR13	NR has initiated a benchmarking exercise with the objective of demonstrating an efficient delivery profile for Control Period 5 Enhancement projects. A challenging element of this is to demonstrate that the solutions proposed are justifiable in relation to the expected outcomes i.e. ‘the right solution’ at the ‘right price’. If this is not adequately articulated in NR’s PR13 submission – and ORR’s Determination - a risk exists that solutions will be proposed which give the impression of efficiency. Through its benchmarking proposal NR appears to recognise this issue but we have observed elsewhere that this is an issue in Control Period 4.	The solutions underpinning the Control Period 5 proposals should be supported by asset policy decision-making which is underpinned by justified analysis and judgement, taking into account the relevant factors such as RAMS, WLCC and first cost affordability. This should aid the definition of a sustainable efficiency profile and should serve as a baseline should any different asset policy decisions be made mid Control Period. For example, if a better whole-life solution was sought by industry stakeholders mid Control Period which was not envisaged at Periodic Review, this could be change-controlled.	Network Rail

Ref.	Title	Issue	Recommended Action	Responsible
22	Change Causation	We observe that whilst NR maintains change control logs for individual projects, it does not undertake change causation analysis.	NR should undertake change causation analysis in order to help it address those underlying reasons which could be preventable, on order to: <ul style="list-style-type: none"> a) assist in distinguishing under-spends due to efficiency from those due to other causes; and b) improve accountability, not only within NR but also across the whole railway system. 	Network Rail
23	Measuring physical progress of infrastructure renewals	We observe that there is inappropriate reliance upon volumetric measures as a means of reporting physical progress with infrastructure renewals owing to the absence of a parameter which can be adapted pragmatically to the wide variety of work types and circumstances.	NR should develop better ways to measure physical progress and seek the agreement of the ORR to their common use.	Network Rail
24	Measuring efficiency	We observe that there is lack of certainty and transparency around the calculation of efficiency savings.	NR should develop better ways to distinguish between efficiency and: <ul style="list-style-type: none"> a) the release of contingency and over-accrual (which in overall terms are more properly characterised as consequences of over-estimation of risk); and b) under-spending due to problems with delivery (which may not be visible due to difficulties in reporting physical progress, which mask net slippage). 	Network Rail

Ref.	Title	Issue	Recommended Action	Responsible
28	Commercial risk	We observe that risk is shared between contracting parties, and that any risk transferred down the procurement chain results in the supplier adding a contingency provision, which (depending on the form of contract) may result in the employer paying for the risk whether it comes to pass or not. A common procurement convention is to allocate the risk contractually to the party best able to manage it, and incentivise that party to mitigate it as far as practicable. However, such a practice may be forestalled if the paying party has an over-riding objective, such as cost certainty, and he is prepared to pay for it. Thus, a contract rate viewed in isolation may not be the most cost-effective measure of overall efficient working.	The ORR and NR should apply commercial considerations with regard to the risks and incentives to all parties when considering the potential savings associated with risk control, in order to be clear that the optimal risk allocation has been used, subject to any over-riding objectives the paying party may have. Thus, the Periodic Review Determination should take cognisance of the proposed form of procurement amongst other factors.	ORR and Network Rail
29	Potential savings from Estimating Uncertainty and Contingency: Enhancements	We observe that, subject to commercial considerations and detailed review and analysis of a significant number of projects, NR could achieve increasing benefits from reduced cumulative levels of estimating tolerances and contingency provisions. Although NR's confidence in its estimating practices has significantly improved since the Optimism Bias study in 2010, it still retains significant levels of up-lift (comprising estimating tolerance and risk provisions) in GRIP Stages 1 to 2, and there is potential for local practices to incorporate up-lifts which are higher than necessary. We also observe that without systemic capture of data to build up a statistically significant sample of the tens of thousands of diverse projects under NR's management, it is impracticable to come to a robust conclusion about the size of potential savings in this area. We also observe that NR has recognised this, and is taking steps better to collect data at appropriate stages in project life-cycles.	Subject to the qualifications made elsewhere in this report about double counting benefits with other studies, and noting the steps that NR has already made to this end, we recommend that NR: <ul style="list-style-type: none"> a) implement the analysis of project outturns and final costs anticipated at early GRIP stages, which it has started to do under the CAF process, so as to cover a significant body of projects and feed back the results to estimators; b) review the procedures for estimating tolerances and contingency provisions and the practices of its staff in fulfilling those procedures; and c) develop the use of portfolio governance procedures; with a view to starting a virtuous circle of reductions in levels of contingency.	ORR and Network Rail

