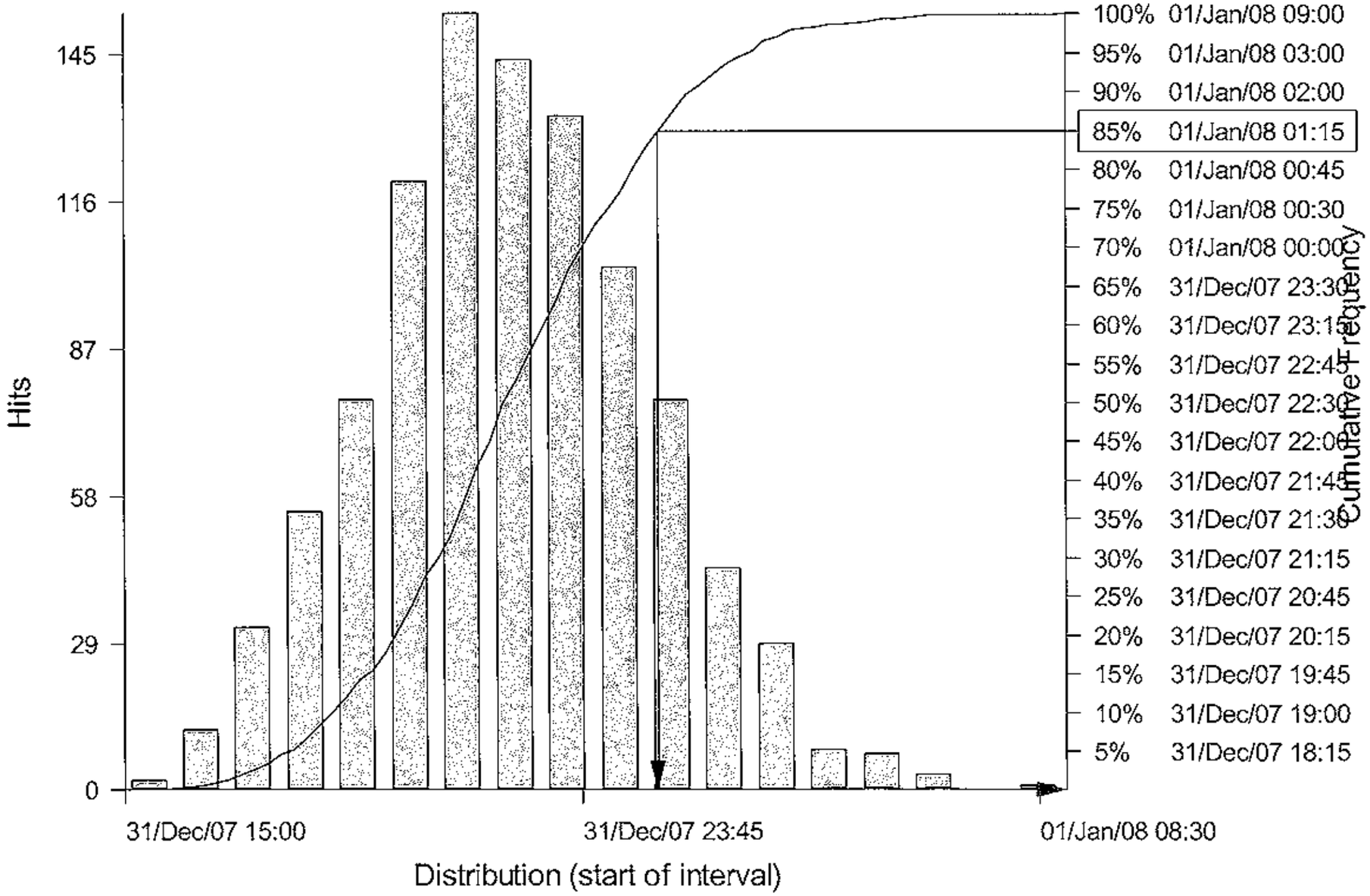
Annex 3

Key supporting documents

X07 V7 - 30 percent

00851 - Open New Down Fast, Dn Coventry & New Up Fast : Finish Date



Analysis

Simulation:	Latin Hypercube
Iterations:	1000

Convergence

Plan Finish Date:
Converged in 200 iterations
(variation < 1% over 100 iterations)
Total Plan Cost:
Converged in 200 iterations
(variation < 1% over 100 iterations)

Statistics

Minimum:	31/Dec/07 15:15
Maximum:	01/Jan/08 09:00
Mean:	31/Dec/07 22:30
Max Hits:	153
Std Deviation:	10.63
Selected Confidence 85%:	01/Jan/08 01:15
Deterministic Finish:	31/Dec/07 15:15
Probability	(less than 1%)
Target Finish:	01/Jan/08 05:00
Probability	99%

Network Rail

Appendix G
T-4 Readiness Review Update for T-1

RUN Project

Xmas 2007
FWI Commissioning

T-4 Readiness Review
Update for T-1

Prepared By

Ian Johnson

..... Date: 27th November 2007

(Signature)

Details of Meeting

Purpose:	The Project Team present the scope and implementation plan for the Xmas Blockade, raising issues and risks that are identified.
Date:	27th November 2007 @ 1000
Location:	Project Offices – Lecture Room
Chairperson:	Ian Johnson (NWR)

Attendees:

NWR

Dick Mcilhattan
Alan Brake
Tony Brennan
Bill Henry
Mark Tracy Inglis
Justin Rogers
Alistair Raisbeck
Tony Fradley
Richard Elkin
Hayden Crumpler
Ian Alsop
Mick Ryan
Rod Green
Steve Plyler
Andy Whitehouse
John McDougle
Felice Presti
Mike O'Connor
Mike Dunham
Fred Dykstra
Eric Mumm
Brian Tunneycliffe
Jason Lacey
Frank Sierra
Paul Mann
Shawn Priddle
Rob Owen
Ian Robinson
Fergal Malone
Martin Drake
Richard Mayne
Steve derrick
Geoff Brown
Ian Berry
Chris Ryan
Andy Chapman
Lee Parlett
Steve Luck
Mark Lamb
Michael Walker
Bill Alderson

Atkins Rail

Ian Buckley
Terry Alderson
John Maguire
Gordon Stewart
Encarna Moreno
Conor Linnell
Steve Airey
Stave Higham

Jarvis Rail

Stuart Birch
Paul Summerfield
Roy Skinner
Nick Sarai
Mark Thomas
Ian Bryson
Fin Burke

Distribution:

Attendees, plus

Dave Richards
Ted Douglas
John Whitehurst
Terry Oliver
Paul Nelson
Duncan Warburton
Phil Jones
Paul Atherton
Ray Bland
Lee Farmer
Dave Swann
Andy Thomson
Mark Blyth
John Matthews

Meeting Details

ITEM NO	Agenda Item	COMMENT / ACTION	ACTION BY
1	**Introduction**	MTI opened the meeting with an overview of the Rugby Project and how important the Xmas commissioning is to the RuN Project.	
1.1		All attendees introduced themselves	
1.2		IJ opened the presentation and advised the agenda for the review; • To give an overview of the stage • To give current progress status (4D model review) • To present scope as follows: o PWay – Jarvis o OLE – Jarvis o Signalling – Atkins o Other – I Johnson • To review Integrated Plan, with focus on logistics • To present QSRA results • To review issues • Te review Blockade Management • To review EIS documentation • To review Handback / completion documentation	
2	**Actions / Notes**		
2.1	**Redundant OLE**	Check redundant OLE structures that are planned to be left at the end of Stage E, against Stage F build. Due to shortfalls in OLE planned work, there will be OLE structures obstructing Stage F works. These to be prioritised for recovery post Xmas	C Ryan / R England
2.2	**Hillmorton**	Verify delivery dates of new switches for 405 & 408 points. This needs to be raised as Project Critical Issue. 405 due for delivery in week 41, replacement weeks 50 & 51 408 due for delivery in week 41, replacement weeks 43 & 44	Ian Berry
2.3	**OLE Clashes with PWay**	The model shows the following OLE clear of PWay build (G82/137, G83/31 & G83/33), but these are reported as critical to remove for Xmas. Need to confirm if they need to be recovered for Xmas or not. G82/137 is not critical to recover by Xmas and has been descoped. G83/31 & 33 have now been recovered.	Nick Sarai / John Matthews
2.4	**Week 36 OLE**	Jarvis advised that 30% shortfall from week 35 needs to be planned into Week 36. Review required to see if this is possible. Further lost OLE works in weeks 36 & 37, major replanning exercise has been undertaken as more work has now to be incorporated into the blockade. Blockade extension applied for.	R Green
2.5	**Engineering Trains**	Extended NBS periods have been agreed, but engineering trains running have not been altered to suit. This needs resolving urgently. Engineering trains have been retimed over the last 3 weeks to suit possession start.	S Plyler
2.6	**OLE Inspection**	NWR Team need a process in place to refine post works (high level) inspections	C Ryan

		Independent inspections planned by NWR	
2.7	**Site Supervision**	Jarvis to advise the supervisor to staff ratio over the blockade Within Jarvis Presentation	S Birch
2.8	**Work Briefings**	Jarvis to brief all supervisors of work in advance of weekend / blockade. NWR briefings planned for Tue, Wed & Thur at 0900 Briefing of PWay supervision planned for each day this week. S&T Briefings held last week OLE supervision briefings to be advised.	S Birch
2.9	**Blockade Staff Levels**	Each Contractor to provide staff levels for each shift to NWR. NWR to produce overall resources histogram. Completed & Included in pack	A Brake
2.10	**Engineering Trains**	Rugby trains are not only coming from depots but also direct from other project works. RuN Project need visibility of the detailed train plan. Detailed train plan and interfaces issued to project. 6R28 & 29 are working at Nuneaton that create 6Y38, 39 & 40 at Rugby. 30hr turnaround at Bescot (1200 Sun to 1900 Mon)	S Plyler
2.11	**NBS Periods**	The integrated plan should shade NBS periods Now shown on Plan	A Brake
2.12	**Engineering Trains**	Project staff need to confirm consist of trains before they depart for site. Instruction to Jarvis	S Plyler
2.13	**Contingencies**	Extra train drivers are to be based on site. 2 trains (50%) will be manned throughout	S Plyler
2.14	**Welding Interfaces**	Details of welding interfaces need to be defined and included in the plan Within the integrated plan. All welding planned to be complete before “Wheels Free”	R Skinner / A Brake
2.15	**Run Through Spares**	The project is to review the MK RRV movement process. Process being reviewed, ie. Red lamps adjacent to crossings. Assessing if practical at Rugby.	F Sierra
2.16	**Follow Up Works**	Jarvis to develop and issue the follow up work plan to NWR Incorporated into the Project plan for 2008.	N Sarai
2.17	**OLE materials**	OLE materials need to be bagged and tagged prior to the block Jarvis Presentation	P Summerfield
2.18	**OLE Staff**	A WCRM linesmen integrated schedule is required to identify shortfalls. Details reviewed by Tony Fradley	T Fradley
2.19	**Boosters**	The Booster / Signal Interface needs risk assessing. BT's were removed in week 30 & 31. Rick Green has a bonding schedule.	R England
2.20	**Recoveries**	A detailed recovery plan is required for signalling equipment. Signalling recoveries now detailed in integrated plan	E Moreno / I Johnson
2.21	**Points rehearsal**	The plan needs to be developed and issued for points rehearsals prior to blockade. Jarvis/Atkins are working the points. 880, 890 & 884 being worked this week, 883 at the weekend	A Briers / D Trevis
2.22	**3B/4**	Rugby currently has a shortfall of 5 for Xmas. Atkins to provide latest update in T1	E Moreno / J Lacey
2.23	**Access**	TV Lines extension needs to be included in the plan. Now detailed on integrated plan (Activity 134) and Engineering Project documents.	I Johnson / A Brake

2.24	**QSRA**	Results to be included with these notes. Updated QSRA to be presented at T-1	R Green / I Johnson
2.25		New analyses to be run with additional works taken into the blockade Updated QSRA to be presented at T-1	R Green / A Brake
2.26	**Bonding**	350 new bonds detailed on bonding plan. Additional materials will be required. Additional bonding material on site and plan from ETI included in Integrated Plan.	T Brennan
2.27	**Inspections**	Quality inspection sequence to be refined and detailed on plan High level inspections / adjustments now to be after Wheels free testing	P Summerfield / A Brake
2.28	**Waste Management**	Jarvis are to issue a waste Management Plan Jarvis Presentation	S Birch
2.29	**Visitors**	Any visitors to the Project over the Blockade should be notified in advance so inductions / arrangements can be made. Inductions being held this week in Project offices.	All
2.30	**Travelling Public**	The Principal Contractor is to make provision for access to bus replacement services throughout the Blockade Jarvis presentation	S Birch
2.31	**Traffic Management**	Jarvis to issue the Traffic Management Plan Jarvis Presentation	S Birch
2.32	**Letter Drop**	Letter drop coordination is required by PC / Hub. Format Agreed and letters printed	S Birch / I Johnson
2.33	**Blockade Management**	Jarvis to issue Blockade Management Plan Jarvis presentation	S Birch
2.34	**Incidents**	Escalation / incident protocol to be developed & issued Will be included in Blockade management Pack	I Johnson / F Sierra
2.35	**ESR**	Jarvis to design contingency ESRs Jarvis preparing designs	N Sarai
2.36	**Contingencies**	T Brennan to advise on extra access requests, in particular the New Years Eve ALB Blockade extension applied for	T Brennan
2.37		Reduced functionality contingencies need to be reviewed with stakeholders. Discussion being held and further review on Thursday 20th Dec	T Brennan
2.38		Mobile chargers to be available for use in War Rooms NWR "War Room" will now be Ops room on ground floor of Project Office. Phone chargers will be provided in the room.	C Ryan / I Johnson
2.39	**Rosters**	To include key stakeholder details Included in Blockade Management Plan and as per weekly engineering packs.	I Johnson
2.40	**Progress reports**	The distribution list for progress updates needs to be refined. Duty Management distribution to be used	F Sierra
2.41	**Hy Drive Issues**	List sent to P Jones. No resolution as yet. Critical Issues Dave Gordon opened up dialogue with Andrew Simmons	MTI / M Ryan
2.42	**Handback**	6 weeks to Handback must be met	J Rogers
2.43	**T2 & T1 SQRA**	Results to be issued to Stakeholders Rod Green to present	I Johnson
2.44	**OLE Review**	External review required for OLE plans. External reviews have been undertaken over last few weeks.	T Fradley

2.45	**Close**		

Appendix K
Programme Risk Register

Risk Information | **Qualitative Analysis** | **Quantitative Analysis**

085 | Current Rating | Cost (£) | 18-Jan-08

IMPACT | Ranking | Total Project Risk

Programme Risk Reference Number	Risk Name	Risk Description	Likelihood	Cost	Schedule	Cost	Schedule	Management Strategy / Mitigation	Probability %	Minimum Impact (cost)	Most Likely Impact (cost)	Maximum Impact (cost)	EV Cost (£)	Modelling Note (cost)
1	External - Scope Change	Risk that third party may increase scope during design and development or as late as implementation stage. Change to train plan Cut back or cancellation of work Extra charges Or.. Late scope changes to individual jobs causing: 1. Changes to train plan and additional freight costs. 2. Cutting back or cancellation of the planned works 3. Additional costs. (Potential Impact on WCRM Programme)	Hi	Vhi	Hi	VH	VH	Projects to ensure that as far as possible no more changes or RVI's are implemented.	70%	£5,000,000	£10,000,000	£20,000,000	£12,250,000	- 20% probability of purchase of disruptive possessions and TOC penalties to commission shortly after planned date at a cost of between £5m to £10m - Re-staging before commissioning started so that commissioning would take place during Xmas period again with TOC penalties and the need to retain additional staff that would otherwise be moving on to future staging work with a cost of between £8m and £16m.
2	Fixed end date for the commissioning	Fixed end date, no signalling commissioning float	Hi	Hi	Med	VH	VH	Optioneering and value Engineering Workshops required to reduce schedule movement to the right. Frequent formal rereviews and manage the cost of additional resources required to maintain the fixed end dates.	55%	£6,000,000	£20,000,000	£40,000,000	£12,100,000	Maximum cost impact determined by assuming a number of project have moved to the right with commissioning dates in 2008 xmas
3	Scope of works excluded from spot (TV4 and RuN)	The re-forecast specifically excluded items that could not be adequately priced and or were considered as contingency / risk items	Vhi	Vhi	Med	VH	VH	1. Review PWAY & Temp Chords design whilst maintaining Operational Railway requirements. 2. Optioneering and Value Engineering Workshops required to to reduce and manage costs.	75%	£5,000,000	£10,000,000	£20,000,000	£8,750,000	Maximum cost potentially equal to the cost removed from spot during the reforecast exercise.
4	Nuneaton August 2008 commissioning	Failure to recover and achieve the Nuneaton August 2008 commissioning	Hi	Vhi	Vhi	VH	VH	Schedule QRA workshops with contractor to improve and enhance existing process to accelerate the works	50%	£10,000,000	£10,000,000	£10,000,000	£7,500,000	
5	Contract Claims	Contract Claims arising from the need to deliver a compressed schedule	Hi	Med	Med	H	M	Each project to maintain contract claim register and actively challenge all claims and use the disputes panel to resolve any of the unresolved claims	90%	£2,000,000	£5,000,000	£7,500,000	£4,350,000	
6	Possessions may be disrupted	Risk that possessions may be disrupted.	Vhi	Vhi	Hi	VH	H	Mitigate by careful planning and co-ordination with other adjacent projects, territory and trains. Ensure that the priority for resources and access is consistently applied.	65%	£3,000,000	£3,000,000	£4,000,000	£3,250,000	Week-end possessions are assessed as costing £150 k if they are seriously disrupted. Mid-week possessions are assessed as £30k (2 Road Rail + 20 staff + welding team). Possession planning is ongoing but it is assumed that around 30 week-end possessions will be required for critical crossing, OLE and bridge work. Based on 1 in 5 being disrupted this gives a figure of 6 possessions at £150k = £900k with a further 4 possessions being partially disrupted at £75k. Much of the work is planned to be done in mid-week possessions where the contractor will make a claim based on every disruption but not necessarily for the full value. The impact value is therefore based on 100 possessions being disrupted at a cost between £20k and £30k = £2000k and £3000k. Rounding the combined figures gives a spread of between £3m and £4m. Includes costs for ETI loss of possessions (80K).
7	Design quality and approvals	Design quality and approvals process requires the design to be of very high quality to ensure timely approvals. Poor quality designs will result in additional cost and schedule impact	Hi	Med	Med	M	M	work closely with the Design contractor, EE signalling and National Renewals. Six sigma black belts working improve design quality	55%	£1,000,000	£3,000,000	£7,000,000	£3,025,000	
8	New Products Approvals	A number of products will require approvals 125mph switch Green banners Axel counters	Hi	Hi	Med	H	M		55%	£1,000,000	£2,500,000	£5,000,000	£2,337,500	
9	Freight costs	The cost per train seen by the project is significantly in excess of budget.	Hi	Hi	Med	H	M		55%	£1,500,000	£2,500,000	£3,500,000	£2,062,500	Cost modelled on revised figures provided by Train and Operations planning. Needs to be verified against re-forecast figures.
10	Design Resources Availability & Competence	Risk that the programme is delayed due to the lack of engineering resource to enable design deliverables to be met and or Appropriate number and skill of resources can not be found or provided to complete the project. Consequence of RuN project Prolongation potentially in to 2009 with a potential cost impact in access of £100m (Risk model does not reflect the consequence)	Hi	Vhi	Med	H	M	1. Various dashboard reports and reporting mechanisms/trackers are in place to manage the weekly progress. 2. Maintenance of a cost & resource loaded schedule. 3. Strategy to place delegated authority within the project. 4. Working with NR Renewal team	30%	£1,000,000	£3,000,000	£9,000,000	£1,950,000	HQ approvals may continue to be an issue. Late approvals and design changes could lead to additional costs, particularly if the contract is fixed price. 50% probability between £1000k £3000k. The turnaround for most approvals is 10 days but can take up to 4 months. Current performance would indicate an approval rate of 37% at form B. Additional iteration for Re-work is not carried in the project programme. Also there has been a rise in the number of AIP submissions.
11	Testing &Commissioning Resources	Coventry Basingstoke and other projects require testing, engineering and other resources at the same time as WRCM	Hi	Hi	Hi	H	H	Projects within West Coast programme have been required to ensure that their resources are ring fenced by obtaining names of individuals on the organisation charts	30%	£2,000,000	£4,000,000	£6,000,000	£1,800,000	
12	Staffing Transition	It may also became difficult to re-locate all of the Network Rail personnel to other parts of Network Rail. It will became necessary to make them on the project beyond their end dates.	Hi	Med	Lo	H	M	Transition plan strategy	80%	£250,000	£1,000,000	£5,000,000	£1,666,667	
13	Industry Delivery Constraints	Industry Delivery Constraints: The delivery of a number of items, to the West Coast Programme, has became critical such as -S&C - Rail	Hi	Hi	Hi	H	H	Working with NDS and I.I. to gain first priority	30%	£1,500,000	£2,000,000	£7,000,000	£1,575,000	
14	Utilities May need to be diverted	There is a risk that there will be unknown utilities that may need to be diverted.	Vhi	Vhi	Hi	H	H	This risk has already materialised for FO diversions. Probability of further diversions is high residual increase from 1M o 2M.	75%	£500,000	£1,000,000	£2,000,000	£1,312,500	FO diversions has already occurred. Risk now modelled on remaining duration with high probability of further diversionary works being required, between £1 & £2M overall increase from £312K to most likely of £1.12M. (£150K estimated until confirmation by Cloughs 24-Feb-06)

Risk Information | **Qualitative Analysis** | **Quantitative Analysis**

085 | Current Rating | Cost (£) | 18-Jan-08

IMPACT | Ranking | Total Project Risk

Programme Risk Reference Number	Risk Name	Risk Description	Likelihood	Cost	Schedule	Cost	Schedule	Management Strategy / Mitigation	Probability %	Minimum Impact (cost)	Most Likely Impact (cost)	Maximum Impact (cost)	EV Cost (£)	Modelling Note (cost)
15	Extreme weather	Weather Conditions – Implementation is at risk of adverse weather conditions including: Low Temperatures – below -15 degrees Wind Speed – above 12m/s Fog – Potentially stop works Heavy Rain – disrupt works Snow – disrupt works / travel to Lightening – Potential to stop works	Med	Lo	Med	M	M	Weather details will be monitored on a regular basis	10%	£5,000,000	£10,000,000	£20,000,000	£1,166,667	
16	Coal terminal may require additional infrastructure (RuN)	Discussions are underway regarding the infrastructure that may be required if the Rugby coal terminal re-opens after the works. This could lead to the need for additional S&C and track.	Vhi	Hi	Med	H	H	Negotiate with Stakeholders to avoid change.	75%	£750,000	£1,000,000	£2,250,000	£1,000,000	Modelled on the likely cost as indicated by original estimate. Authority has not been consented nd therefore not included in the re-forecast.
17	Cable and Service Diversions	The uncertainty surrounding the quantity also imports risk to other implementation disciplines with potential cost and schedule impact. Potential significant additional cost vs. the Project estimate and budget.	Hi	Med	Med	M	M		40%	£500,000	£750,000	£1,000,000	£900,000	Example - New Bilton - not deemed a significant issue by Engineering designers.
18	Staffing retention	Staff retention: There are a number of critical position on the Programme for which it will be necessary to retain the personnel.	Hi	Med	Med	M	M	Transition plan strategy	75%	£500,000	£1,000,000	£2,000,000	£875,000	
19	Jarvis P-Way Cost Performance Target (RuN)	Senior Management Instructed the Project to set a Performance Target to reduce Jarvis Permanent Way Direct Costs by 5%	Med	Vlo	Lo	M	M		50%	£1,000,000	£1,500,000	£2,700,000	£866,667	
20	GrantRail Preliminaries Performance Target	Senior Management Instructed the Project to set a Performance Target to reduce GrantRail Preliminaries by 10%	Med	Vlo	Lo	M	M		50%	£855,821	£1,500,000	£2,500,000	£809,304	
21	Closeout of Programme	Closeout fo the programme requires additional resources over a longer period with consequential impact on OPEX cost	Med	Med	Lo	H	M		50%	£500,000	£1,000,000	£1,500,000	£750,000	
22	Nuneaton Isolation Transformers	The DNO supplier is required to provide Earthing as per the Contact, the Price and Project schedule. Traditionally this has been difficult to enforce, in the event that the DNO supplier does not provide Earthing Isolation Transformers will be required.	Med	Vlo	Lo	M	M		80%	£565,000	£605,666	£1,100,000	£605,511	
23	Unforeseen Ground Conditions	There is a risk that due to unforeseen ground conditions the assumed piled foundations may not be feasible and that alternative solutions may be required at additional cost.	Med	Med	Med	M	M	G.I. being carried out prior to detailed design.	20%	£1,500,000	£2,000,000	£2,500,000	£600,000	£1M approximately will need to be spent to remove old station concrete bases. Residual risk has been reduced to low probability. Modelled on PM assessment of costs during implementation works - spread at £1.5M to £2.5M (£1M moved to actual to cover bases above)
24	Existing Asset Deficiencies	Additional works may be required to rectify problems with the condition of the existing assets.	Hi	Med	Lo	M	M	Accurate asset survey and robust dilapidation surveys.	40%	£1,000,000	£1,200,000	£2,000,000	£560,000	
25	Rugby ATF Scope	ATF Scope has been removed from Project Re-forecast	Med	Vlo	Lo	M	M		50%	£425,000	£545,078	£2,300,000	£545,013	
26	SWR Design Performance Target (RuN)	Senior Management Instructed the Project to set a Performance Target to reduce SWR design costs by £ 2,000,000	Med	Vlo	Lo	M	M		30%	£1,500,000	£1,500,000	£2,000,000	£500,000	
27	OLE quantities	Assessed as a spread of between a 20% and 30% increase in the estimated cost for the OLE works.	Hi	Hi	Med	H	M		50%	£800,000		£1,200,000	£500,000	
28	Rugby Isolation Transformers	The DNO supplier is required to provide Earthing as per the Contact, the Price and Project schedule. Traditionally this has been difficult to enforce, in the event that the DNO supplier does not provide Earthing Isolation Transformers will be required.	Med	Vlo	Lo	M	M		80%	£375,000	£403,377	£740,000	£404,901	
29	Trains and Plant	Demand for Haulage trains may exceed supply due to competition for resources in Midlands area.	Med	Med	Med	M	M	Priority projects to have first allocation where resources are short. This must be applied consistently throughout the duration of the programme..	35%	£500,000	£1,000,000	£1,500,000	£350,000	Reduction in supply of materials could impact efficiency and require alternative more costly methods to recover lost time. PM/ PCM estimate this could cost around £500k. It is also assumed that Rugby remains priority.
30	Rugby SCC Collision Barrier	The cost of constructing a collision barrier at Rugby SCC has been deleted from the re-forecast	Med	Vlo	Lo	M	M		50%	£250,000	£350,000	£1,500,000	£350,000	
31	General Civils Scope Growth	There is a risk that not all of the scope has been fully considered i.e. Retaining Walls	Vhi	Med	Med	H	H		80%	£100,000	£400,000	£750,000	£333,333	
32	Tamper pre-ordered	There is a risk that the availability of tamper machines will decrease due to the national consensus that orders are to be placed in advance as for trains.	Med	Med	Med	M	M	This has already resulted in ESR required at Hillmorton following the shift in priority of tampers to other midlands projects.	20%	£500,000	£0	£2,500,000	£300,000	estimated provision
33	Speed Signals	Risk that the continual Route Signage may be non compliant.	Med	Med	Med	M	M	Adequate management of ORS (V&V) against new compliance.	20%	£525,000	£750,000	£2,500,000	£251,667	
34	Rugby SCC Fibre Optic	Design option that identifies that the cable diversions at the SCC are not required needs to be confirmed	Med	Vlo	Lo	M	M		50%	£500,000	£500,000	£500,000	£250,000	
35	Galliford Try CRC's (RuN)	Due to schedule impacts there is a risk that Network Rail will settle for a greater amount than included in the re-forecast	Hi	Med	Med	M	M		50%	£0	£250,000	£600,000	£212,500	

Risk Information | **Qualitative Analysis** | **Quantitative Analysis**

085 | Current Rating | Cost (£) | 18-Jan-08

IMPACT | Ranking | Total Project Risk

Programme Risk Reference Number	Risk Name	Risk Description	Likelihood	Cost	Schedule	Cost	Schedule	Management Strategy / Mitigation	Probability %	Minimum Impact (cost)	Most Likely Impact (cost)	Maximum Impact (cost)	EV Cost (£)	Modelling Note (cost)
36	Bridge 281 CRC's (RuN)	Risk that Network Rail will settle for a greater amount than included in the re-forecast	Hi	Med	Med	M	M		50%	£150,000	£350,000	£750,000	£208,333	
37	Existing Structure Condition	Additional works and procurement of additional steelwork, cost and schedule.	Vlo	Med	Lo	M	L		5%		£4,000,000		£200,000	
38	Sub-Contract Interface Management	Risk that the Interface management and associated planning arrangements & control may be underestimated between contractors etc.	Hi	Med	Lo	M	M		40%	£10,000	£250,000	£1,000,000	£168,000	
39	Survey Data inaccuracy	Risk that the lack of accurate survey data means that services/utilities may be damaged or may require re-routing.	Vhi	Med	Lo	H	M	Inaccuracy has already contributed to poor design documentation being received. Put in robust survey requirements	40%	£200,000	£400,000	£650,000	£166,667	Further analysis required on cost and schedule impact to determine full forecast of risk. (Model estimated at 200K to 650K in additional works/recovery)
40	PWAY Drainage	Risk that the PWAY drainage is not adequate or in a poor state/disrepair.	Med	Med	Lo	M	M	Confirm survey data.	25%	£50,000	£250,000	£1,500,000	£150,000	
41	Unearthed archaeological features	Earthworks may unearth archaeological features not previously identified putting the programme at risk	Vlo	Med	Vhi	L	M		2%	£10,000	£1,000,000	£20,000,000	£140,067	Overall cost attributed to WCRM programme
42	Test Plan Approvals	Delay Risk to T&C approvals of Test Plans	Hi	Med	Med	M	M	1. Improve stakeholders communication within the T&C Plan approval process. 2. Ensure Test Plans are delivered early to allow sufficient time for acceptance.	30%	£100,000	£250,000	£700,000	£105,000	
43	Interproject dependencies Rugby SCC	Changes in the Project schedule and potentially redesign of commissioning staging. Risk that power requirements within the RSCC may not be adequate. (Potential impact on WCRM Programme)	Hi	Lo	Med	M	M	Atkins are the single design authority. NWR now have the ICPA team available to manage RSCC interfaces, however responsibility for the schedule of works still to be determined.	40%	£100,000	£200,000	£300,000	£80,000	
44	Theft and Vandalism (Security)	Theft or vandalism may delay planned works or divert resources away from planned works. If there is vandalism of installed equipment rework will be required to rectify.	Med	Lo	Lo	M	M	Define security measures.	20%	£250,000	£250,000	£250,000	£75,000	Disposal of materials to NLU site is covered by NR rates. This is to be confirmed. Main cost is for site protection including clothing and masks. CET estimate required for removal of known contaminants. (this will be an actual cost)
45	Quality / Delivery of materials and equipment.	Risk that supplier does not delivery to the quality expected or does not deliver on time causing delay to implementation + costs of additional delivery time.	Hi	Vlo	Lo	M	M	Use approved suppliers and implement robust quality assurance protocols.	40%	£10,000	£100,000	£250,000	£48,000	Further analysis required on cost and schedule impact to determine full forecast of risk. (Model estimated at 200K to 650K in additional works/recovery)
46	Land Contamination	It is known that contaminants are in the ground where the project will be excavating, there is a risk that scope of work has been underestimated. contaminated land not previously identified may be unearthed resulting in programme slippage and the cost of removing hazardous materials	Med	Vlo	Lo	M	M	Risk has already materialised with asbestos found on station roof and in the track bed. Current risk value only allows for protection and not recovery of know and future discovery. Recovery costs could be significant with closed wagons etc.	20%	£50,000	£150,000	£500,000	£46,667	
47	Hydrive Availability	Risk that Hydrive components are not readily available to support the S&C installation requirements.	Hi	Vlo	Med	M	M		30%	£10,000	£120,000	£250,000	£38,000	

Risk	£ 77,485,461
To Go	£ 933,000,000
	8.30%

Title	Very low	Low	Medium	High	Very High
Score	1	2	3	4	5
Schedule	< 1 Week	1-2 Weeks	2-4 Weeks	4-6 Weeks	> 6 Weeks
Cost	< £50k	£50k - £99k	£100k - £499k	£500k - £999k	> £1m
Probability	0 - 5%	6 - 10%	11 - 25%	26 - 50%	51 - 100%

Appendix O
RuN Risk Register

RuN Risk Register updated to include Programme cost evaluation

Risk Information

085

Cost (£)

Quantitative Analysis

18-Jan-08

											Total Project Risk	Project Values	Programme values		
Project Risk Reference Number	Risk Name	Risk Description	Trigger Date	Expiry Date	Management Strategy / Mitigation	Probability %	Probability % (WS/AR)	Minimum Impact (cost)	Most Likely Impact (cost)	Maximum Impact (cost)	EV Cost (£)	EV (NEW)	Modelling Note (cost)	Comments Bill/Amar
EE40/318/001	Jarvis Additional Costs	The re-forecast specifically excluded items that could not be adequately priced and or were considered as contingency / risk items	01-Apr-07	31-Dec-08	1. Review PWAY & Temp Chords design whilst maintaining Operational Railway requirements. 2. Optioneering and Value Engineering Workshops required to to reduce and manage costs.	60%	25%	£ 6,000,000	£ 16,000,000	£ 26,000,000	£ 9,600,000	£ 4,000,000	Cost provided by PCM to be validated	Detailed Estimate Review scope quantities known Process in place to control growth New scope would be challenged
RuN/RES/006	Test & Commissioning Resources	Coventry and other projects require testing, engineering and other resources at the same time as Rugby, in particular test and commissioning staff for Xmas 2007 and throughout key possessions in 2008.	01-Apr-07	31-Dec-08	Mitigated by ensuring that WCRM Integrated Works Planners are aware of priorities. New staging strategy puts the key stage D 2007 commissioning back to Dec 2007. The latest Integrated schedules are to be assessed and modelled to to identify pintch points in the prgramme. The results of which can be used to help determine the WCRM programme requirements.	30%	10%	£ 5,000,000		£ 16,000,000	£ 3,150,000	£ 1,050,000	The census of the project management team is that there are two potential scenarios: - 20% probability of purchase of disruptive possessions and TOC penalties to commission shortly after planned date at a cost of between £5m to £10m - Re-staging before commissioning started so that commissioning would take place during Xmas period again with TOC penalties and the need to retain additional staff that would otherwise be moving on to future staging work with a cost of between £8m and £16m. This was modelled as a 30% probability of a cost impact of between £5m and £16m.	Christmas 07 ok since TV4 restaging Coventry done SITEC being ring fenced specifically for RuN
RuN/DES/002	Poorly defined Scope	The scope of works may change either due to changes in client requirements or due to interfaces with other projects. Works not previously accounted for may be required or removed from scope.	01-Apr-07	30-Sep-08	1. Walkouts of all areas to be conducted to determine signalling requirements. Output from walkouts to be formalised and structured meetings held on constructability. Mick Ryan & John McDougle to manage process. 2. Refinement of the signalling strategy to reflect the above.	80%	30%	£ 250,000	£ 3,500,000	£ 7,500,000	£ 3,000,000	£ 1,125,000	Significant amount of rework and re-design already instigated due to the affect of this risk. Given the current level of scope detail would suggest that the current figures have been underestimated. Needs to be revised.	External trend process Project should not take on new scope
RuN/PSS/003	Possessions may be disrupted	Risk that possessions may be disrupted.	01-Apr-07	31-Dec-08	Mitigate by careful planning and co-ordination with other adjacent projects, territory and trains. Ensure that the priority for resources and access is consistently applied.	60%	50%	£ 3,000,000		£ 4,000,000	£ 2,100,000	£ 1,750,000	Week-end possessions are assessed as costing £150 k if they are seriously disrupted. Mid-week possessions are assessed as £30k (2 Road Rail + 20 staff + welding team). Possession planning is ongoing but it is assumed that around 30 week-end possessions will be required for critical crossing, OLE and bridge work. Based on 1 in 5 being disrupted this gives a figure of 6 possessions at £150k = £900k with a further 4 possessions being partially disrupted at £75k. Much of the work is planned to be done in mid-week possessions where the contractor will make a claim based on every disruption but not necessarily for the full value. The impact value is therefore based on 100 possessions being disrupted at a cost between £20k and £30k = £2000k and £3000k. Rounding the combined figures gives a spread of between £3m and £4m. Includes costs for ETI loss of possessions (80K).	PAM actively managing progress Additional planning and Field Engineering services should mitigate
RuN/TAR/006	Jarvis Preliminaries Review & Reduction	Senior Management Instructed the Project to set a Performance Target to review & reduce Jarvis Preliminaries	01-Apr-07	31-Dec-08		80%	50%	£ 1,600,000	£ 1,656,778	£ 3,000,000	£ 1,668,474	£ 1,042,796	Cost provided by PCM to be validated	Project has stated that they have all the needed access and programme is working at de-risking Based on Amar feedback
RuN/TAR/010	SWR Design Performance Target	Senior Management Instructed the Project to set a Performance Target to reduce SWR design costs by £ 2,000,000	01-Apr-07	31-Dec-08		50%	20%	£ 1,500,000	£ 2,000,000	£ 5,500,000	£ 1,500,000	£ 600,000	Cost provided by PCM to be validated	Based on Amar feedback
RuN/TAR/008	Jarvis Preliminaries Performance Target	Senior Management Instructed the Project to set a Performance Target to reduce Jarvis Preliminaries by 10%	01-Apr-07	31-Dec-08		80%	20%	£ 1,200,000	£ 1,481,100	£ 2,900,000	£ 1,488,293	£ 372,073	Cost provided by PCM to be validated	Based on Amar feedback
RuN/DES/004	External - Scope Change	Risk that the TOC/FOCS may increase scope during design and development or as late as implementation stage. Change to train plan Cut back or cancellation of work Extra charges Or.. Late scope changes to individual jobs causing: 1. Changes to train plan and additional freight costs. 2. Cutting back or cancellation of the planned works 3. Additional costs. (Potential Impact on WCRM Programme)	01-Apr-07	30-Sep-08	Project to ensure that as far as possible no more changes or RVI's are implemented.	50%	20%	£ 500,000		£ 5,000,000	£ 1,375,000	£ 550,000	- 20% probability of purchase of disruptive possessions and TOC penalties to commission shortly after planned date at a cost of between £5m to £10m - Re-staging before commissioning started so that commissioning would take place during Xmas period again with TOC penalties and the need to retain additional staff that would otherwise be moving on to future staging work with a cost of between £8m and £16m. This was modelled as a 15% probability of a cost impact of between £5m and £16m.	RVI's will now go thru IRG and be trended/funded or won't do Accounted for in possessions
RuN/TAR/009	Jarvis P-Way Cost Performance Target	Senior Management Instructed the Project to set a Performance Target to reduce Jarvis Permanent Way Direct Costs by 5%	01-Apr-07	31-Dec-08		80%	50%	£ 1,000,000	£ 1,313,305	£ 2,700,000	£ 1,336,881	£ 835,551	Cost provided by PCM to be validated	Project to manage to target
RuN/CON/001	Utilities May need to be diverted	There is a risk that there will be unknown utilities that may need to be diverted.	01-Apr-07	31-Dec-08	This risk has already materilised for FO diversions. Probability of further diversions is high residual increase from 1M o 2M.	75%	75%	£ 1,000,000		£ 2,000,000	£ 1,125,000	£ 1,125,000	FO diversions has already occurred. Risk now modelled on remaining duration with high probabilty of further diversionary works being required, between £1 & £2M overall increase from £312K to most likely of £1.12M. (£150K estimated until confirmation by Cloughs 24-Feb-06)	Question how much work to go impacting utilities, but left as is
RuN/PSS/002	Possessions 2007/8.	Risk that further changes in the staging need to be reflected in the ordering and management of works trains. Many cancellations have already been made with additional booking costs expected.	01-Apr-07	31-Dec-08	Continual assessment of train orders and bookings. Many cancellations have already been evident. Shifts in staging to be minimised as this adds to the overall impact.	75%	40%	£ 1,500,000		£ 1,500,000	£ 1,125,000	£ 600,000	To be validated.	All possessions accounted for Project should be managing this and establish
RuN/DES/003	Design Resources Availability & Competence	Risk that the program is delayed due to the lack of engineering resource to enable design deliverables to be met and or Appropriate number and skill of resources can not be found or provided to complete the project. Consequence of RuN project Prolongation potentially in to 2009 with a potential cost impact in access of £100m (Risk model does not reflect the consequence)	01-Apr-07	30-Sep-08	1. Various dashboard reports and reporting mechanisms/trackers are in place to manage the weekly progress. 2. Maintenance of a cost & resource loaded schedule. 3. Strategy to place delegated authority within the project.	50%	20%	£ 1,000,000	£ -	£ 3,000,000	£ 1,000,000	£ 400,000	HQ approvals may continue to be an issue. Late approvals and design changes could lead to additional costs, particularly if the contract is fixed price. 50% probability between £1000k £3000k. The turnaround for most approvals is 10 days but can take up to 4 months. Current performance would indicate an approval rate of 37% at form B. Additional iteration for Re-work is not carried in the project programme. Also there has been a rise in the number of AIP submissions.	Jim Crawford recently dedicated staff Open Engineering positions being filled
RuN/TAR/001	GrantRail Preliminaries Performance Target	Senior Management Instructed the Project to set a Performance Target to reduce GrantRail Preliminaries by 10%	01-Apr-07	31-Dec-08		80%	80%	£ 855,821	£ 855,821	£ 1,500,000	£ 856,438	£ 856,438	Cost provided by PCM to be validated	
RuN/DES/020	Detailed Design Change	Late changes in design may impact the manufacturing and implementation.	01-Apr-07	31-Dec-08	Improvement in the control and management of issues and action resulting from IDR/IDC.	30%	20%	£ 400,000		£ 5,000,000	£ 810,000	£ 540,000	Many designs are still be provided to the project behind schedule. This carries an element of change to the impementation. In review this was estimated at costing between 400K & 5000K.	Late design changes should not be accepted, or cross charged
RuN/DES/023	Coal terminal may require additional infrastructure	Discussions are underway regarding the infrastructure that may be required if the Rugby coal terminal re-opens after the works. This could lead to the need for additional S&C and track.	01-Apr-07	30-Sep-08	Negotiate with Stakeholders to avoid change.	75%	75%	£ 750,000	£ 1,000,000	£ 1,250,000	£ 750,000	£ 750,000	Modelled on the likely cost as indicated by original estimate. Authority has not been consented nd therefore not included in the re-forecast.	
RuN/PRO/004	Freight costs	The cost per train seen by the project is significantly in excess of budget.	01-Apr-07	31-Dec-08		50%	25%	£ 1,500,000		£ 1,500,000	£ 750,000	£ 375,000	Cost modelled on revised figures provided by Train and Operations planning. Needs to be verified against re-forecast figures.	*Although the costs are up, this was accounted for in reforecast through 07FY *Revised costs in 08 should be minimal for work expected
RuN/DES/019	Design Contractor Delay	Design contractor may not be able to meet delivery time scales for AIP/DD.	01-Apr-07	30-Sep-08		30%	30%	£ 250,000	£ 2,200,000	£ 4,500,000	£ 695,000	£ 695,000	Combined costs modelled on additions works as seen by Jarvis and Atkins to include the additional value of EE and potential change to construction staging.	Potential double dip with Atkins cost plan Need to actively manage both companies