Ref.	Title	Issue	Recommended Action	Responsible
30	Potential savings from Estimating Uncertainty and Contingency: Renewals	We observe that the same principles which were discussed in relation to enhancements apply to renewals too, but that there is presently significant uncertainty regarding the level of net slippage. This makes real levels of efficiency hard to measure.	We recommend that it would be more productive, at least in the latter years of Control Period 4, to improve the measurement and certainty of delivery of infrastructure renewals within the constraints of the track access process, rather than to seek savings under this heading. Once more confidence has been achieved over the measurement of the results, feed-back to the estimating process could be used to identify deliverable savings that would not jeopardise the overall asset condition.	Network Rail
32	Governance	We note that the IIP provides for new governance arrangements to be applied for most of the Funds, and that major projects should be subject to whole-system arrangements too. However, the potential for savings will be lost if the industry does not change its approach.	The ORR should press the industry to prepare – and monitor the suitability of – empowered client organisations and effective governance procedures for infrastructure enhancements, for the approval of DfT and the ORR in order to clarify the impact of change on total project costs. In particular, those arrangements should provide for incentives for all participants not to alter project specifications and scopes after approval, and for clear accountability where change is unavoidable. Subject to this proviso, we support the savings identified by the Atkins and RVM Studies.	ORR
34	Renewals savings	We observe better value for money would accrue from <i>Increased Early Effort</i> in planning and designing asset renewals.	We recommend that NR consider what improvements in effectiveness can be achieved in renewals projects, and increase Opex expenditure and headcount in order to deliver at least the same amount of reduction to Capex. The ability to deliver is likely to be constrained by track access and resource limitations, so we recommend no net savings in this study in this regard. However, we consider that this subject is worthy of further attention by NR and ORR.	Network Rail

Ref.	Title	Issue	Recommended Action	Responsible
35	Potential savings from Efficiency	We observe that there is a tension between the <i>Increased Early Effort</i> head of saving and a reduction to staff Opex that might be deployed on such works.	Nevertheless, we support in principle the application of an allowance for efficiencies which the RVM and Atkins studies applied to the addressable costs for enhancements.	ORR and Network Rail
37	Double counting	We observe that the RVM Study made allowances for double-counting with other initiatives, and that other studies are proceeding in parallel with this one.	We recommend that ORR makes adjustments to the cost savings identified in this study in consultation with NR, in order to avoid either double-counting or the omission of potential savings.	ORR
38	Portfolio effects	We observe that the choice of the programmes, portfolios and projects selected for execution in CP5 will have a bearing on the savings which NR could make by capitalising on synergies arising from geographical and timing factors etc.	We recommend that ORR provides scope within the process of arriving at the Control Period 5 determination to enable this effect to be maximised. NR has itself identified the potential for significant savings but these savings will only be realised with the co-ordinated effort of the industry.	NR, ORR and Funders

Secondary Issues

Ref.	Title	Issue	Recommended Action	Responsible
6	KPIs and IPIs	NR's Corporate KPIs provide visibility of the broad range of metrics which are important to its success in delivering a valuable service. Such metrics provide guidance and can help to identify issues and opportunities to aid performance improvement. However, care must be applied to their derivation and use to avoid misinterpretation.	NR appears to use its KPIs and IPIs as a guidance tool, but if more reliance is placed on them by top management they should seek other assurance that the KPIs are not providing misleading results. For example, absolute measures might be considered to understand the strength of the IPI / KPI derived. The data collected to derive the IPI / KPIs is valuable and could be used – if conveniently collated – for wider benchmark comparison. This appears to be an opportunity missed at present.	Network Rail
7	Learning from CP4 Delivery Plan Change Control	The changes experienced in the CP4 Enhancements Delivery Plan may have led to reduced effectiveness and efficiency in delivery for both NR and its supply chain. However, the nature and impact of these changes have not yet been analysed as a whole.	The changes that have occurred to the CP4 Delivery Plan outputs should be reviewed and analysed by NR and ORR to understand the causation and impact of the changes. These should be understood with a view to identifying areas of inefficiency and opportunities for improvements. Publicly, NR and its customers are stating their intention to align interests across contractual boundaries; funders and the ORR have a role in maximising opportunities as well.	Network Rail and ORR
8	Impact on Benefits from Changes to the DP	Any change to the CP4 or CP5 Delivery Plan has a potentially significant impact on the forecast timing and benefits that actually accrue. Due to the structure of the industry we consider that there is a potential disconnect which does not allow NR – or ORR – to understand the full implications of 'changing the plan'. From a programme management perspective this is a potential weakness if no other party in the industry has full oversight of the impact of change when it occurs.	NR is limited in the extent to which it can exert a full end-to-end approach to programme management. However, the IIP at least provides a combined view from NR and its customers. Funders and ORR must now provide a framework which allows the full benefits of programme management to be embraced.	Network Rail, ORR and Funders