Risk Information | **Quantitative Analysis**

085 | Cost (£) | 18-Jan-08

												Total Project Risk		Project Values	Programme values		
Project Risk Reference Number	Risk Name	Risk Description	Trigger Date	Expiry Date	Management Strategy / Mitigation	Probability %	Probability % (WS/AR)	Minimum Impact (cost)	Most Likely Impact (cost)	Maximum Impact (cost)	EV Cost (£)	EV (NEW)	Modelling Note (cost)	Comments Bill/Amar
RuN/TAR/007	Jarvis P-Way Cost Performance Target	Senior Management Instructed the Project to set a Performance Target to reduce Jarvis Permanent Way Direct Costs by 5%	01-Apr-07	31-Dec-08		80%	80%	£ 500,000	£ 671,261	£ 1,350,000	£ 672,336	£ 672,336	Cost provided by PCM to be validated	
RuN/RES/009	EE Availability	EE Resource availability may be underestimated or unavailable to meet schedule.	01-Apr-07	31-Dec-08		40%	40%	£ 300,000		£ 3,000,000	£ 660,000	£ 660,000	Number of EE reduced in April 06. Impact on the duration of approvals across midlands projects.	EE providing service or delegated authority to RuN Engineers
RuN/DES/005	Detailed Design Programme	Risk that the detailed design programme is underestimated	01-Apr-07	30-Apr-08	1. Detailed Design Tracker 2. Design Package QRA Process 3. Reform the design, check and approve process to include parallel independent verification. 4. Development of detailed schedule.	25%	15%	£ 1,200,000		£ 4,000,000	£ 650,000	£ 390,000	Complexity of the interlocking design by Atkins Rail. Mitigation measures to provide additional staff at cost to NWR. Comparison needs to be made with revised figures for re-forecast.	*Atkins revised cost and commodities accounted for trended forecast * Detailed commodity trackers identify scope for mitigation *similar to #2 &3 above
RuN/APP/001	Approval Process Underestimated	Design Approval may be delayed leading to schedule delays and/or possible further submissions.	01-Apr-07	31-Dec-08	1. Agree approvals and acceptance procedure with clear time scales. 2. AIP acceptance controlled by EE however DD acceptance to be controlled by Project.	80%	50%	£ 350,000	£ 750,000	£ 1,200,000	£ 613,333	£ 383,333	estimated provision for rework, redesign and re-approval.	*Programme actively being managed * Project would move forward at risk * Multiple trackers and coordinators along with delegated authority should reduce this risk
RuN/DES/006	NWR/ Project Driven Change	Client driven changes in scope could impact all phases of design works. This may cause additional works necessitating the requirement for additional design staff. i.e. Crown Posts	01-Apr-07	31-Dec-08	1. Close liaison between client and contractor. 2. Maintain a robust change control procedure 3. Standards Freeze as of December 06. 3. Assessment of undefined scope required.	25%	15%	£ 350,000	£ 2,000,000	£ 5,000,000	£ 612,500	£ 367,500	Design costs of increase by between 10 and 40%.	* MBR requested scope freeze, so senior management should have leverage to stop * Project supported by programme freeze
RuN/ISO/001	Nuneaton Isolation Transformers	The DNO supplier is required to provide Earthing as per the Contact, the Price and Project schedule. Traditionally this has been difficult to enforce, in the event that the DNO supplier does not provide Earthing Isolation Transformers will be required.	01-Apr-07	31-Dec-08		80%	25%	£ 565,000	£ 605,666	£ 1,100,000	£ 605,511	£ 189,222	Cost provided by PCM to be validated	* Project should either not do or have others do it since this is not a project requirement
RuN/CON/022	Performance	Not achieving completions causing Timetable delays	01-Apr-07	31-Dec-08	As above	5%	5%	£ 5,000,000	£ 10,000,000	£ 20,000,000	£ 583,333	£ 583,333		
RuN/ATF/001	Rugby ATF Scope	ATF Scope has been removed from Project Re-forecast	01-Apr-07	31-Dec-08		50%	25%	£ 425,000	£ 545,078	£ 2,300,000	£ 545,013	£ 272,507	Cost provided by PCM to be validated	Project should not do the scope and challenge anyone from making them do it
RuN/CON/002	Cables may be damaged or require relocating	Risk that cables will be damaged or require re-routing. Damage will be covered by insurance where services are disrupted however there will be delays and additional costs.	01-Apr-07	31-Dec-08	Survey in progress with contract in place for south side. New cables will be used where appropriate.	40%	65%	£ 500,000		£ 2,000,000	£ 500,000	£ 812,500	Significant probability of occurrence. On average 10 instances predicted over implementation period between £50K and £200K gives spread of £500K to £2M. Increase from £375K to £635K.	*Programme increased since seeing widespread stealing
RuN/OLE/001	OLE quantities	Assessed as a spread of between a 20% and 30% increase in the estimated cost for the OLE works.	01-Apr-07	30-Apr-08		50%	25%	£ 800,000		£ 1,200,000	£ 500,000	£ 250,000	Cost provided by PCM to be validated	*numerous related OLE and scope change risks already covers items
RuN/COM/002	Inadequate Supply Market	Risk that the market is exhausted by dependency projects.	01-Apr-07	30-Apr-08	Many contractors are already involved with WCRM works elsewhere. It may prove difficult in obtaining contractors. The severity of this risk may be relaxed under Cost re contracting strategy.	20%	10%	£ 1,000,000	£ -	£ 4,000,000	£ 500,000	£ 250,000	Modelled on Contract variance over time due to changes in contracting strategy and availability to reduce costs.	*Programme is monitoring total contractor involvement, and reassessing as needed (i.e. Jarvius)
RuN/SCC/001	Rugby SCC Fibre Optic	Design option that identifies that the cable diversions at the SCC are not required needs to be confirmed	01-Apr-07	31-Dec-08		50%	50%	£ 400,000	£ 500,000	£ 2,100,000	£ 500,000	£ 500,000	Cost provided by PCM to be validated	
RuN/RES/003	Design Resources underestimated	Risk that the program is delayed due to the lack of engineering resource to enable design deliverable to be met.	01-Apr-07	30-Apr-08	This is met by week on week slippage from the design contractor. Various dashboard reports and reporting mechanisms/trackers are in place to manage the weekly progress.	30%	30%	£ 1,000,000	£ -	£ 2,000,000	£ 450,000	£ 450,000	Risk that design contractors will not be able to meet project delivery milestones and compromise the project programme. This has materialised at SWR with additional funding required of £3.1M due to escalation in scope. - See Issues 076 & 077	
RuN/PRO/003	Long Lead Items	Late availability of design deliverables may impact the ability to procure materials.	01-Apr-07	30-Apr-08	MAS to be in place to enable early assessment of long lead items with a view of early procurement.	30%	20%	£ 250,000		£ 2,500,000	£ 412,500	£ 275,000	Some early procurement has been placed with enabling contractors. Full assessment required.	*Project should be advance buying and have a handle on commodities
RuN/ISO/002	Rugby Isolation Transformers	The DNO supplier is required to provide Earthing as per the Contact, the Price and Project schedule. Traditionally this has been difficult to enforce, in the event that the DNO supplier does not provide Earthing Isolation Transformers will be required.	01-Apr-07	31-Dec-08		80%	25%	£ 375,000	£ 403,377	£ 740,000	£ 404,901	£ 126,531	Cost provided by PCM to be validated	* Project should either not do or have others do it since this is not a project requirement
RuN/HQE/005	Unforeseen Ground Conditions	There is a risk that due to unforeseen ground conditions the assumed piled foundations may not be feasible and that alternative solutions may be required at additional cost.	01-Apr-07	31-Dec-08	G.I. being carried out prior to detailed design.	20%	20%	£ 1,500,000		£ 2,500,000	£ 400,000	£ 400,000	£1M approximately will need to be spent to remove old station concrete bases. Residual risk has been reduced to low probability. Modelled on PM assessment of costs during implementation works - spread at £1.5M to £2.5M (£1M moved to actual to cover bases above)	
EE39/317/003	Birse OPL0004	Miscellaneous Scope Items	01-Apr-07	31-Dec-08		80%	80%	£ 200,000	£ 430,000	£ 800,000	£ 381,333	£ 381,333	Cost provided by PCM to be validated	
RuN/CON/006	Troughing	Risk that the troughing strategy & quantity has been underestimated. This is in conjunction with the cable strategy that is still to be determined.	01-Apr-07	30-Apr-08		30%	10%		£ 1,200,000		£ 360,000	£ 120,000	Check with re-forecast for civils works.	*subject of a project pip and believed to have a handle on scope and quants
RuN/BIR/001	Birse Forecast Cost to Completion	Senior Management Instructed the Project to include the Birse increase at 75% of face value	01-Apr-07	31-Dec-08		50%	50%	£ 250,000	£ 352,500	£ 1,500,000	£ 350,417	£ 350,417	Cost provided by PCM to be validated	
RuN/PNT/001	Trains and Plant	Demand for Haulage trains may exceed supply due to competition for resources in Midlands area.	01-Apr-07	31-Dec-08	Priority projects to have first allocation where resources are short. This must be applied consistently throughout the duration of the programme..	35%	35%	£ 500,000	£ 1,000,000	£ 1,500,000	£ 350,000	£ 350,000	Reduction in supply of materials could impact efficiency and require alternative more costly methods to recover lost time. PM/ PCM estimate this could cost around £500k. It is also assumed that Rugby remains priority.	
RuN/SCC/002	Rugby SCC Collision Barrier	The cost of constructing a collision barrier at Rugby SCC has been deleted from the re-forecast	01-Apr-07	31-Dec-08		50%	50%	£ 250,000	£ 350,000	£ 1,500,000	£ 350,000	£ 350,000	Cost provided by PCM to be validated	
RuN/LID/001	Nuneaton Locking Lids	Locking lids for Troughing as a deterrent for cable theft have been deleted from the re-forecast	01-Apr-07	31-Dec-08		80%	80%	£ 200,000	£ 338,964	£ 750,000	£ 343,724	£ 343,724	Cost provided by PCM to be validated	
EE40/319/001	General Civils Scope Growth	There is a risk that not all of the scope has been fully considered i.e Retaining Walls	01-Apr-07	31-Dec-08		80%	80%	£ 100,000	£ 400,000	£ 750,000	£ 333,333	£ 333,333	Cost provided by PCM to be validated	
RuN/KEL/002	Rugby Kelman VCB Units	Kelman VCB Signet Units have been excluded from the re-forecast a variation to the design requirement is being sought to eliminate the requirement. Some units have been ordered and billed to the project, the project will have to incur the cost if they cannot be transferred back to the Network Rail Corporate Inventory	01-Apr-07	31-Dec-08		80%	50%	£ 320,000	£ 320,000	£ 560,000	£ 320,000	£ 200,000	Cost provided by PCM to be validated	*Project should work with HQ procurement to redirect and obtain credit within system similar to others
RuN/KEL/001	Nuneaton Kelman VCB Units	Kelman VCB Signet Units have been excluded from the re-forecast a variation to the design requirement is being sought to eliminate the requirement. Some units have been ordered and billed to the project, the project will have to incur the cost if they cannot be transferred back to the Network Rail Corporate Inventory	01-Apr-07	31-Dec-08		80%	50%	£ 308,000	£ 308,000	£ 540,000	£ 308,267	£ 192,667	Cost provided by PCM to be validated	*Project should work with HQ procurement to redirect and obtain credit within system similar to others
RuN/PNT/002	Tamper pre-ordered	There is a risk that the availability of tamper machines will decrease due to the national consensus that orders are to be placed in advance as for trains.	01-Apr-07	31-Dec-08	This has already resulted in ESR required at Hillmorton following the shift in priority of tampers to other midlands projects.	20%	20%	£ 500,000	£ -	£ 2,500,000	£ 300,000	£ 300,000	estimated provision	

Risk Information | **Quantitative Analysis**

085 | Cost (£) | 18-Jan-08

										Total Project Risk	**Project Values**	**Programme values**		
Project Risk Reference Number	**Risk Name**	**Risk Description**	**Trigger Date**	**Expiry Date**	**Management Strategy / Mitigation**	**Probability %**	**Probability % (WS/AR)**	**Minimum Impact (cost)**	**Most Likely Impact (cost)**	**Maximum Impact (cost)**	**EV Cost (£)**	**EV (NEW)**	**Modelling Note (cost)**	**Comments Bill/Amar**
RuN/SPM/007	Inter-Project Dependencies	Rugby is critically dependent on the provision of other related projects to provide infrastructure before Rugby access and facilities are put out of action Post Easter 2006.	01-Apr-07	31-Dec-08	Robust reporting and management plan is in place to mitigate the risk. An alternative temporary site as a fall-back to the Northampton Loop is to be investigated.	50%	25%	£ 300,000	£ 600,000	£ 900,000	£ 300,000	£ 150,000	Dependency projects will be assessed for potential slippage and this will be included in the schedule model and cost impact included in the schedule prolongation risk.	*EE49 (Hampton) & W132 (ICP) are being updated frequently with Impleemntation director controling work
RuN/DES/009	New Novel Products	Introduction of PLODS & Green Banners cause re-design of infrastructure architecture and other design elements. Green Banner not yet approved, carries performance issues with severe consequences.	01-Apr-07	30-Apr-08	Early visibility of solution to design, construction and test.	25%	25%	£ 500,000	£ 750,000	£ 2,500,000	£ 312,500	£ 312,500		
RuN/DES/008	Speed Signals	Risk that the continual Route Signage may be non compliant.	01-Apr-07	30-Apr-08	Adequate management of ORS (V&V) against new compliance.	20%	20%	£ 525,000	£ 750,000	£ 2,500,000	£ 251,667	£ 251,667		
RuN/PSS/005	Implementation possessions curtailed or cancelled	Impact varies from curtailment of planned works to loss of the planned possession with abortive costs. Assume there are 105 8/9 hour possessions and 67 30/52/54 hour possessions with abortive costs between £1k to 5K (8/9) and min 10k, ML 20k and 100k max.	01-Apr-07	31-Dec-08		50%	50%		£ 500,000		£ 250,000	£ 250,000		
RuN/CON/003	Survey Data inaccuracy	Risk that the lack of accurate survey data means that services/utilities may be damaged or may require re-routing.	01-Apr-07	30-Apr-08	Inacurracy has already contributed to poor design documentation being received.	60%	60%	£ 200,000	£ 400,000	£ 650,000	£ 250,000	£ 250,000	Further analysis required on cost and schedule impact to determine full forecast of risk. (Model estimated at 200K to 650K in additional works/recovery)	
RuN/TAR/002	GrantRail P-Way Cost Performance Target	Senior Management Instructed the Project to set a Performance Target to reduce GrantRail Permanent Way Direct Costs by 5%	01-Apr-07	31-Dec-08		80%	80%	£ 240,233	£ 240,233	£ 425,000	£ 241,458	£ 241,458		
										SUB TOTAL	£ 45,942,212	£ 27,626,219		

Appendix E
SQRA – 13 September 2007

W010-001-PM-REP-000XXX
Issue: A1

Rev: 1

Date: 13 of September 2007

Commercial In Confidence

West Coast Route Modernisation Programme

Title

RuN: Schedule Quantitative Risk Analysis and Integrated plans

Prepared by:
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Program Controls

Date: 14-Sep-07
(Signature)

Controlled Copy Number	

Approved by: M Tracy-Inglis

Senior Project Manager

Date: 14 Sept 07
(Signature)

Approved by: W. Swanson

Programme Control Director

Date: 14-SEP-07
(Signature

APPENDICES

Appendix A **Integrated schedules**

1 EXECUTIVE SUMMARY

This report provides senior management with the current status of the Integrated Schedule for both EE40 Rugby Station Remodelling and EE39 Nuneaton Remodelling Phase 2, together with the Schedule Quantitative Risk Analysis (SQRA) of the key stages critical to the delivery of the projects.

The deliverables noted in this report also form and meet the requirements of the Key Performance Index KPI "Develop fully integrated schedules for Rugby and Nuneaton with appropriate logic ties between each. Conduct QSRA's for each major commissioning – Rugby Free Wired Interlocking, Nuneaton Stage 1, Rugby Stage G, Nuneaton Stage 2, Rugby Stage J, where appropriate, propose methodology to improve commissioning probability to an acceptable level."

Development of the Integrated Schedule for each of the projects together with logical links has been achieved, and the details are provided in the body of this report. The overall schedule produces forecast dates noted in the table below.

The results of the SQRA for the key stages:

Activity ID	Description	Target Date	Current Forecast Date	Probability of meeting Target date	85% Confidence Date
SDCMBL010	Nuneaton Stage 1 - Birmingham/ Leicester Lines. [2 SSI]	23 Mar 08	29 Apr 08	< 1%	08 Apr 08
COMS4010	Nuneaton Stages 2 – Trent Valley Interlockings. [6 SSI]	02 Sep 08	30 Sep 08	37%	15 Sep 08
BRCM005	Stages D/E Commissioning. [FWI]	31 Dec 07	01 Jan 08	99%	23 Dec 07
BRMC025	Stages F/G. [3 SSI]	24 May 08	16 Jun 08	< 1%	16 Jul 08
BRSCG025	Stage J. [4 SSI]	21 Nov 08	01 Dec 08	95%	05 Nov 08

Two of the above critical stages have a low probability of successes, primarily due to the Data production, independently checking and reworking the requirements of the signalling design. These results concur with Atkins programme which is currently showing a bust in the Nuneaton Stage 1 and Rugby Stage G schedules and is expected to be updated on 14th September which is expected to fix these busts.

This critical driver to the successful delivery of all the key commissioning stages has been determined to be the signalling design, data construction, implementation and commissioning.

The projects have developed mitigation plans with detailed actions to improve the % probability of delivery.

2 SCOPE

The scope of the report covers the development of an integrated schedules for both EE40 Rugby Station Remodelling and EE39 Nuneaton Remodelling Phase 2, together with the Schedule Quantitative Risk Analysis (SQRA) of the key stages for the delivery of the projects. The following stages have been included as part of the SQRA:

- Christmas 2007 Stage E (Rugby)
  - Free wired interlocking Rugby Station area controlled from Rugby PSB
- Easter 2008 Stage 1 (Nuneaton)
  - Nuneaton Leicester SSI
  - Nuneaton Birmingham SSI
  - Initial transfer of control to SCC
- May 2008 Stage G (Rugby)
  - Rugby Interlocking
  - Long Lawford
  - Newbold SSI
  - Brinklow SSI
  - Additional Functionality (FWI & HNJ)
  - Initial Transfer control to SCC
- August 2008 Stage 2 (Nuneaton)
  - Nuneaton Interlockings
  - 1 South
  - 2A WestNorth & 2B Westsouth
  - 3 East
  - 4 North
  - 5 Atherstone
  - 8 Coventry (part)
  - Additional FWI Functionality (up side routes)
- November 2008 Stage J (Rugby) plus LSE RuN
  - Rugby Interlockings
  - Rugby Up (Final) SSI
  - Rugby Yard SSI
  - Hillmorton SSI
  - Rugby Down SCC
  - Transfer of control to SCC

3 PURPOSE

1. To provide senior management a snap shot of the current status of the projects schedule and the inherent risk within the programme which if not mitigated would adversely impact the project milestones.
2. Provide evidence for the achievement of the designated KPI for the current period.

4 PROCESS

Fully integrated schedules have been developed for both EE40 Rugby Station Remodelling and EE39 Nuneaton Remodelling Phase 2. These schedules take full cognisance of the schedules developed by the contractors for awarded contracts and Project developed schedules for un-awarded works and Network Rail activities.

From the above schedules, schedules for each of the critical stages were isolated with particular focus on the critical paths through each of the stages and all other 'near' critical activities. These schedules were then subjected to Quantitative Risk Analysis; optimistic, most probable and pessimistic durations, using Pertmaster.

5 INTEGRATED SCHEDULES

5.1 Process for development of schedules

The following criterion was used by the project and the planners reviewing schedules to ensure compliance with good practice and technical requirements. This guide is not exhaustive and should not be considered definitive. Good judgement and common sense were used in all cases.

- In no case were the constraints Start On, Finish On, Mandatory Start or Mandatory Finish be used. If these constraints were used in a contractor's schedule it was replaced with the appropriate constraint. The noted constraints override schedule logic.
- All constraints in the contractor's schedule were reviewed to ensure that they were not introducing inappropriate float calculations. In no case was the application of a constraint allowed to override good logic and the free flow and calculation of the schedule dates.
- The total scope, 100% of the budgeted works, was accounted for within the schedule. If the contractor has planned for a lesser percentage the NWR Project Planner included the balance of the effort with logically linked activities in the NWR area of control until such time that the scope is remitted.
- The scheduling rules should be set to 'progress override'. This recognizes that the original logic may be incomplete or inaccurate. Work around and acceleration methods may cause works to be progressed 'out of sequence'. Hence, we need to take credit for these out of sequence works and set the schedule mode to 'progress override'.
- Dangling activities although not preferred may not have any impact on the schedule. It would be best to ensure that predecessors and successors are included in all cases.

All dangling activities were reviewed to ensure that they were properly logic linked to the other activities in the network, if appropriate. There were many cases when no action was required because there was no impact to the schedule logic.

- All interfaces were logic linked between the various OBS elements of the project. There is no specific method to completely and accurately identify and define an interface. This relies to a large extent on the knowledge and experience of the planner. Once identified, these interfaces serve as key control points to be monitored and controlled to ensure the orderly flow of information, documents and physical deliverables on the project.
- In general, lags serve a very useful purpose. However, if the lag is intended to account for a scope, deliverable or service the lag was replaced by an activity defining the actual activity to be accomplished.
- All activities were assigned to the correct WBS. This structure is maintained on the project and each planner should manage the assignment of activities to this specific WBS elements.
- All activities were assigned activity code values as appropriate. There were cases when an activity code value is not appropriate. In these cases, the code field should be filled with 'Z's' to indicate that the activity has been reviewed for coding and none is appropriate. This facilitates producing exception reports later, only blank fields need to be addressed.
- Calendars assigned to activities were reviewed to ensure that the correct correlations had been made. As many of the activities are tied to a specific possession regime, ie, calendar, the correct association is very important.

The Nuneaton schedule is comprised of a little more than 10,300 activities and the Rugby schedule 18,300 activities. The review and maintenance of this magnitude of activities requires diligence and discipline. Continued vigilance with regard to the quality of the schedules is imperative to success.

In line with the QSRAs performed for this KPI, the critical and 'near' critical activities for each of the commissioning stages is attached for review and information.

5.2 Nuneaton key commissioning stages

Nuneaton key integrated commissioning stages have been developed and are attached below in Appendix A

5.3 Rugby key commissioning stages

Rugby key integrated commissioning stages have been developed and are attached below in Appendix A

6 SCHEDULE QUANTITATIVE RISK ANALYSIS

6.1 General Assumptions

The following assumptions have been made in this schedule analysis:

- The analysis of the various stages of the Rugby and Nuneaton schedules will provide an accurate overall indication of the probability of achieving the overall programme

- Additional possessions will be purchased in the event of loss of access
- Yellow plant and trains will be prioritised to avoid disruption of RuN possession work
- Critical signalling data engineers will be available to under take the data preparation tasks
- The previous theft of cable from around the Rugby area will not be a significant issue now that new security guards are patrolling
- Outstanding engineering issues (e.g. Green Banner/ PLODS)will be resolved in time to avoid major disruption to the programme
- Signal Testing and Commissioning engineers will be made available to meet the programme

6.2 Risks likely to have a schedule impact

The following risks in the risk register were identified as having a potential schedule impact:

Risk ID	Title
RuN/DES/002	Poorly defined scope
RuN/PSS/003	Possession disruption
RuN/CON/001	Utilities diversion
RuN/PSS/002	Staging changes lead to the need for additional possession
RuN/DES/003	Design resource availability and competence
RuN/DES/020	Detailed design change
RuN/DES/019	Design contractor delay
RuN/APP/001	Delays in approvals
RuN/RES/003	Design resource underestimated
RuN/PRO/003	Long lead items delivered late
RuN/PNT/001	Trains and plant not available in required quantities
RuN/DES/009	Novel products – Green Banners/ PLODS – lead to delays and rework

6.3 Method

The RuN project, comprising the recent amalgamation of the Nuneaton and Rugby projects, is planned using an integrated schedule mostly made up of the individual contractor programmes. This schedule has now grown in excess of 20,000 activities which is considerably in excess of the 200 to 1500 activity schedule required for a quantitative analysis. The first stage of the analysis involved a major exercise using project and WCRM staff to break up and summarise the schedule into the various commissioning stages ensuring that the activities were logic driven and representative of the detailed contractor schedules.
The analysis is based on a snapshot of these individual stages updated to 25th August. The P3e schedules were then exported in XER format into the schedule analysis software, Pertmaster. Two schedules, Nuneaton Stage 1 and Rugby Stage E were reviewed on a line by line basis during a workshop held on 7th September and the remainder reviewed by planning and project staff to agree the likely maximum and minimum durations for each significant activity. The duration spreads were then modelled using the Pertmaster Monte Carlo software to provide the quantitative analysis results in this report.

6.4 Workshop Attendees

The following staff attended the workshop:

Ian Alsop	OLE, PWay, Civils
Ian Johnson	S&T
Jason Lacey	Signalling
Mike Pollard	Nuneaton and Rugby System Engineer
John McDougall	Integration and Assurance
Paul Hodson	Integration and Assurance (taking over from John McDougall)

It was noted that there was no design representatives and it was agreed that a separate meeting would be required to capture their input.

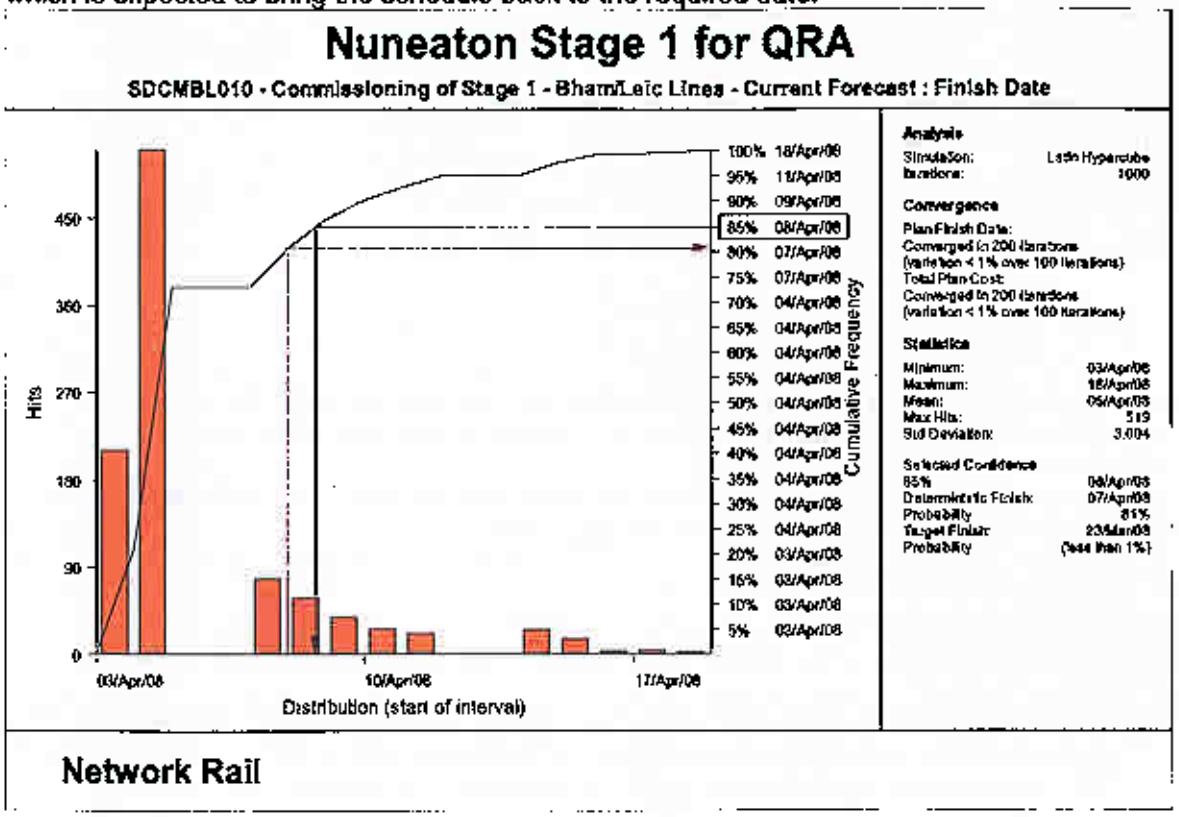
6.5 Nuneaton Stage 1

6.5.1 Key Issues

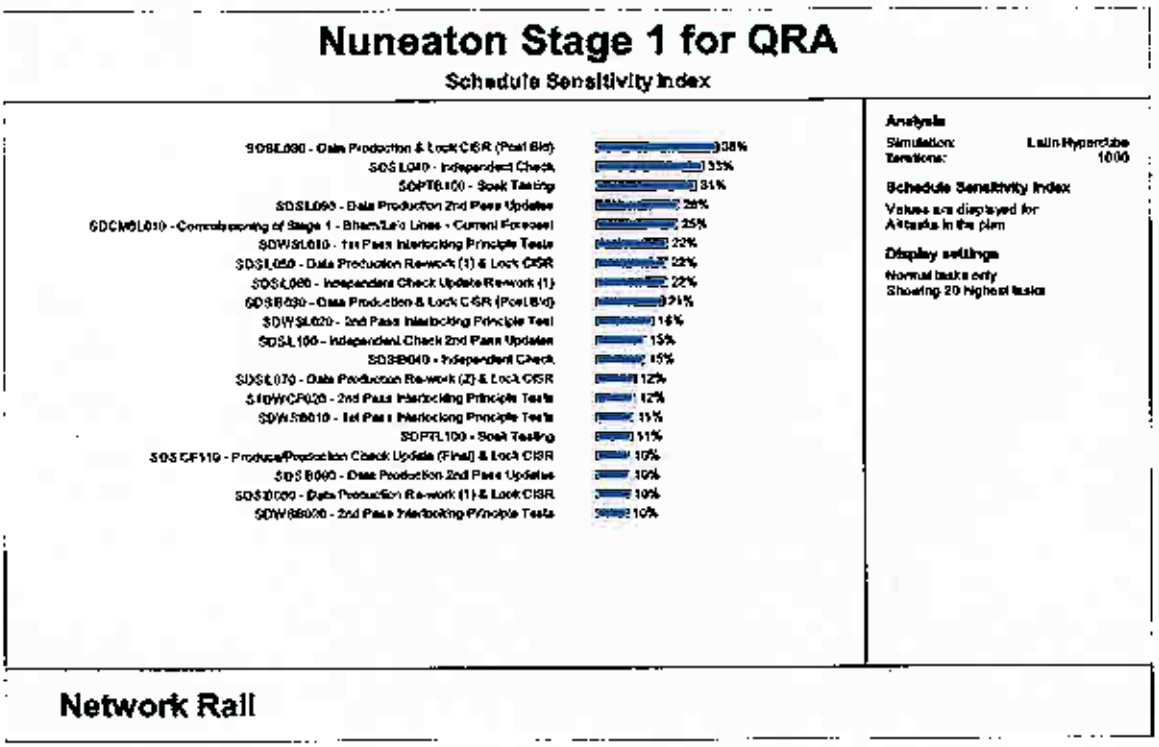
- The Nuneaton Stage 1 is seen as straightforward with only two SSI. The current schedule is currently showing 2 week delay (negative float) due to the signalling schedule.
- Possessions have in some cases been cut back from 50 hours to 30 hours which could lead to overrun/ additional possessions being required
- Late delivery of points has meant that some work has been deferred to later in the programme
- Design activities need to be included in the model
- Civils and Power activities need to be included in the model as they are on the critical path
- PSP Bases – start date now in accordance with the revised schedule from BIRSE.
- Nuneaton concentrator upgrade needs to be complete by 13 Mar 08
- FTN needs to be up and running by start of February – the viability of this needs to assessed
- Test and Commissioning telecoms must be brought forward to end January early February.
- Power for test and commissioning is shown as available in January – this date needs to be brought forward to end November/ early December – fallback will be the use of mobile generators.
- Power supplies are complex and power details have changed recently impacting ITPS Form B – needs to be included in logic
- 16 signalling structures are required to be installed between 21st October and 9th December. Slippage is evident in BIRSE deliveries caused by overload of suppliers (Collis) - Signal Post activities need to be included in schedule. Programme contingency has been used up.
- Programme schedule contingency has been used up.

6.5.2 Modelling results based on current schedule

The following cumulative probability curve for the commissioning was produced from the workshop and the updated Atkins signalling schedule received on the 7th of September. . The current schedule shows a two week bust. The probability is based on the commissioning date of 23rd March. A revised signalling schedule is due on 14th September which is expected to bring the schedule back to the required date.



The following Tornado chart shows the activities most likely to affect the commissioning date.

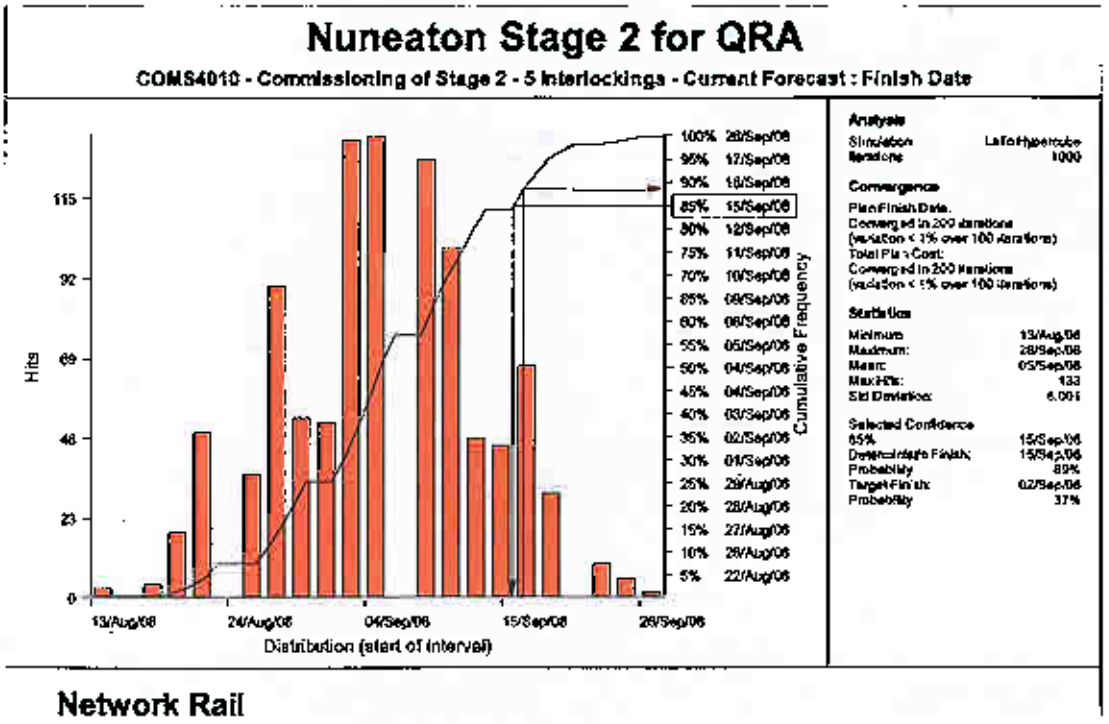


Recommendation

The critical path and therefore the key programme dependency currently lies with the Signalling programme specifically data design (Production) and test. As a result of these results the RuN Project expects delivery of the revised Signalling Programme from Atkins on 14th of September 2007. The Risk model for Nuneaton 1 Commissioning will then need to be re-run to reflect the progression as a result of these changes.

6.6 Nuneaton Integrated Schedule Phase 2

An integrated schedule covering activities up to the August 2008 Stages 2-5 commissioning has been prepared. Nominal spreads have been applied to applicable and significant activities. The results are given below. The cumulative probability curve shows probabilistic results against achieving the 02nd of September 2008. The model shows a 37% probability of meeting the 02nd of September date.



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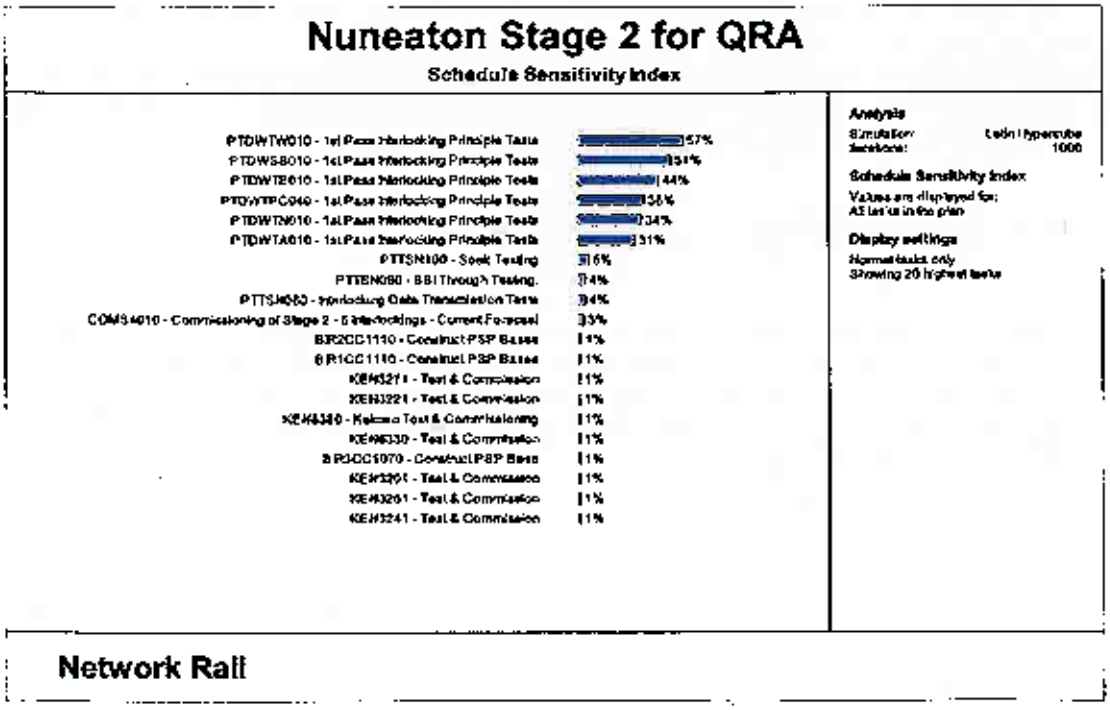
The following Tornado chart shows the key activities driving the late date.



Recommendations

The results taken from this model shows the criticality of the signalling testing given that the critical path flows through the PSP base installations into the pre-testing and principles testing. The signalling programme and the critical interface associated with the installation of the PSP bases requires careful consideration. A revised signalling programme is expected by 14-Sep-07. Possible mitigation measure against the PSP interface may need to be implemented.
Under closer examination slight change to the timing of the PSP installations and a small re-measurement (minor reduction of duration) against the testing activities increases the overall percentage of probability in achieving this plan to 94% against the 02-September Date.

6.7 Rugby Stage E

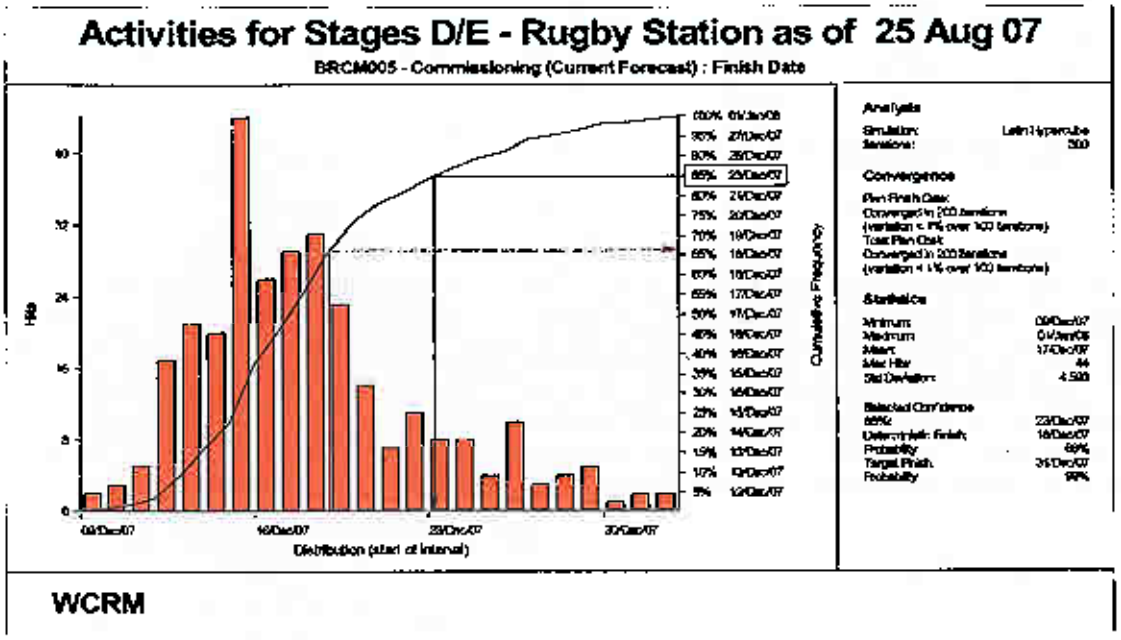
The Rugby Stage E schedule had been previously reviewed by the RuN risk manager who applied spreads to the key activities. It was reviewed during the Friday workshop and afterwards with Jason Lacey the signalling manager; in general the spreads were seen as realistic. The workshop identified areas of missing OLE and PWay activities and efforts have since been made to correct this. The analysis is based on the updated schedule provided on 11th September. The analysis results indicate that there is more float in the signalling programme than in PWay, OLE, Civils and to a lesser extent Telecoms. This is now being given special management focus. The issues raised are listed below.

6.7.1 Key Issues

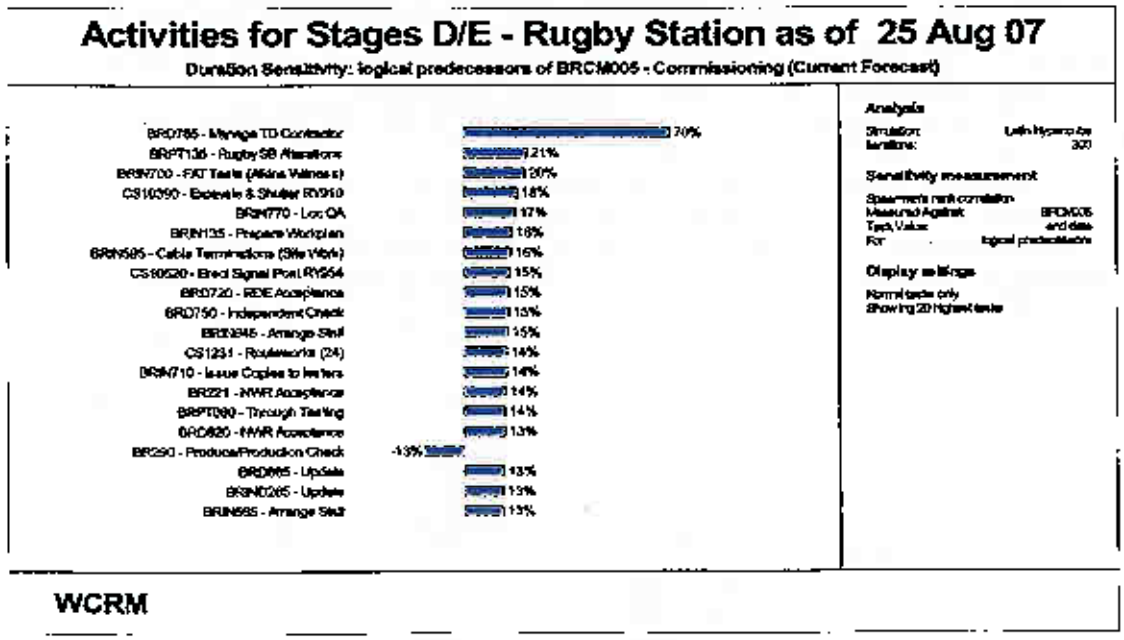
- OLE is currently behind schedule. Schedule is very tight and a further check is needed to confirm that the design and material supply are correctly reflected in the schedule.
- PWay is dependent on OLE and although on a Green Field site is now critical and likely to require special measures to achieve the programme – at additional cost.
- The Civils programme is less of an issue compared with OLE but troughing, bases and plant need to be reviewed to ensure that they are far enough away from the critical path not to require activities to be included in the Stage E schedule.
- A multi project independent Design Check is required for the ICP workscope and it is not clear how and when this will be managed.
- Free issue Axle Counter material has proved unreliable and the situation should be reviewed to ensure that this will not impact the programme.
- There is significant scope uncertainty regarding North Viaduct Bridge 281B (track off and waterproof) involving S&C, 4 OLE and PWay stages and signalling commissioning [NEED TO CHECK THIS FOR ACCURACY]

6.7.2 Modelling Results for Stage E

The 'Start No Earlier Dates' were removed from the schedule thus allowing commissioning to be driven by the logic, hence the dates indicate the time at which the various workgroups will be ready for commissioning. Removing this constraint allows the deterministic date to come forward to 18th December and give a probability of meeting the December 31 target as 99%.



The model Tornado indicates that the following activities need management focus to achieve the date. The tornado will change as activities are progressed.