Ref.	Title	Issue	Recommended Action	Responsible
12	Improving Understanding of Cost and Schedule Progression	<p>NR's CAF framework is developing which should improve its understanding of the cost of delivery and the specific reasons why the same work attracts a different cost in different situations. Ultimately this should benefit NR in refining base cost estimates and narrow the application of estimating uncertainty ranges.</p> <p>Although CAF is an example of good practice we consider that this needs to be extended in order for NR to extract full learning from the progression of cost and schedule over the full lifecycle; the process currently omits the earliest view of cost and schedule (for example at business planning / Control Period Determination stage).</p>	The full lifecycle of forecast cost and schedule to be compared at various points of reference in the project lifecycle (i.e. the forecast cost at 'Original Announcement', 'Full Investment Authority', 'Principal Contract Award' and 'Outturn') in order to pinpoint the timing and reasons for change in order to better isolate risks and opportunities.	Network Rail
15	Revised Headcount	Although NR states its DIME proposals will achieve a reduction of 10% in its current Investment Projects business, no statement has been made concerning the overall impact of DIME and Devolution on the new Client organisation that will be created on both a route and central basis.	NR should clarify to ORR the overall headcount and OPEX impact of its proposals under DIME and Devolution to enable the benefit of the changes to be assessed.	Network Rail
16	Alliancing - NR staff and organisational competency	NR is placing great emphasis on alliancing with both its customers and its supply chain. Alliancing – and other forms of partnering – can offer significant step-change cost savings advantages. However, success depends on many factors which NR must take cognisance of to avoid no savings at best and delivery failure at worst.	If NR has not already done so it must critically assess the capability of its individuals and organisation to ensure that they constructively support delivery rather than continue with their traditional approaches. At the very least this will require committed, by-example leadership and appropriate direction to those who favour a traditional approach. It may also require the re-assignment of staff who do not display appropriate behaviours.	Network Rail

Ref.	Title	Issue	Recommended Action	Responsible
27	Portfolio Risk	We observe that NR is applying concepts of portfolio risk management to mega-programmes, more effective risk management is possible through improved governance on other types of enhancement works and should also, in time, feed back to estimating. Some benefits can arise from procurement initiatives such as alliancing, whereby provisions made for the same risk at different levels of the supply chain, and we assume that such benefits will be accounted for in other studies.	NR should undertake a detailed review of contingency provisions made at the various levels within NR (and in the supply chain) and apply portfolio risk management principles more widely, wherever they will add value.	Network Rail
31	Market conditions	We observe that NR has made savings from favourable market conditions in the supply chain.	NR and the ORR should consider who bears the risk, as between HM Government and NR, if market conditions alter. If the risk is NR's, what level of contingency provision should they make?	Network Rail
33	Mix of Opex to Capex expenditure	We observe that NR's renewals teams are managed to head-count targets which may be constraining NR's ability effectively to achieve its renewals programmes.	Subject to other constraints such as the track access planning regime, NR should consider whether there is benefit in increasing head-count in delivery teams in order to reduce under-spending of the Capex budget and net slippage of renewals portfolios.	Network Rail