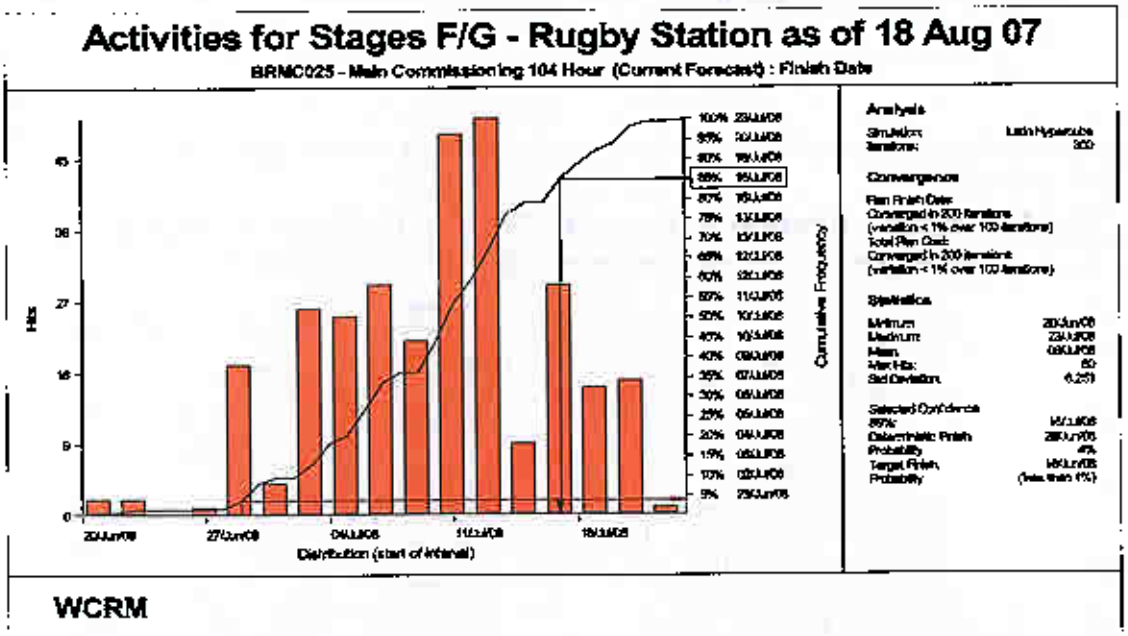


6.7.3 Stage E Conclusions and Recommendations

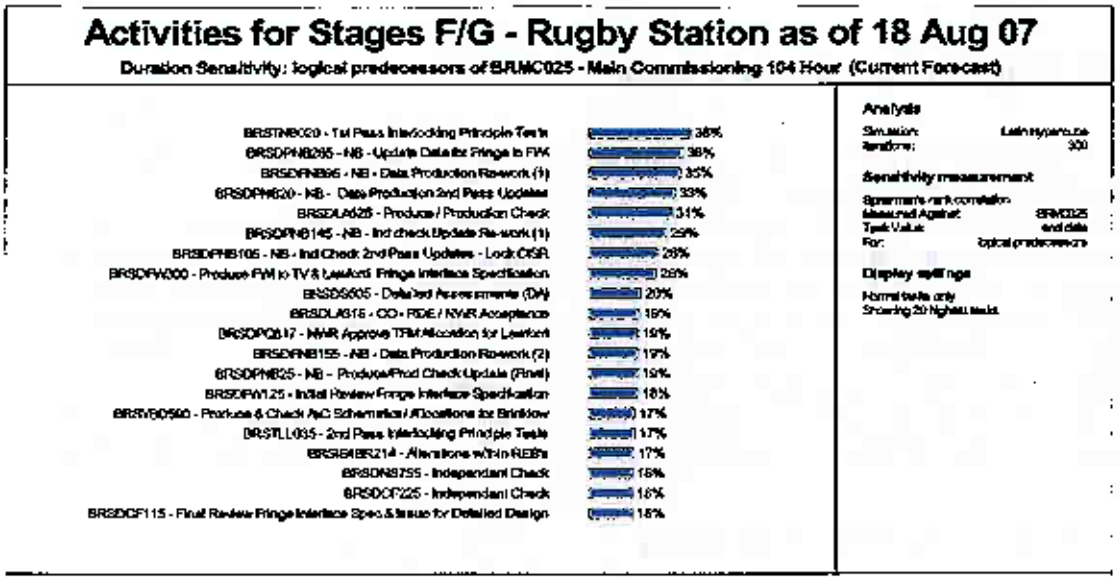
The schedule for Stage E contains a significant amount of detail in most areas and gives a very good probability of completion by 31st December. There is however a clear indication that virtually all the trades are very close to the critical path and this is receiving day by day management focus and constant adjustments to hold the schedule. In order to ensure that all the affected contractors are 'onboard' and pulling together it is recommended that a schedule workshop is held with them at an early opportunity. This will help identify the critical issues and the workarounds necessary. This should be followed up by weekly meetings with the key contractors ensure that any problems are identified and workarounds agreed as soon as possible. It is recommended that the schedule is further refined and the spreads from the Pertmaster schedule uploaded into P3e and the model re-run on a regular basis.

6.8 Stage G Schedule Analysis

The spreads agreed during the workshop were extrapolated onto this schedule to provide an initial result. The results indicate a three week bust on the schedule and Atkins are expected to remedy this with a new schedule delivered on 14th September.



The Tornado shows a heavy bias towards the signalling activities. The schedule has been re-work over the last few days but a further careful check should be made of the associated P Way, Civils, telecoms and power activities to ensure that there are no logic links/ activities missing that would cause this degree of bias.

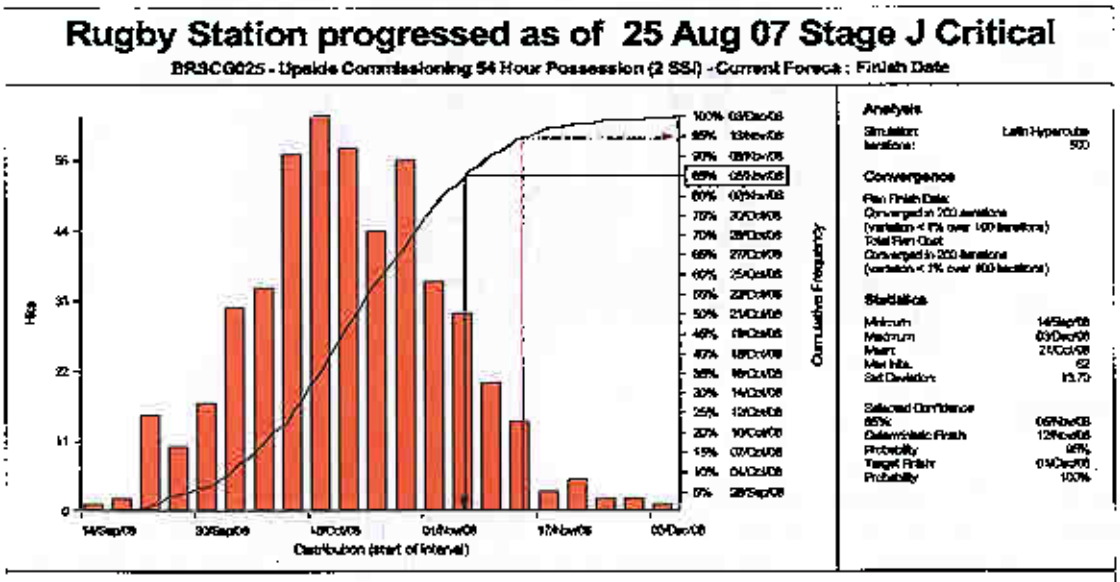


WCRM

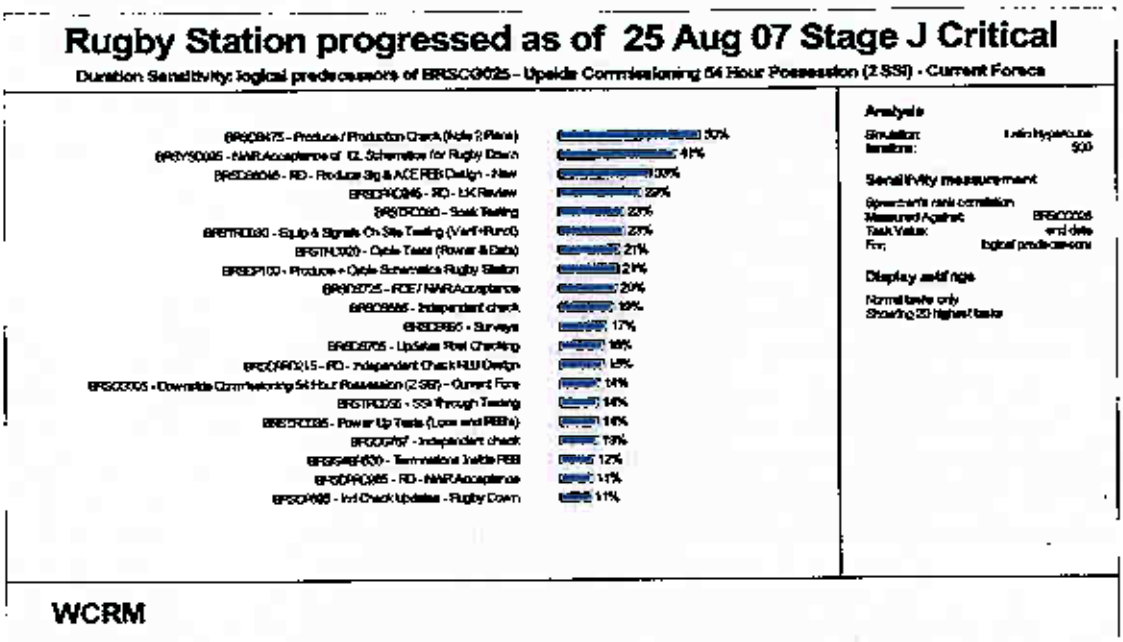
The activities driving the late date are shown on the next sheet.

6.9 Stage J Schedule Analysis

The results for Stage J indicate 95% probability of meeting the 21 November target date.



WCRM



7 OVERALL INTERIM CONCLUSIONS AND RECOMMENDATIONS

The results indicate that some further work is required to ensure that non-signalling activities are correctly linked into the schedule as the workshop highlighted design, OLE, PWay and telecoms issues. A separate dependencies chart which has been supplied may help this. . It is anticipated that the revised signalling programme due for delivery on the 14th September will remedy the one month bust on the Nuneaton programme and the Stage G programme. The spreads in all the models should be uploaded into the P3e schedules to enable the models to be run on a regular basis. The issues are listed against the various stages and it is strongly recommended that a workshop with the key contractors is held in the very near future to review the programme of work and get 'buy-in' for the workarounds that will be needed to hold the key dates. This should be followed up by weekly progress (White Board) meetings to closely co-ordinate the work.

8 MITIGATION ACTION PLANS

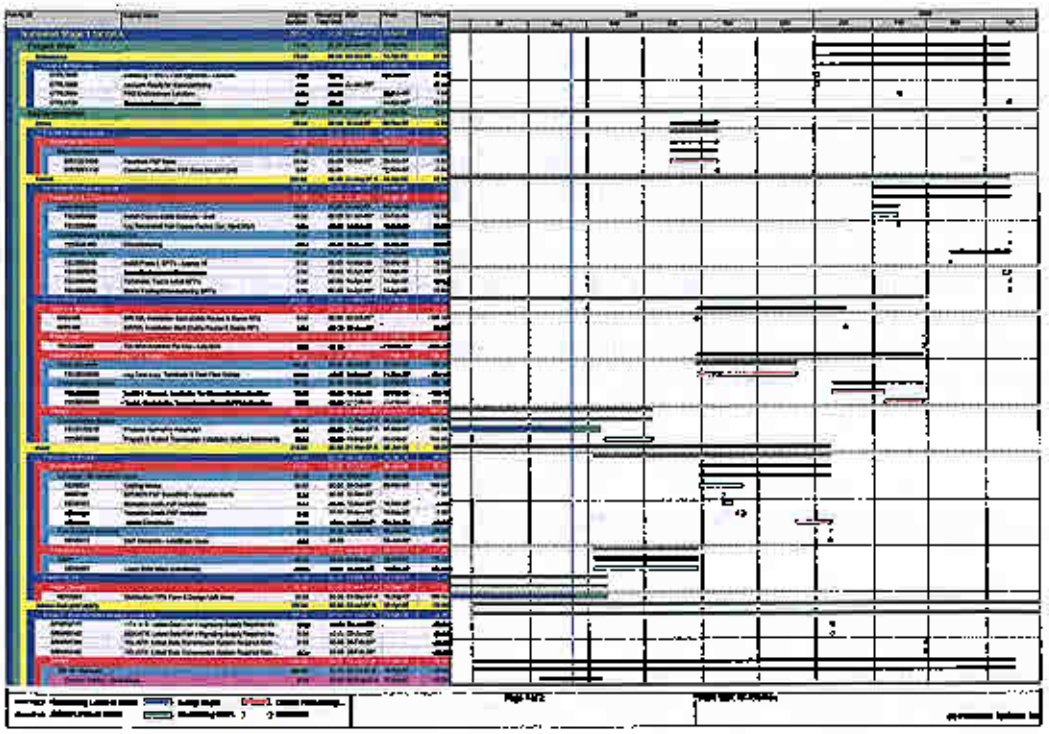
The overall project schedule has negative float pertaining to a number of milestone. This has been identified by the projects and suitable mitigation plans have been developed and implemented. At the time of writing this report a number of the above schedules which have low probability of achievement had been ameliorated and further actions identified to continue the mitigation. These actions are detailed below.

The programme interrogation is taking the form of;

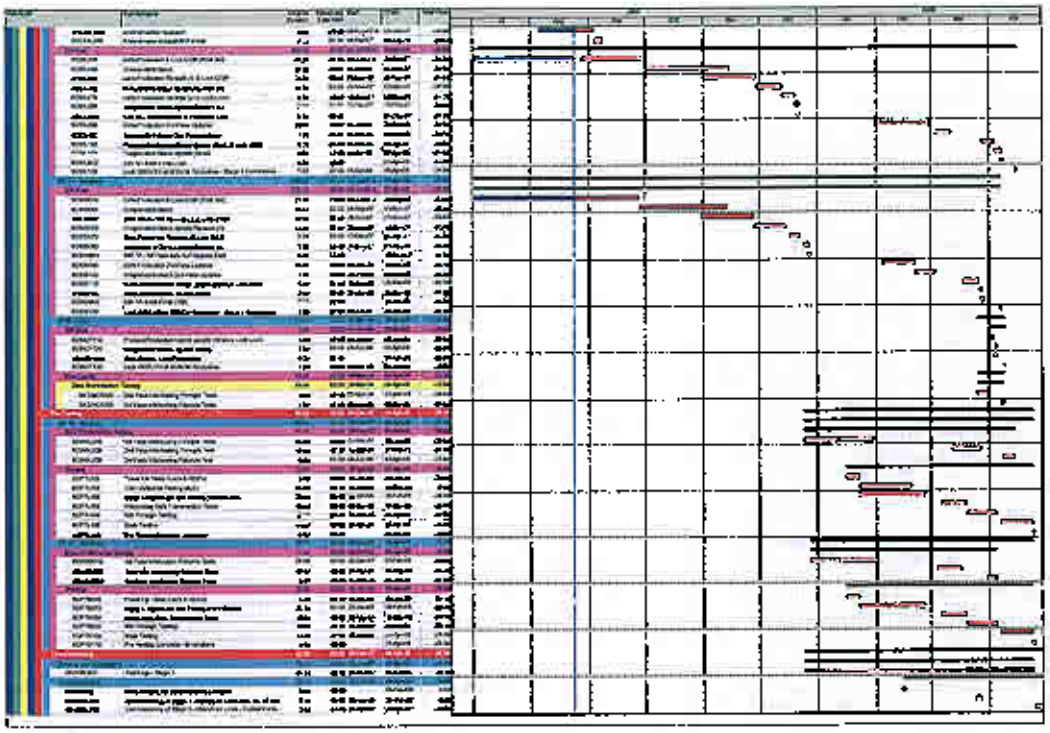
1. Review Critical Path line by line
2. Review Individuals by name carrying out the task

3. Review competenence and confidence of individual
4. Review Individuals ability to work overtime (midweek) and (weekends)
5. Review Individuals ability to work Xmas if required
6. Review outstanding issues preventing activity start
7. Review outstanding issues preventing activity finish
8. Review activity duration
9. Review whether activity can start earlier
10. Review whether activity can be overlapped
11. Review whether assistance is appropriate
12. Review annual leave of each individual
13. Ensure 'hand-off' between activities is planned
14. Review potential to de-scope activity or process
15. Review any 'new' initiatives that may assist activity
16. Ensure appropriate 'tools' are in place for the activity
17. Review possibility of incentives / rewards

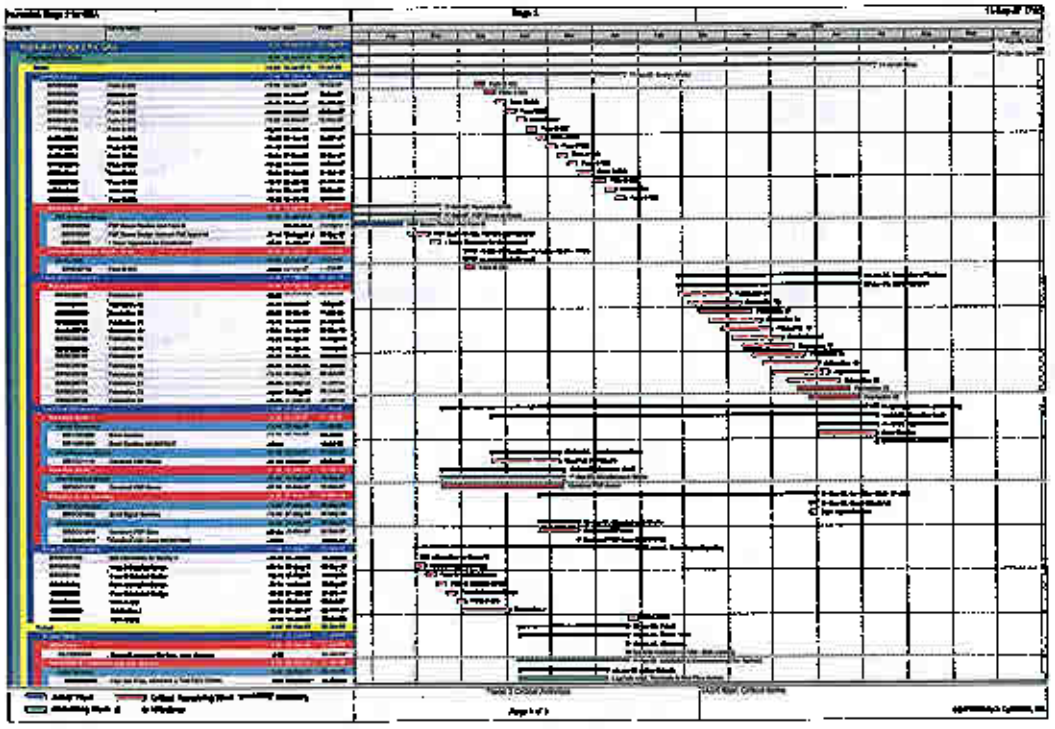
Appendix A:

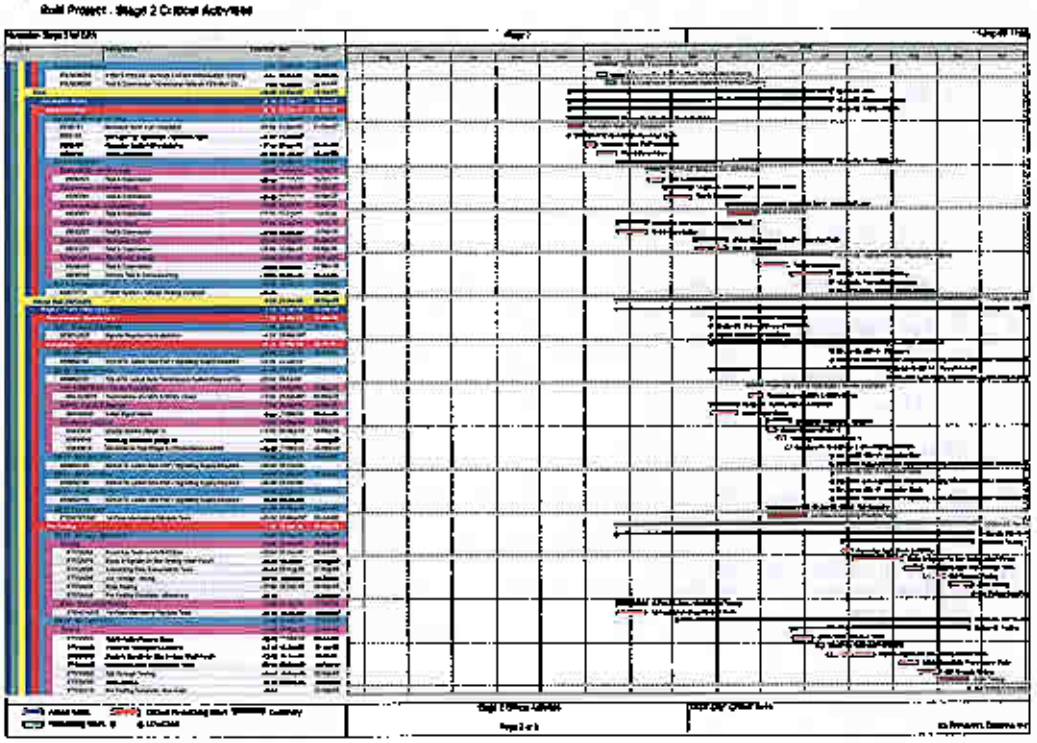


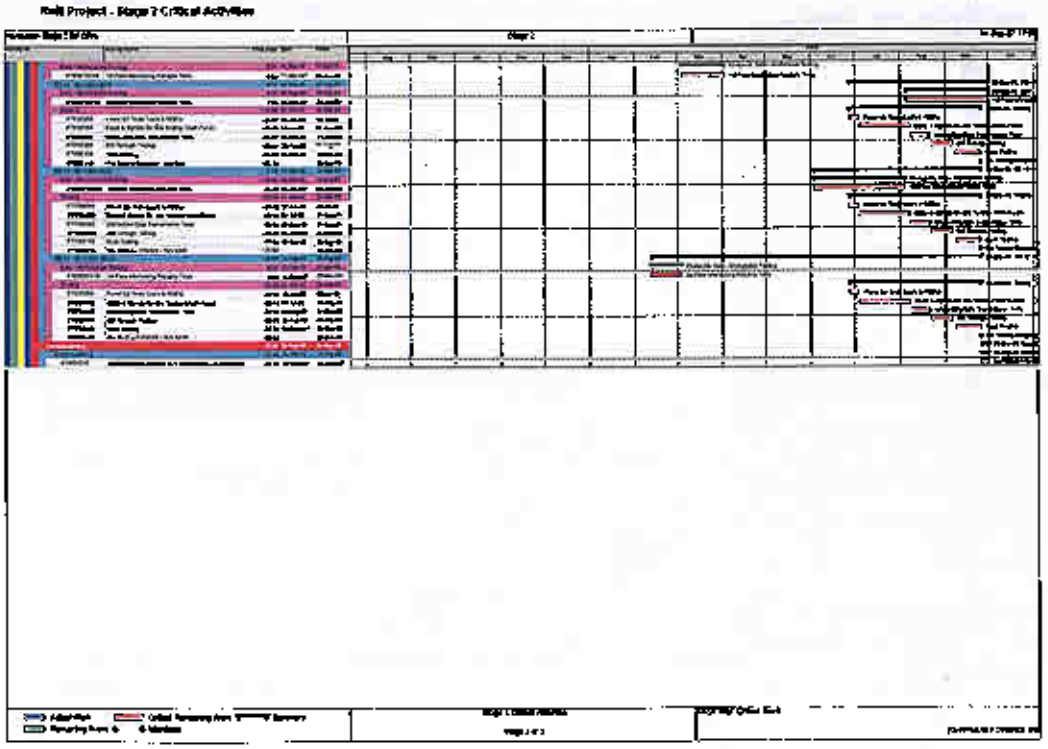
RAR Project - Stage 1 Critical Activities

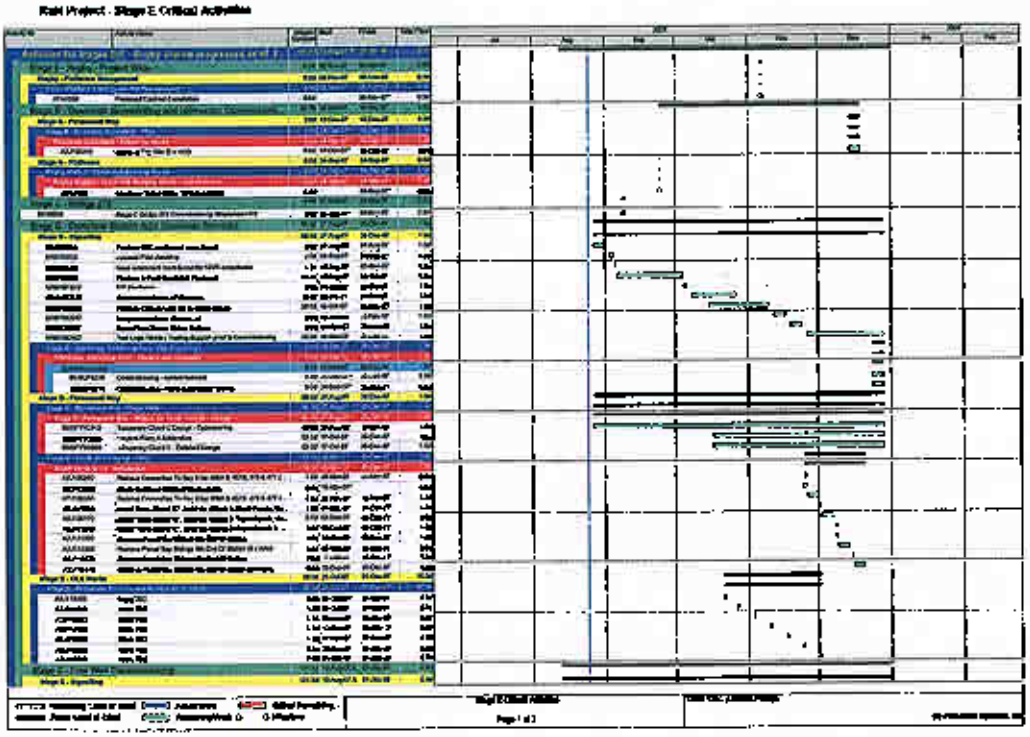


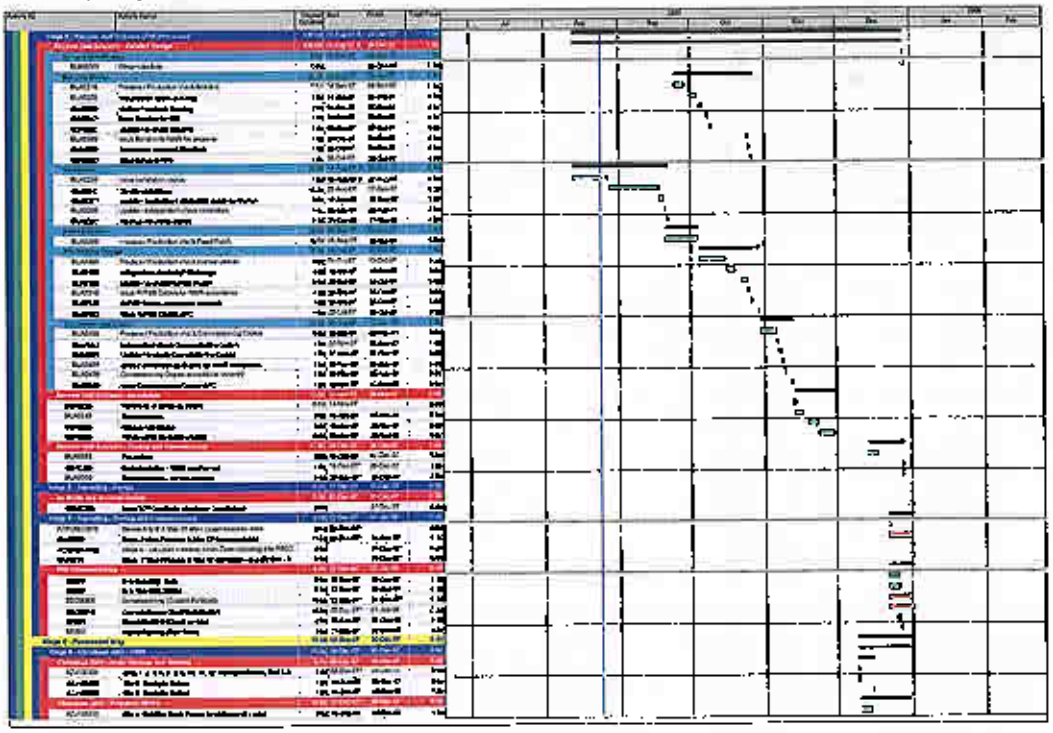
RAR Project - Stage 2 Critical Activities