Good Practice Observations

Ref.	Title	Issue	Recommended Action	Responsible
2	Devolution	NR is taking affirmative action to re-align its client and project delivery capability with the needs of its principal customers.	Although the success of this will depend on details of execution the principle is appropriate in the absence of any significant industry restructuring.	Network Rail
9	Sponsorship and Alignment	The current arrangements for sponsorship within the industry present the opportunity for misaligned incentives and behaviour amongst industry partners. It also creates the potential within NR for lack of clarity over who is actually responsible for delivery.	NR appears to have taken positive steps to clarify roles within its organisation for projects currently in delivery, albeit the NR deliverer must be 'kept honest'. This is a particular feature that must be considered in the new Devolution / DIME structures once the detail is presented. At industry level NR and some of its customers have publicly announced the intent to create alliances which will seek to deliver benefits to both NR, NR's customers and, crucially, the fare-paying public. No details of these arrangements are available but in principle such arrangements offer an expedient route to achieving benefits which might not be otherwise achieved without restructuring the industry. ORR must consider its role in regulating such arrangements.	Network Rail
14	Resource Scenario Model	The RSM is a valuable tool which gives NR visibility of potential resource availability issues.	The model should prove useful in the DIME restructuring. At the moment it appears to be focussed on core activities in Investment Projects only and might be extended to the new NR Client organisation also.	

Ref.	Title	Issue	Recommended Action	Responsible
18	Outturn Risk Review	We observe that B&C use a process to highlight over-accruals and over-provision of contingency, and amend delivery business plans for future years to provide for savings that will accrue in future years due to actions taken to date.	We recommend that these practices are deployed to other parts of IP, if not already in hand.	Network Rail
19	Portfolio management of contingency	We observe that contingency in track renewals is managed a portfolio level.	We recommend that these practices are deployed to other groups of projects, where appropriate.	Network Rail
25	Cost History	We observe that NR has made significant advances on providing feed-back from completed projects to estimators, and recognises that more needs to be done to make the practice widespread and, in particular, to extend the process to capture cost data at those GRIP Stages where it is practicable to do so.	More needs to be done to implement the benefits of capturing cost data at all GRIP Stages where it is practicable in order to: <ul style="list-style-type: none"> a) reduce levels of optimism bias ; b) help to clarify the difference in expectations at Control Period determinations and those when projects have been developed to GRIP 4; and c) assist in the management of contingency provisions. 	Network Rail
26	Feed-back of market conditions to estimators	We observe that NR is developing ways of feeding back market forces to estimators, and that this would fulfil Halcrow's recommendation that optimism bias should be reviewed two years after its 2010 report. Market conditions change over time, and feed-back is essential to reduce estimating uncertainty.	NR is tightening its procedures to control local practices which might lead to sub-optimal results in estimates. NR should consider reviewing levels of optimism bias to be used in estimates for enhancements for CP5.	Network Rail

Ref.	Title	Issue	Recommended Action	Responsible
36	Multi-skilling and deployment of staff	We observe that NR's track renewals team is considering the benefits from facilitating better deployment of personnel across the days of the week, leading to more continuity of employment for individuals, less dependence upon labour-only sub-contractors and a greater incentive for contractors to invest in staff training to achieve multi-skilling. Whilst this is presently thought of as an initiative for the track renewals supply chain, there is also potential benefit for the deployment of NR's directly employed staff, albeit that Industrial Relations issues may arise. There is also potential benefit for other engineering functions.	<p>Whilst this is principally a matter for the Civity study into the supply chain, we recommend that the initiative is spread across all engineering functions, as project management considerations inter-relate with procurement options.</p> <p>We also observe that this initiative sprang from initial benchmarking against European railways, and that NR is actively pursuing such initiatives, even though at this stage it declined to share other results with us.</p>	Network Rail



Appendix D

Glossary

Appendix D Glossary

Term	Meaning / Definition
DIME	NR's transformation project for its current Investment Projects division
DRAM	Director of Route Asset Management
FOC	Freight Operating Company
GRIP	Governance for (formerly Guide to) Railway Investment Projects
IIP	Initial Industry Plan
IPI	Indexed Performance Indicator
KPI	Key Performance Indicator
LoC	Level of Control
MSP	Managing Successful Programmes
Newco	Current holding-name under project DIME for NR's new project delivery organisation post 16 April 2012
NR	Network Rail
OGC	Office of Government Commerce
ORR	Office of Rail Regulation
P3M3®	OGC Portfolio, Programme and Project Management maturity framework
PoP	Project on a Page
QCRA	Quantitative Cost Risk Assessment
RAMS	Reliability, Availability, Maintainability and Safety
RfL	Rail for London
RMD	Route Managing Director
SEU	Signalling Equivalent Unit
TOC	Train Operating Company
VfM	Value for Money
WLCC	Whole Life Cycle Cost

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