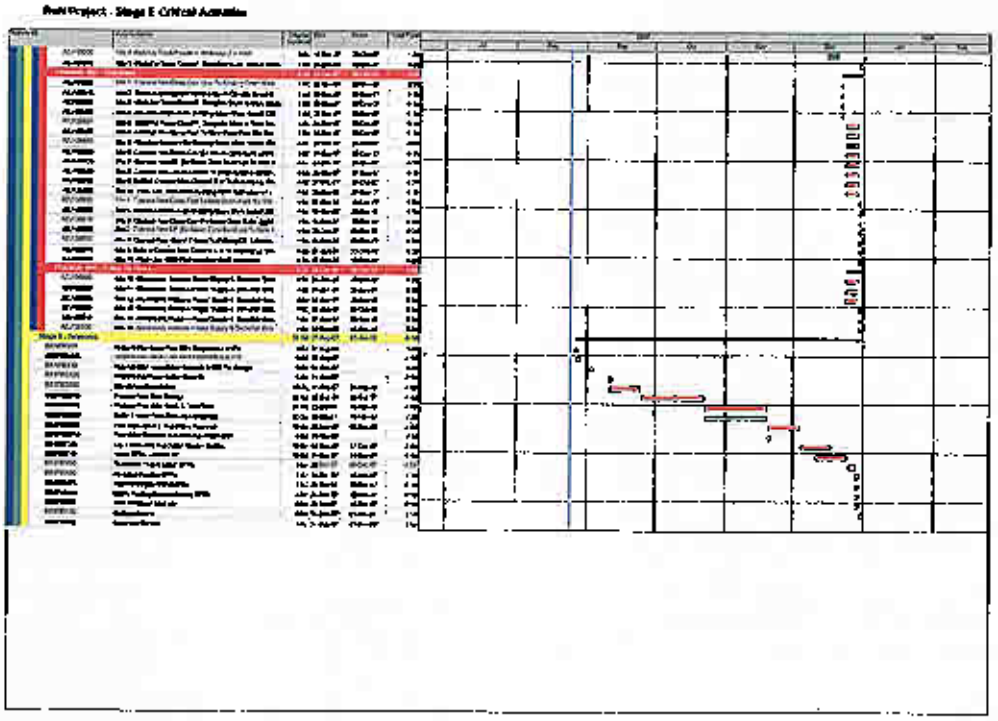


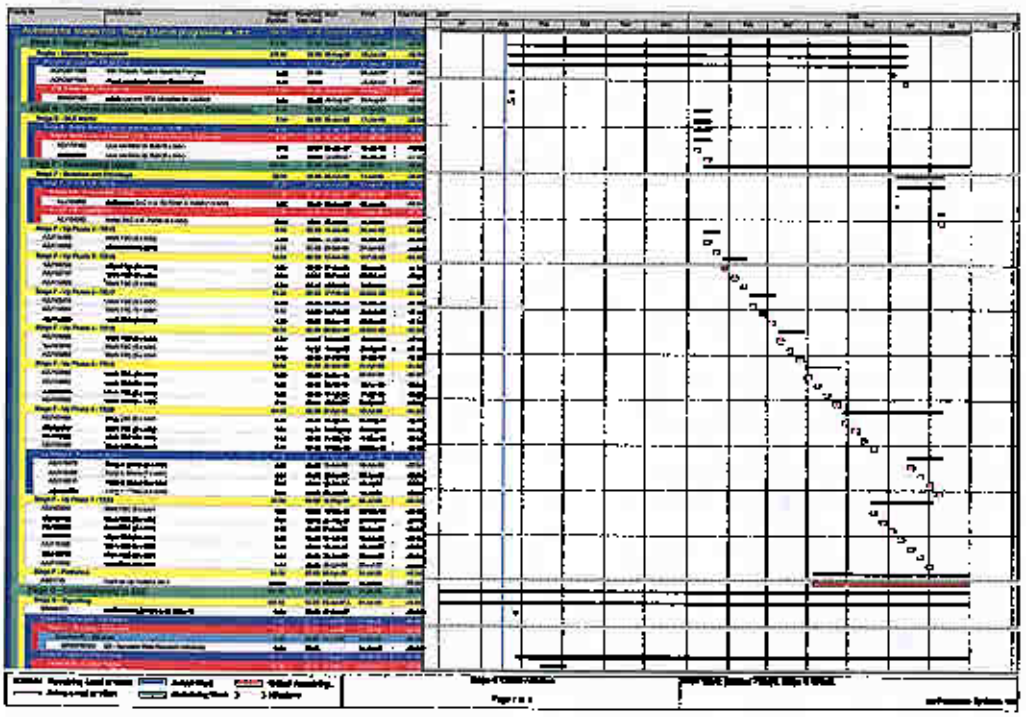


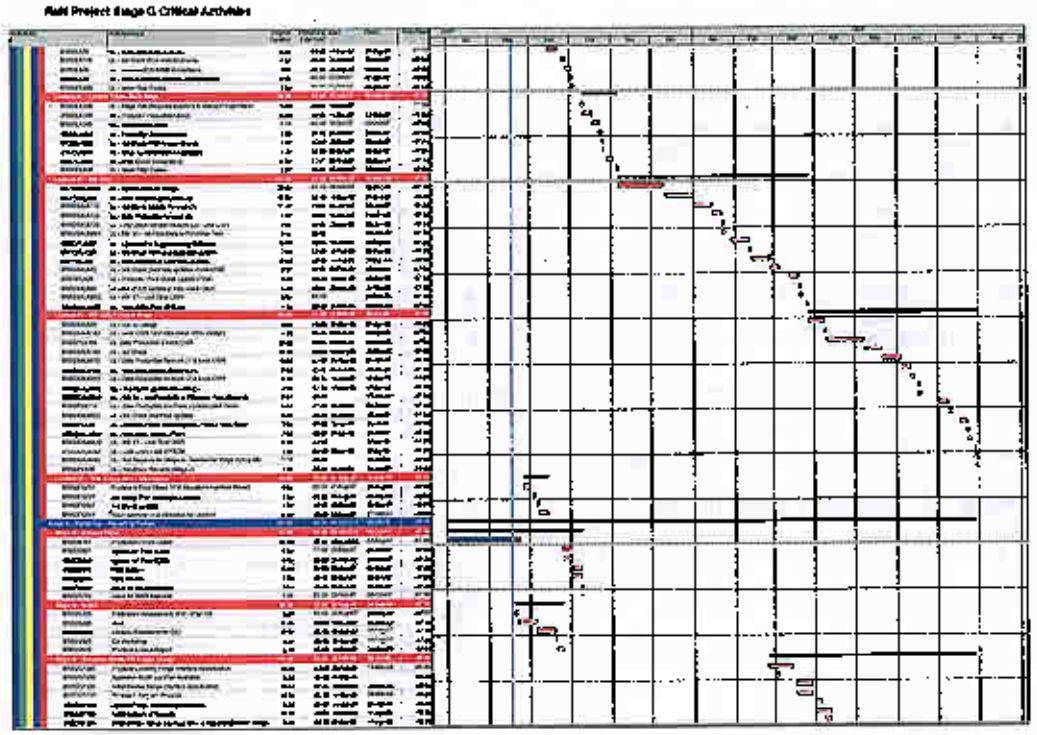


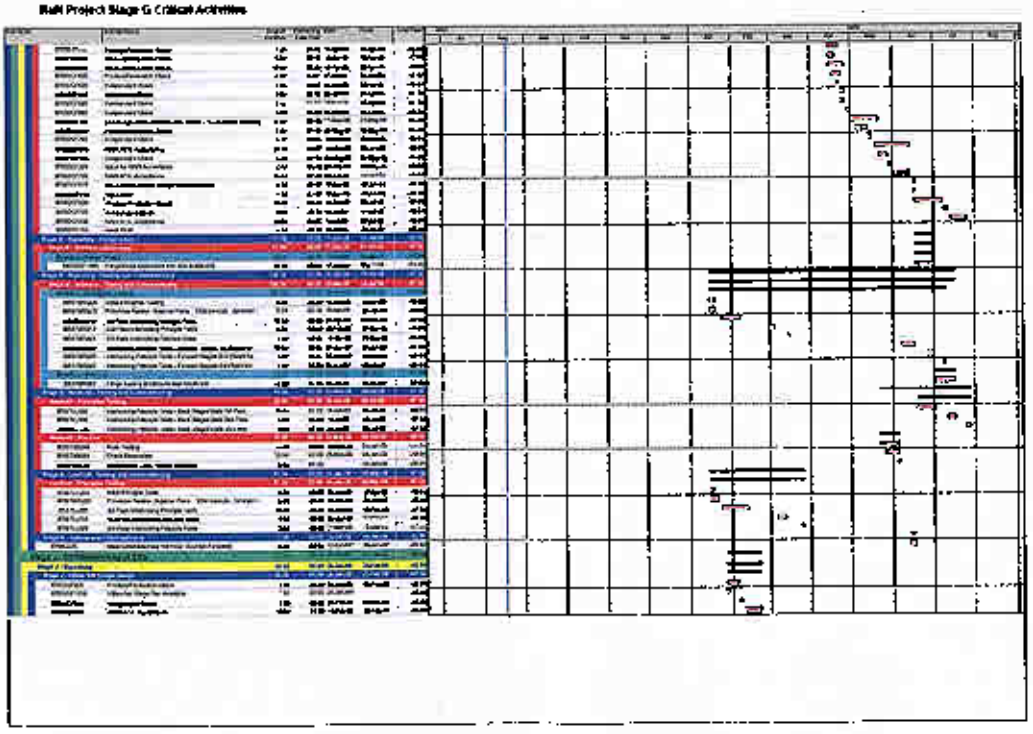


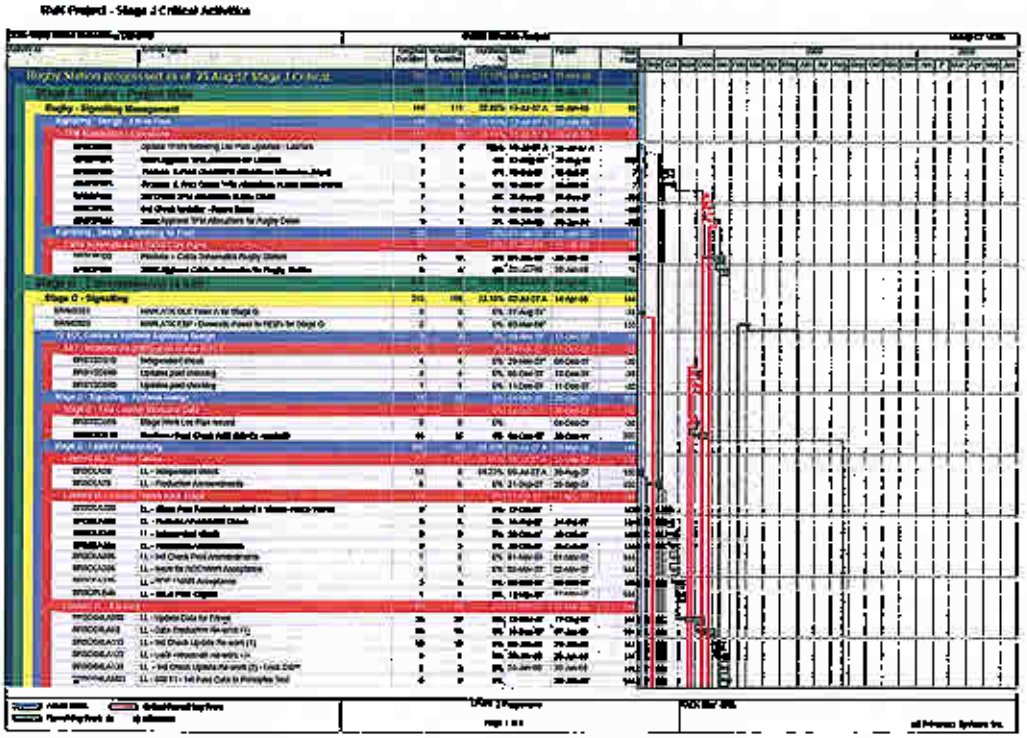


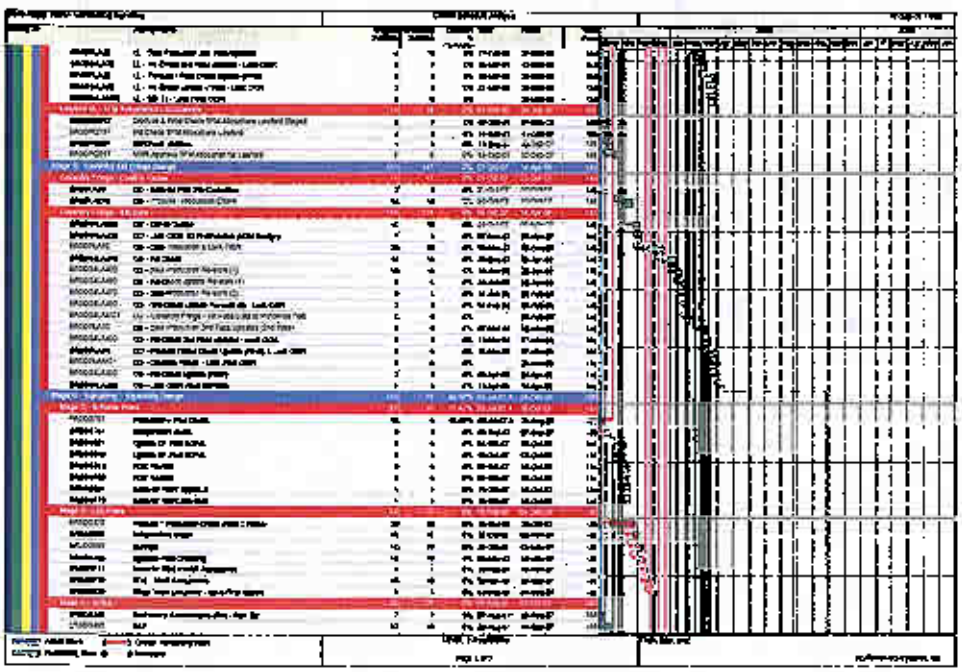


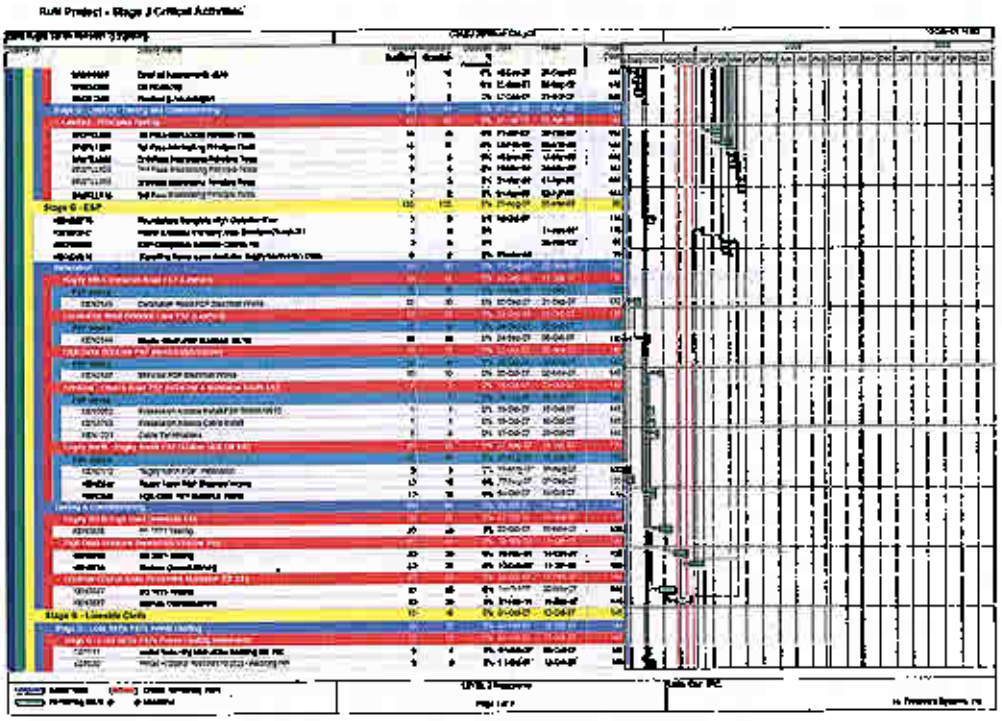


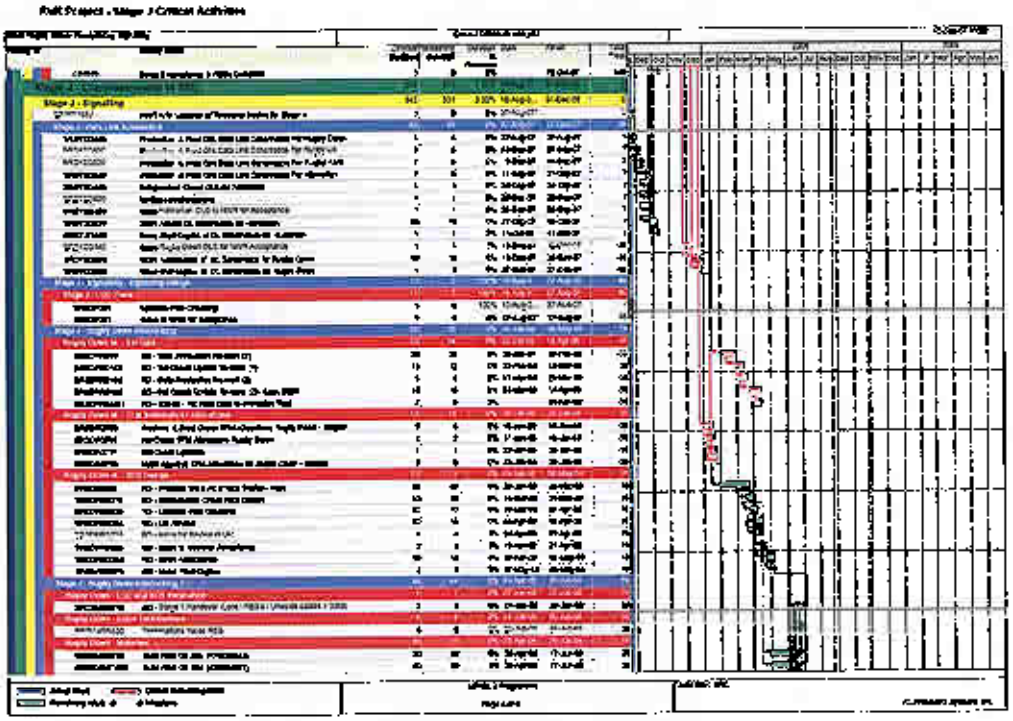

Rail Project Stage G Critical Activities

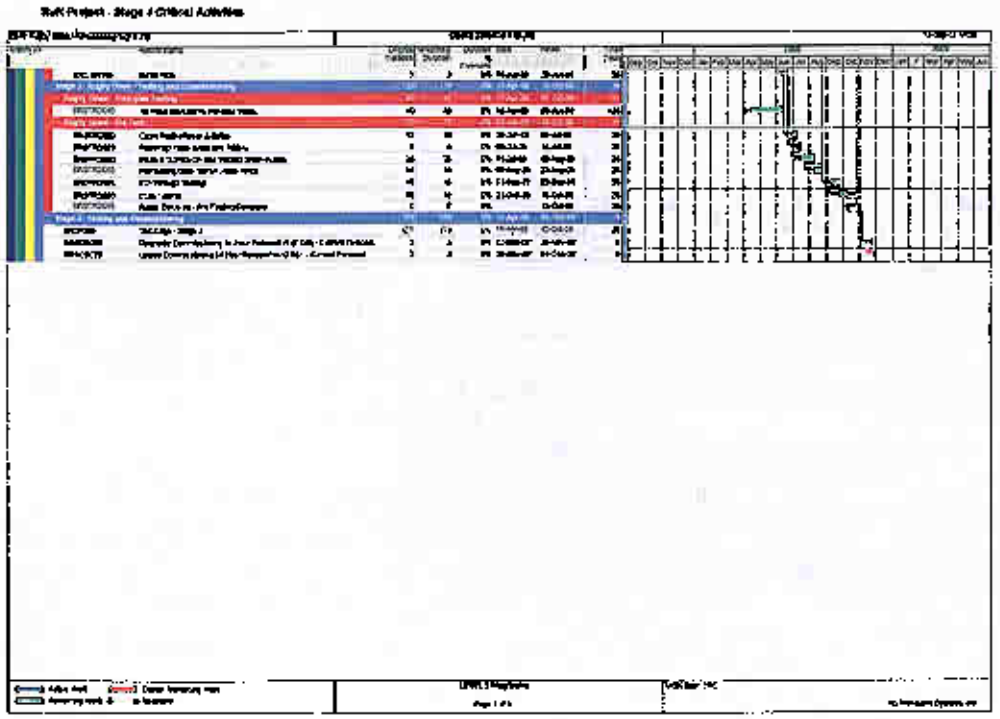

Rail Project Stage G Critical Activities











Appendix G
T- 4 Readiness Review

RUN Project

Xmas 2007
FWI Commissioning

T-4 Readiness Review

Prepared By

Ian Johnson

.....
(Signature)

Date: 27th November 2007

Details of Meeting

Purpose: The Project Team present the scope and implementation plan for the Xmas Blockade, raising issues and risks that are identified.

Date: 27th November 2007 @ 1000

Location: Project Offices – Lecture Room

Chairperson: Ian Johnson (NWR)

Attendees:

NWR
Dick Mcilhattan
Alan Brake
Tony Brennan
Bill Henry
Mark Tracy Inglis
Justin Rogers
Alistair Raisbeck
Tony Fradley
Richard Elkin
Hayden Crumpler
Ian Alsop
Mick Ryan
Rod Green
Steve Plyler
Andy Whitehouse
John McDougle
Felice Presti
Mike O'Connor
Mike Dunham
Fred Dykstra
Eric Mumm
Brian Tunneycliffe
Jason Lacey
Frank Sierra
Paul Mann
Shawn Priddle
Rob Owen
Ian Robinson
Fergal Malone
Martin Drake
Richard Mayne
Steve derrick
Geoff Brown
Ian Berry
Chris Ryan
Andy Chapman
Lee Parlett
Steve Luck
Mark Lamb
Michael Walker
Bill Alderson

Atkins Rail
Ian Buckley
Terry Alderson
John Maguire
Gordon Stewart
Encarna Moreno
Conor Linnell
Steve Airey
Stave Higham

Jarvis Rail
Stuart Birch
Paul Summerfield
Roy Skinner
Nick Sarai
Mark Thomas
Ian Bryson
Fin Burke

Distribution:

Attendees, plus
Dave Richards
Ted Douglas
John Whitehurst
Terry Oliver
Paul Nelson
Duncan Warburton
Phil Jones
Paul Atherton
Ray Bland
Lee Farmer
Dave Swann
Andy Thomson
Mark Blyth
John Matthews

Meeting Details

ITEM NO	Agenda Item	COMMENT / ACTION	ACTION BY
1	Introduction	MTI opened the meeting with an overview of the Rugby Project and how important the Xmas commissioning is to the RuN Project.	
1.1		All attendees introduced themselves	
1.2		IJ opened the presentation and advised the agenda for the review: • To give an overview of the stage • To give current progress status (4D model review) • To present scope as follows: o PWay – Jarvis o OLE – Jarvis o Signalling – Atkins o Other – I Johnson • To review Integrated Plan, with focus on logistics • To present QSRA results • To review issues • Te review Blockade Management • To review EIS documentation • To review Handback / completion documentation	
2	Actions / Notes		
2.1	Redundant OLE	Check redundant OLE structures that are planned to be left at the end of Stage E, against Stage F build.	C Ryan / R England
2.2	Hillmorton	Verify delivery dates of new switches for 405 & 408 points. This needs to be raised as Project Critical Issue.	Ian Berry
2.3	OLE Clashes with PWay	The model shows the following OLE clear of PWay build (G82/137, G83/31 & G83/33), but these are reported as critical to remove for Xmas. Need to confirm if they need to be recovered for Xmas or not.	Nick Sarai / John Matthews
2.4	Week 36 OLE	Jarvis advised that 30% shortfall from week 35 needs to be planned into Week 36. Review required to see if this is possible.	R Green
2.5	Engineering Trains	Extended NBS periods have been agreed, but engineering trains running have not been altered to suit. This needs resolving urgently.	S Plyler
2.6	OLE Inspection	NWR Team need a process in place to refine post works (high level) inspections	C Ryan
2.7	Site Supervision	Jarvis to advise the supervisor to staff ratio over the blockade	S Birch
2.8	Work Briefings	Jarvis to brief all supervisors of work in advance of weekend / blockade.	S Birch
2.9	Blockade Staff Levels	Each Contractor to provide staff levels for each shift to NWR. NWR to produce overall resources histogram.	A Brake
2.10	Engineering Trains	Rugby trains are not only coming from depots but also direct from other project works. RuN Project need visibility of the detailed train plan.	S Plyler
2.11	NBS Periods	The integrated plan should shade NBS periods	A Brake

2.12	**Engineering Trains**	Project staff need to confirm consist of trains before they depart for site.	S Plyler
2.13	**Contingencies**	Extra train drivers are to be based on site.	S Plyler
2.14	**Welding Interfaces**	Details of welding interfaces need to be defined and included in the plan	R Skinner / A Brake
2.15	**Run Through Spares**	The project is to review the MK RRV movement process.	F Sierra
2.16	**Follow Up Works**	Jarvis to develop and issue the follow up work plan to NWR	N Sarai
2.17	**OLE materials**	OLE materials need to be bagged and tagged prior to the block	P Summerfield
2.18	**OLE Staff**	A WCRM linesmen integrated schedule is required to identify shortfalls.	T Fradley
2.19	**Boosters**	The Booster / Signal Interface needs risk assessing.	R England
2.20	**Recoveries**	A detailed recovery plan is required for signalling equipment.	E Moreno / I Johnson
2.21	**Points rehearsal**	The plan needs to be developed and issued for points rehearsals prior to blockade.	A Briers / D Trevis
2.22	**3B/4**	Rugby currently has a shortfall of 5 for Xmas.	E Moreno / J Lacey
2.23	**Access**	TV Lines extension needs to be included in the plan	I Johnson / A Brake
2.24	**QSRA**	Results to be included with these notes.	R Green / I Johnson
2.25		New analyses to be run with additional works taken into the blockade	R Green / A Brake
2.26	**Bonding**	350 new bonds detailed on bonding plan. Additional materials will be required.	T Brennan
2.27	**Inspections**	Quality inspection sequence to be refined and detailed on plan	P Summerfield / A Brake
2.28	**Waste Management**	Jarvis are to issue a waste Management Plan	S Birch
2.29	**Visitors**	Any visitors to the Project over the Blockade should be notified in advance so inductions / arrangements can be made.	All
2.30	**Travelling Public**	The Principal Contractor is to make provision for access to bus replacement services throughout the Blockade	S Birch
2.31	**Traffic Management**	Jarvis to issue the Traffic Management Plan	S Birch
2.32	**Letter Drop**	Letter drop coordination is required by PC / Hub.	S Birch / I Johnson
2.33	**Blockade Management**	Jarvis to issue Blockade Management Plan	S Birch
2.34	**Incidents**	Escalation / incident protocol to be developed & issued	I Johnson /

			F Sierra
2.35	**ESR**	Jarvis to design contingency ESRs	N Sarai
2.36	**Contingencies**	T Brennan to advise on extra access requests, in particular the New Years Eve ALB	T Brennan
2.37		Reduced functionality contingencies need to be reviewed with stakeholders.	T Brennan
2.38		Mobile chargers to be available for use in War Rooms	C Ryan / I Johnson
2.39	**Rosters**	To include key stakeholder details	I Johnson
2.40	**Progress reports**	The distribution list for progress updates needs to be refined.	F Sierra
2.41	**Hy Drive Issues**	List sent to P Jones. No resolution as yet. Critical Issues	MTI / M Ryan
2.42	**Handback**	6 weeks to Handback must be met	J Rogers
2.43	**T2 & T1 SQRA**	Results to be issued to Stakeholders	I Johnson
2.44	**OLE Review**	External review required for OLE plans.	T Fradley
2.45	**Close**		

101567
GE OLE Renewals
Time Analysis
QSRA Report

Document Control	
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Prepared by: James Arzur-Kean	
Date:	23/May/2007
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Date:	

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Network Rail

Version Control

Version	Comments	Author	Date
Draft	Draft for R&V Team approval	James Arzur-Kean	23/May/2007
Version 1	Issued to Project Manager		
Version 2	Revised programme		

Contents

1 Executive Summary

This reports details a first attempt at undertaking a Schedule Risk Analysis on the GE OLE Renewals programme. The workshop highlighted that the plan requires further granularity in order to provide an accurate estimate of the likelihood of handing the blockade back on 02:00 on 2nd January 2007. Key outputs include:-

- Identification and qualitative assessment of risks to the blockade;
- Risks have been linked, where possible, to individual tasks within the plan;
- A list of assumptions has been generated from the workshop output;
- All parties now have a clear idea of possession constraints;
- Key dependencies on the programme, including Bridge 19 and Track Renewals, have been identified and actions agreed to further develop this interface.

In order to obtain a baseline for further schedule risk analysis work due to take place on this project, a risk analysis was run on the model using the current inputs defined by the Contractor. The overall probability of completing the works at 02:00 on the 2nd January 2007 was assessed at 43%. **It is however emphasised that this is a best case scenario as modelled risks have not been taken into account in the calculation of this figure.**

Further, more detailed schedule analysis of the GE OLE plan will take place once agreed revisions have been undertaken by the Contractor.

2 Background

Project 101567 concerns major OLE rewiring and rationalisation work being undertaken out of Liverpool Street to Southend Victoria. The scope of the works include:-

- The first stage of this project is the Renewal of the Fixed Termination (FT) system with a Modern Equivalent Form from Liverpool Street to Bridge 19 (0.75miles) during an 11 Day blockage of the line at Xmas 2007. This will also include de-wiring and rewiring of Bridge 19.
- The next phase is the Renewal of the Fixed Termination systems with an Auto Tensioned (AT) system between Bridge 19 and Shenfield by 2010.
- And finally, the Renewal of the Fixed Termination system with an AT system between Shenfield and Chelmsford by 2012 and Shenfield to Southend Victoria by 2018.

This SQRA mainly focuses on the first stage, the blockade.

Key possession dates are as follows:-

- Various possessions prior to Christmas Blockade as follows:-
    1. 12hr possession in Week 19 – 5 August 2007
    2. 12hr possession in Week 20 – 12 August 2007
    3. 5hr possession in Week 21 – 18 August 2007
    4. 5hr possession in Week 22 – 26 August 2007
    5. 12hr possession in Week 23 – 02 September 2007
    6. 12hr possession in Week 24 – 09 September 2007
    7. 12hr possession in Week 25 – 16 September 2007
    8. 12hr possession in Week 28 – 07 October 2007
    9. 12hr possession in Week 31 – 28 October 2007
    10. 27hr possession in Week 35 – 24/25 November 2007
    11. 27hr possession in Week 36 – 1/2 December 2007
    12. 32hr possession in Week 37 – 08-10 December 2007
    13. 29 & 33hr possession in Week 38 – 15-17 December 2007

- Christmas Blockade 2007 –from 01:15 on 22nd December 2007 to 02:00 on 2nd January 2007
- 27 hour weekend possessions throughout all of 2008.
- Additional possessions during the 2009 calendar year, which have not yet been identified.

3 Methodology

A Quantitative Schedule Risk Analysis (QSRA) workshop was held at James Forbes House to review the scoped works, programme and risks in respect of the Christmas blockade for the GE OLE Renewals project.

Duration uncertainty and discrete risks were identified and their likelihood of occurrence and impacts were assessed. Representatives of both the client and contractor AMEC SPIE were present and all participated in the deliberations.

The objectives of the meeting were to:

- Identify the probability of completing the scoped works within the blockade
- identify and list all assumptions and constraints
- identify actions to be undertaken to increase the probability of project success

The risks to the project were identified in a brainstormed session.

Each risk was then analysed to understand the probability of occurrence and impact of the risks on the project outcome. A risk owner was allocated and a treatment strategy decided upon.

Evaluation was conducted using Monte Carlo analysis, using Pertmaster software, 5,000 simulations were used. The tornado graph was created to identify the uncertainty that has the most influence on the project.

4 Attendees

Name	Position	Company
Richard Murphy	Scheme Project Manager	Network Rail
Gilles Chareyne	Project Manager	AMEC SPIE
Mark Francis	Construction Manager	AMEC SPIE
James Hargreaves	Planning Manager	AMEC SPIE
Mat Baine	Construction Manager	AMEC SPIE
Mick O'Brien	Construction Manager	Network Rail
Bob Forsyth	Project Engineer	Network Rail
James Arzur-Kean	Risk & Value Analyst	Network Rail

5 Results

5.1 Risks

The workshop participants started by a discussion of project risks having a schedule impact on the plan. Network Rail provided the QCRA risk register produced at GRIP 4 to assist the process. As this was a first attempt at assessing the schedule impact of the risks and the first time the register had been reviewed by the contractor, a qualitative assessment was used and (where possible) each risk was assigned to a specific task in the plan (the qualitative impact matrix used is contained in Appendix A, which was shown to and agreed by the workshop participants). If an action could not be identified, an owner was assigned to identify the appropriate linked task(s). The risks that were modelled are as follows:-

Risk ID	Risk Title	Probability Assessed	Impact Assessed	Activities Affected
101567S – 1	RRV derailment at points	Low	Low	All blockade activities are affected by this risk.
101567S – 2	Third parties disrupting the project	Medium	High	All Shorten Wire Run activities Activities AM5480 to AM5535
101567S – 3	Spillages from the Fuel Bowzer	Very Low	Very Low	All blockade activities are affected by this risk
101567S – 4	Fumes resulting from working within an enclosed environment	High	Low	**Activities to be provided by AMEC SPIE**
101567S – 5	Access to the station	High	Medium	All Shorten Wire Run activities
101567S – 6	Marker board standard requires splicing of wire runs	Very Low	Very High	All Shorten Wire Runs activities Activities AM5480 to AM5535
101567S – 7	Overrun on track renewals element of the project	Medium	High	Activities AM5480 to AM5535
101567S – 8	Issues arising from interface with the London Fire Brigade	Low	Low	**All activities planned to take place in the station vicinity (to be provided by AMEC SPIE)**
101567S – 9	Bridge 19 project overrun	Medium	Very High	Activities AM5480 to AM5535.
101567S – 10	Contractor resource availability for Christmas	Medium	Low	All activities in the plan

101567S – 11	Failure to complete enabling works in pre-possessions	High	High	**AMEC SPIE to identify specific wire runs where foundation or other preparatory works need to have been completed.** **This may also result in the inclusion of new items in the plan**
101567S – 12	Condition of existing equipment resulting in a need to change more SPS than envisaged	Medium	Very Low	**Only affects tunnel works. All activities relating to Wire Runs B3 and B4 were identified.** **AMEC SPIE to identify other tasks which are relevant.**
101567S – 13	Security/accident	Low	Medium	All activities in the plan
101567S – 14	Delays in obtaining an isolation for the works.	Medium	Low	Activities AM5033 to AM5070
101567S – 15	Plant failure during the blockade	Low	Very Low	All activities within the Blockade
101567S – 16	Theft and Vandalism during the site works	High	Low	All activities within the blockade
101567S – 17	Availability of plant	Low	Low	All activities within the blockade
101567S – 18	Outside party approvals (e.g. third party funding for Bridge 19 works)	Very Low	Very High	As this would be a show-stopper risk, this has not been modelled in the plan.
101567S – 19	Traffic management	TBC	TBC	**Richard Murphy** to identify whether this is to be taken by B19 and will contact **Paul Callender** to confirm.
101567S – 20	Testing and commissioning of the new system	Low	Low	Section proving activity AM5570

All of these risks will be imported into ARM in due course.

5.2 Line Item Duration Uncertainty

The project team then progressed to review the duration uncertainty on each line item within the plan on the basis of the figures put in by the Contractor. The figures that were included by the contractor are detailed in Appendix B.

However, it emerged that, owing to the Contractor not having received the final copy

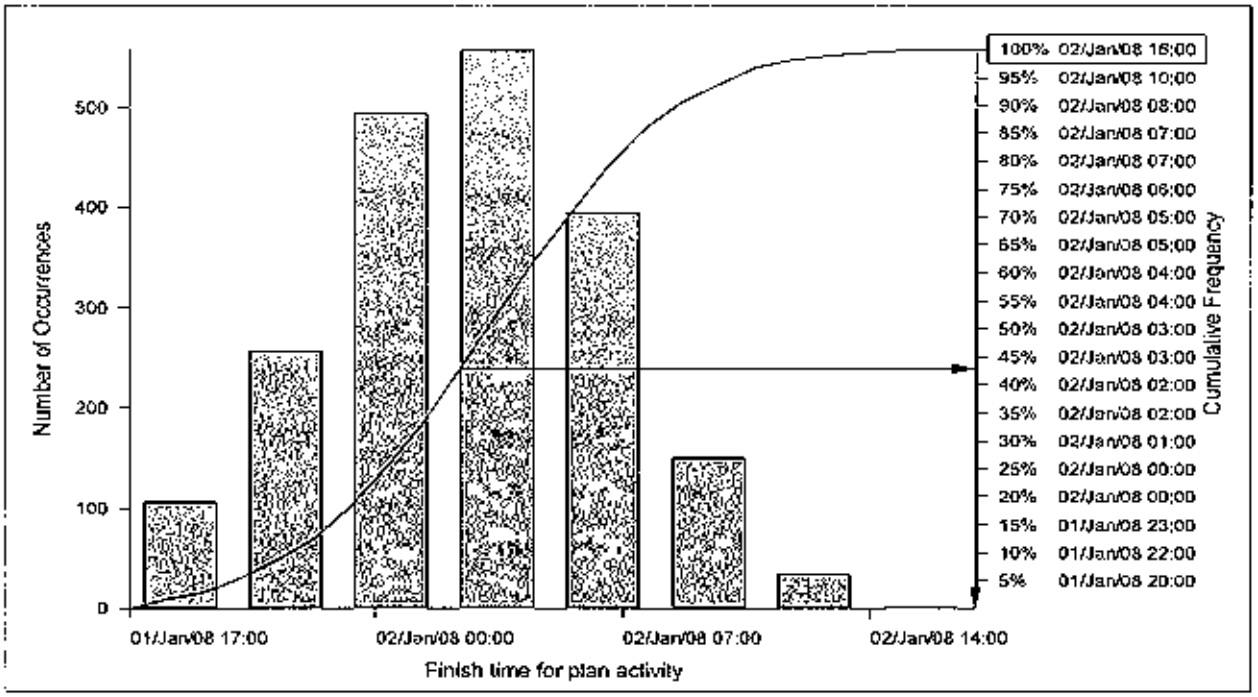
of the possession strategy, their project plan would need to be revised. Other key revisions can be found below:-

Activity	Review necessary
AM5080 to AM5130	To review the plan items in order to maximise available working time
AM5010 to AM5070	To review in order to assess whether each activity should carry the same line item duration uncertainty.
AM5230	The contractor thought that this activity may need to be reviewed as it was floating.
AM5460	This activity is a concurrent activity but was not modelled as such in the plan. Its duration uncertainty was therefore reduced to zero.
AM5540	This activity is a concurrent activity but was not modelled as such in the plan. Its duration uncertainty was therefore reduced to zero.
AM5550	This activity is a concurrent activity but was not modelled as such in the plan. Its duration uncertainty was therefore reduced to zero.
AM5560	This activity is a concurrent activity but was not modelled as such in the plan. Its duration uncertainty was therefore reduced to zero.
AM5570	This activity is a concurrent activity but was not modelled as such in the plan. Its duration uncertainty was therefore reduced to zero.
All activities	It became apparent that the plan would need to be broken down into further detail to identify the specific tasks within each wire run (i.e. registration, section insulators, droppering, etc.) in order to gain further accuracy within the model.

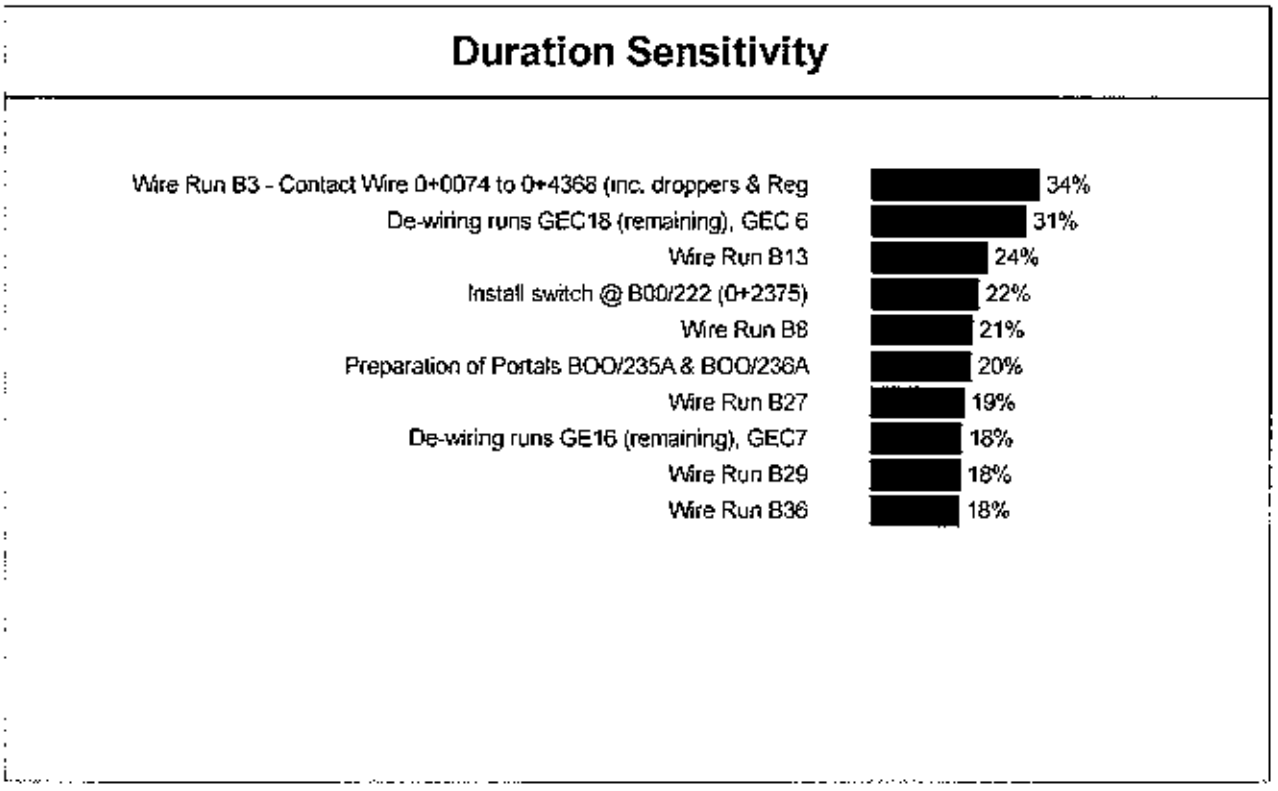
5.3 Initial plan results

Despite the issues identified above, the plan was analysed to provide an indicative baseline for future Schedule analysis.

Without taking the impact of risks into account, the analysis suggested a 43% likelihood of handing back the blockade at 02:00 on the 2nd January 2007. The Cumulative S-Curve is as follows:-



The Top 10 activities driving this output are detailed below:-



The impacts of risks will be taken into account once all activity mappings have been supplied by appropriate action owners.

6 Actions

The following actions were recorded in the workshop. Owners were assigned from people within the room. These actions should be entered in to the project plan where capital expenditure or time is taken to complete the action.

Action	Owner	Close Out Date
AMEC SPIE to provide activity mappings for Risk IDs 101567S-4, 101567S-8, 101567S-11, 101567S-12	Gilles Chareyne (GC)	24/06/2007
Richard Murphy to contact Paul Calendar in order to confirm whether Traffic Management will be undertaken by the Bridge 19 team	Richard Murphy (RM)	24/06/2007
AMEC SPIE to complete the review of activities as specified in Section 5.2 of this report and supply a revised plan in due course	GC	24/06/2007
Richard Murphy to supply AMEC SPIE with a finalised copy of the possession plan	RM	24/06/2007
James Arzur-Kean to investigate whether a Schedule QRA is being held on the B19 works and report back to the team.	James Arzur-Kean (JAK)	24/06/2007
Richard Murphy to liaise with Dave Humberstone in order to chase delivery of Section Insulators from BICC	RM	24/06/2007
AMEC SPIE to confirm fall back plan in the event of Section Insulators not being available in time	GC	24/06/2007
Richard Murphy to provide AMEC SPIE with buried services information	RM	24/06/2007
James Arzur-Kean to arrange a follow up SQRA once AMEC SPIE have produced a revised plan, planned for the end of June.	James Arzur-Kean	End June
James Arzur-Kean and member of the project team to attend QSRA for the Bridge 19 works, currently planned for 18 July 2007. James Arzur-Kean to coordinate.	James Arzur-Kean	18/07/2007

7 Assumptions and Constraints

7.1 Assumptions

The following assumptions were made for the purpose of this analysis. These assumptions are potentially risks that could occur and actions may need to be taken to reduce their likelihood of occurrence or impact.

- That no further product approvals are currently planned and, even if they became required, these would not impact on the project.
- That the contractor was sufficiently familiar with the design as it is based mainly on standard components.
- That access to the blockade will be confirmed.
- That the Bridge 19 team would liaise with the local authority regarding noise.
- That the OLE rewiring team will be given appropriate priority within the blockade.
- That access to the worksite will not be restricted by RRV movements to neighbouring worksites.
- That there will be no problems encountered in removing scrap material from the worksite.
- That no problems will be encountered in gaining security clearance for worksite personnel.
- That there are sufficient Network Rail design resources to cover the project.
- That any damage caused to surrounding infrastructure will not delay works being undertaken on the project.

7.2 Constraints

The following constraints for possession working were confirmed in the meeting:

Possession time	Possession lines	Worksites
01:15 to 06:00 – 22/12/07	Liverpool Street to Bow – Mains/Electrics	WS A (OLE) – 0mp to 0m75ch (Mns) 0mp to 2m69ch (Electrics)

06:00 to 12:00 – 22/12/07	Liverpool Street to Bow – Electrics	WS A (OLE) – 0mp to 0m63ch (Electrics)
12:00 22/12/07 to 02:00 23/12/07	Liverpool Street to Bow – Electrics	WS A (OLE) – 0mp to 0m43ch D&U Electrics WS B (Bridge 19) – 0m48ch to 0m63ch D&U Electrics
02:00 23/12/2007 to 12:00 23/12/2007	Liverpool Street to Bow – Mains Electrics Liverpool Street to Hackney Downs – Subs/Fasts	WS A (OLE) – 0mp to 0m43ch D&U Electrics WS B (Bridge 19) – 0m48ch to 0m63ch D&U Electrics
12:00 23/12/2007 to 12:00 30/12/2007	Liverpool Street to Bow – Mains/Electrics Liverpool Street to Hackney Downs – Subs/Fasts	WS A (OLE) – 0mp to 0m43ch D&U Electrics WS B (Bridge 19) – 0m48ch to 0m63ch D&U Electrics WSC – 0m69ch to 2m69cm/2m60cm (Elec/Mn/Subs/Fasts)
12:00 30/12/2007 to 03:30 02/01/2007	Liverpool Street to Bow – Mains/Electrics Liverpool Street to Hackney Downs – Subs/Fasts	WS A (OLE) – 0mp to 1m D&U Electrics WS C (Track Renewals) – 1m05ch to 3m40ch/2m20ch (Elec/Mn/Subs/Fasts)

8. Appendix A - Qualitative Impact Matrix

Probability

	Probability		
	Min	Most likely	Max
Very Low	0%	2.5%	5%
Low	5%	7.5%	10%
Medium	10%	17.5%	25%
High	25%	37.5%	50%
Very High	50%	75.0%	100%

Impact

	Impact (Days)		
	Min	Most likely	Max
Very Low	0	0d5hrs	0d10hrs
Low	0d10hrs	0d15hrs	0d20hrs
Medium	0d20hrs	1d6hrs	2d2hrs
High	2d2hrs	4d4hrs	6d6hrs
Very High	6days 6hrs		

9 Appendix B – Programme

101567 – Liverpool Street OLE Renewals – Blockade Plan

Activity level detail can be provided on request.

Enabling works

Date	Works being undertaken
W19 12hr possession	Trial Holes on 206A-212A
	Dewiring GEC1,3
	Wiring B1,2
	Creating uninsulated overlaps
W20 12hr possession	Foundations for bases 206A,207A
	Dewiring GEC10
	Wiring B6
	Temporary anchors on Down Suburban
	Creating uninsulated overlaps
W21 5hr possession	OLE Support
W22 5hr possession	Trial Hole for 235A and 243A
W23 12hr possession	Temporary anchors on Up Suburban
	Dewiring GEC18
	Wiring B10
	Foundations for bases 208A,209A
	Installing Electric TTC on Up and Down 228A,229A
W24 12hr possession	Foundations for base 211A, 212A
	Dewiring GE2
	Wiring B11
	Temporary anchors
W25 12hr possession	Foundation for base 235A
	Dewiring GEC5
	Wiring B21
	Temporary anchors
	Installing new TTC & Transfer wires 211A, 212A
W28 12hr possession	Foundation for base 243A
	Dewiring GEC12
	Wiring B24
	Installing new TTC & Transfer wires 206A, 207A
W31 12hr possession	Dewire run GEC15, 16
	Wiring B25, B26
	Install new TTC & Transfer Wires 208A, 209A
W35 27hr possession	Temporary anchors
	Transfer Switch from 208 – 209A

	OLE Structures removal -207,208,209 (Portals)
W36 27hr possession	OLE Structures removal – 211,212 (portals)
W37 32hr possession	**Works not specified**
W38 29 & 33hr possession	**Works not specified**

Blockade

Type of Works	Specific Line Items	
Dewiring	Dewiring Run GE10 Dewiring Run GE11 Dewiring Run GE13&GE14 (remaining) Dewiring Runs GE1, GE3, GE6 Dewiring Runs GEC4, GE12 (remaining) Dewiring Runs GE8-9 Dewiring Runs GE4, GE5 Dewiring Runs GE7 Dewiring Runs GE18 (remaining), GE6 Dewiring Runs GEC8,9 Dewiring Runs GEC2, GEC13, GEC14 Dewiring Runs GEC11, GE15	
Wiring	Wire Run B18 Wire Run B19 Wire Run B9 Wire Run B12 Wire Run B23 Wire Run B7 Wire Run B33 Wire Run B20 Wire Run B27 Wire Run B32 Wire Run B13 Wire Run B29 Wire Run B3 Wire Run B32 Wire Run B34	Wire Run B14 Wire Run B22 Wire Run B36 Wire Run B35 Wire Run B5 Wire Run B8 Wire Run B30 Wire Run B31 Wire Run B16 Wire Run B17 Wire Run B28 Wire Run B15 Wire Run B4 Wire Run B33 Wire Run B35
Shortening Wire Runs	GE13 GE14 GEC4 GEC18 GE12 GE16	
Others	Portal preparation 235A, 236A, 238A, 243A Portal Installation 235A, 236A, 243A Panning – All Lines from Buffer stop to OB10/10A Re-connect feeding jumbers @ BOO/248 Section Insulation Final Settings Jumbers All Lines Final Panning from 0+0074 to 0+4600 Section proving by NWR Stand-by team for 1st trains RRV removal from worksite.	

101567
GE OLE Renewals
Time Analysis
QSRA Report

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Date:	5/July/2007
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Date:	5/July 2007

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Version Control

Version	Comments	Author	Date
Draft	Draft for R&V Team approval	James Arzur-Kean	02/07/2007
Version 1	Issued to Project Manager	James Arzur-Kean	
Version 2	Revised programme		

Contents

1 Executive Summary

This reports details the second attempt at undertaking a Schedule Risk Analysis on the GE OLE Renewals programme. Additional granularity has now been built into the plan by the contractor and the qualitative risks identified in the first meeting have been refined and linked to planned activities.

The following table details the results of the analysis and how it has changed since the previous workshop (**it must be emphasised that these results do not include the impact of treatment actions**):-

Plan	% Confidence	Planned finish	P50 Finish	P90 Finish
1st Attempt – no risk	43%	2nd January 2007 04:00	2nd January 2007 03:00 **1 hour early**	2nd January 2007 08:00 **4 hours late**
2nd Attempt – no risk	<1%	2nd January 2007 04:00	3rd January 2007 10:00 **30 hours late**	3rd January 2007 18:00 **38 hours late**
2nd Attempt – risk adjusted	<1%	2nd January 2007 04:00	5th January 2008 18:00 **3 Days 14 hours late**	9th January 2008 22:00 **7 Days 18 hours late**

This result suggests that the key priorities for the project team are (a) to reduce the time necessary to complete specific activities within the plan (please refer to the Tornado Graph for the 2nd Attempt – no risk) and (b) to reduce the risks associated with the completion of those activities, particularly in relation to the interfaces of the project with Bridge 19, Track Renewals and other third parties. Efforts have already been made in this respect and work is continuing. Indeed, the team have formulated a number of proposals which would allow all parties to save time and gain efficiencies within the plan (See Section 5.2).

The next QSRA will aim to reflect the team's ideas regarding treatment actions within the plan through (a) the construction of a target risk plan, (b) the inclusion of opportunities; (c) the consideration of line item uncertainty on each item in the place and (d) the analysis of all risks within the plan on a quantitative basis.

Further work in the plan needs to be undertaken to model the impact of the failure to complete work in pre-possessions and an agenda item will be tabled at the next meeting in order to discuss this in further detail.

2 Background

This workshop follows a previous QSRA conducted on the GE OLE Renewals programme, completed on 22nd May 2007.

Project 101567 concerns major OLE rewiring and rationalisation work being undertaken on the Great Eastern main line out of Liverpool Street to Shenfield and then on to Chelmsford and Southend Victoria. The scope of the works include:-

- Stage 1 - Renewal of the Fixed Termination (FT) system with a Modern Equivalent Form from Liverpool Street to Bridge 19 (0.75miles) during an 11 Day blockage of the line at Christmas 2007. This will also include de-wiring and rewiring of Bridge 19.
- Stage 2 - Renewal of the Fixed Termination systems with an Auto Tensioned (AT) system between Bridge 19 and Shenfield by 2010.
- And finally, Stage 3 - Renewal of the Fixed Termination system with an AT system between Shenfield and Chelmsford by 2012 and Shenfield to Southend Victoria by 2018.

This SQRA mainly focuses on the Stage 1, the blockade.

Key possession dates in advance of the Christmas Blockade are as follows:-

1. 12hr possession in Week 19 – 5 August 2007
2. 12hr possession in Week 20 – 12 August 2007
3. 5hr possession in Week 21 – 18 August 2007
4. 5hr possession in Week 22 – 26 August 2007
5. 12hr possession in Week 23 – 02 September 2007
6. 12hr possession in Week 24 – 09 September 2007
7. 12hr possession in Week 25 – 16 September 2007
8. 12hr possession in Week 28 – 07 October 2007
9. 12hr possession in Week 31 – 28 October 2007
10. 27hr possession in Week 35 – 24/25 November 2007
11. 27hr possession in Week 36 – 1/2 December 2007

12. 32hr possession in Week 37 – 08-10 December 2007
13. 29 & 33hr possession in Week 38 – 15-17 December 2007

The Christmas Blockade 2007 is due to run from 01:15 on 22nd December 2007 to 02:00 on 2nd January 2008

This will be followed by 27 hour weekend possessions throughout all of 2008. Additional possessions will also be required during the 2009 calendar year, which have not yet been identified.

3 Methodology

A Quantitative Schedule Risk Analysis (QSRA) workshop was held at James Forbes House on 29th June 2007 to review the scoped works, programme and risks in respect of the 2007/2008 Christmas blockade for the GE OLE Renewals project.

Duration uncertainty and discrete risks were identified and their likelihood of occurrence and impacts were assessed. Representatives of both the client and contractor AMEC SPIE were present and all participated in the deliberations.

The objectives of the meeting were to:

- Identify the probability of completing the scoped works within the blockade
- identify and list all assumptions and constraints
- identify actions to be undertaken to increase the probability of project success

The risks to the project were identified in a brainstormed session.

Each risk was then analysed to understand the probability of occurrence and impact of the risks on the project outcome. A risk owner was allocated and a treatment strategy decided upon.

Evaluation was conducted using Monte Carlo analysis, using Pertmaster software, 5,000 simulations were used. The tornado graph was created to identify the uncertainty that has the most influence on the project.

4 Attendees

Name	Position	Company
Richard Murphy	Scheme Project Manager	Network Rail
Gilles Chareyre	Project Manager	AMEC SPIE
John Buckner	Director	AMEC SPIE
Mick O'Brien	Construction Manager	Network Rail
Keith Orgill	Senior Design Engineer	Network Rail
James Arzur-Kean	Risk & Value Analyst	Network Rail

5 Results

5.1 Actions closed out

The workshop participants updated the team regarding progress on actions undertaken since the last meeting as follows:-

Action	Closed out	Further actions required
AMEC SPIE to provide activity mappings for risk	Yes	None
Richard Murphy to contact Paul Calendar re: Traffic Management	No	AMEC SPIE to produce road map of Wheeler Street to define how traffic movements are to be carried out.
AMEC SPIE to review activities	Yes	None
Richard Murphy to supply AMEC SPIE with finalised copy of possession plan	No	This cannot be supplied as it is not yet finalised (marker board limits not known). Richard Murphy to arrange a site visit whilst Dilapidation Surveys are undertaken.
James Arzur-Kean to investigate whether Schedule QRA being undertaken on B19	Yes	Invitations to be forwarded by James Arzur-Kean once officially received.
Richard Murphy to liaise with Dave Humberstone regarding Section Insulators (BICC) + AMEC SPIE to confirm fall back plan in event of non-availability.	Yes	Ceramic beads have been ordered as an alternative. Richard Murphy to make a decision on whether a contingency supply is to provided.
Richard Murphy to provide AMEC SPIE with buried services information	No	John Buckner to submit a TQ. Investigation to be undertaken on cables at Norton Folgate.

5.2 Risks

The workshop participants reviewed and reassessed the risks identified in the previous workshop and brainstormed appropriate treatment actions. The same Qualitative Impact criteria were used as in the previous workshop (please see Appendix A). The output of this discussion is as follows:-

Risk ID	Risk Title	Probability Assessed	Impact Assessed	Indicative Activities Affected (Please refer to Appendix C for modelling details)	Treatment actions
101567S – 1	RRV derailment at points	Very Low	Low	All blockade activities are affected by this risk.	Points Operators will be assigned to each team.
101567S – 2	Third parties (excluding those specifically mentioned) disrupting the project at any point.	Low	Medium	All blockade activities are affected by this risk	Richard Murphy to confirm contingency plans
101567S – 3	Spillages from the Fuel Bowzer	Low	Very Low	All blockade activities are affected by this risk	Spill Kits to be provided. Fuel to be stored in a bunded area.
101567S – 4	Fumes resulting from working within an enclosed environment	High	Low	Wiring activities B1, B2, B10, B11-18 Dewiring activities GEC1, 3, 7 + GE 2,4,7,8,10,11	Study to be undertaken under guidance of Kate Warner in pre-possessions.
101567S – 5	Vehicular Access to the station	Low	Low	Wiring activities B1, B2, B10, B11-18 Dewiring activities GEC1, 3, 7 + GE 2,4,7,8,10,11	Kate Warner to be contacted
101567S – 6	Marker board standard requires splicing of wire runs	Very Low	Very High	All Shorten Wire Runs activities Activities AM5480 to AM5535	Make a decision on whether to amalgamate sites.
101567S – 7	Overrun on track renewals element of the project	Medium	High	Wiring activities B4, B32, B33, B34, B35	Obtain plan of activities from Track Renewals.
101567S – 8	Issues arising from interface with the London Fire Brigade	Low	Low	Wiring activities B1, B2, B10, B11-18 Dewiring activities GEC1, 3, 7 + GE 2,4,7,8,10,11	Confirmation that hot works are not being used to be made in contractor's methodology.
101567S	Bridge 19 project	Medium	Very High	Activities AM5480 to	Await results of

– 9	overrun			AM5535.	B19 QSRA.
101567S – 10	Contractor resource and plant availability for Christmas	Medium	High	All activities in the plan	Use SPS machine to de-risk programme. Mick O'Brien to consider whether Network Rail can source machines.
101567S – 11	Failure to complete enabling works in pre-possessions due to external factors	High	High	**This risk needs a separate meeting in order to model in more detail (TBA)**	Mick O'Brien to ensure that all enabling isolations go as far as Bow Neutral Section (no switching necessary). Meetings to be arranged with relevant parties prior to possession
101567S – 12	Condition of existing equipment resulting in a need to change more SPS than envisaged	Medium	Very Low	Wire Runs B3 and B4	Review dilapidation studies Arrange for machine to pass through site.
101567S – 13	Security/accident issues	Low	Medium	All activities in the plan	Treat as appropriate.
101567S – 14	Delays in obtaining an isolation for the works.	Medium	Low	All Shorten Wire Run Activities (start of possession)	Arrange for last train to be cancelled or stop short of site.
101567S – 15	Plant failure during the blockade	Low	Very Low	All activities within the Blockade	Have fitters on site to deal with issues as they arise.
101567S – 16	Theft and Vandalism during the site works	High	Low	All activities within the blockade	Arrange for on-site security.
101567S – 17	Outside party approvals (e.g. third party funding for Bridge 19 works)	Very Low	Very High	As this would be a show-stopper risk, this has not been modelled in the plan.	
101567S – 18	Delays on the testing and commissioning of the new system	Low	Low	Section proving activity AM5570	Further discussion required.

101567S-19	Unforeseen Ground Conditions	Low	Low	Foundation installation activities in enabling possessions.	CAT Scan undertaken (already completed by AMEC SPIE)

Specific opportunities proposed which would help to gain time or reduce risk (not modelled yet as opportunities):-

1. Possibility of splicing contact wire at O/B 18 for the Subs and Electrics;
2. Possibility of getting steel installed on O/B 19 before handback of the worksite from Bridge 19 team
3. Possibility of gaining access to part of Bridge 19 worksite to install SPS (may need to arrange for steel delivery to be moved)
4. Possibility of completing panning on the last 6 runs in Bridge 19 worksite (e.g. the Subs up to the Tunnel) to save approximately 2 hours of working time.

5.3 Line Item Duration Uncertainty

The project team then progressed to review the duration uncertainty on each line item within the plan on the basis of the figures supplied by the Contractor, which have been reviewed since the previous meeting.

Each wiring activity has now been divided into 4 specific activities as follows:- (a) Wiring, (b) Registration, (c) SI Installation, (d) Panning.

The team decided to include the line item duration uncertainty included by the contractor for this meeting. They would consider these input in more detail in subsequent QSRAs.

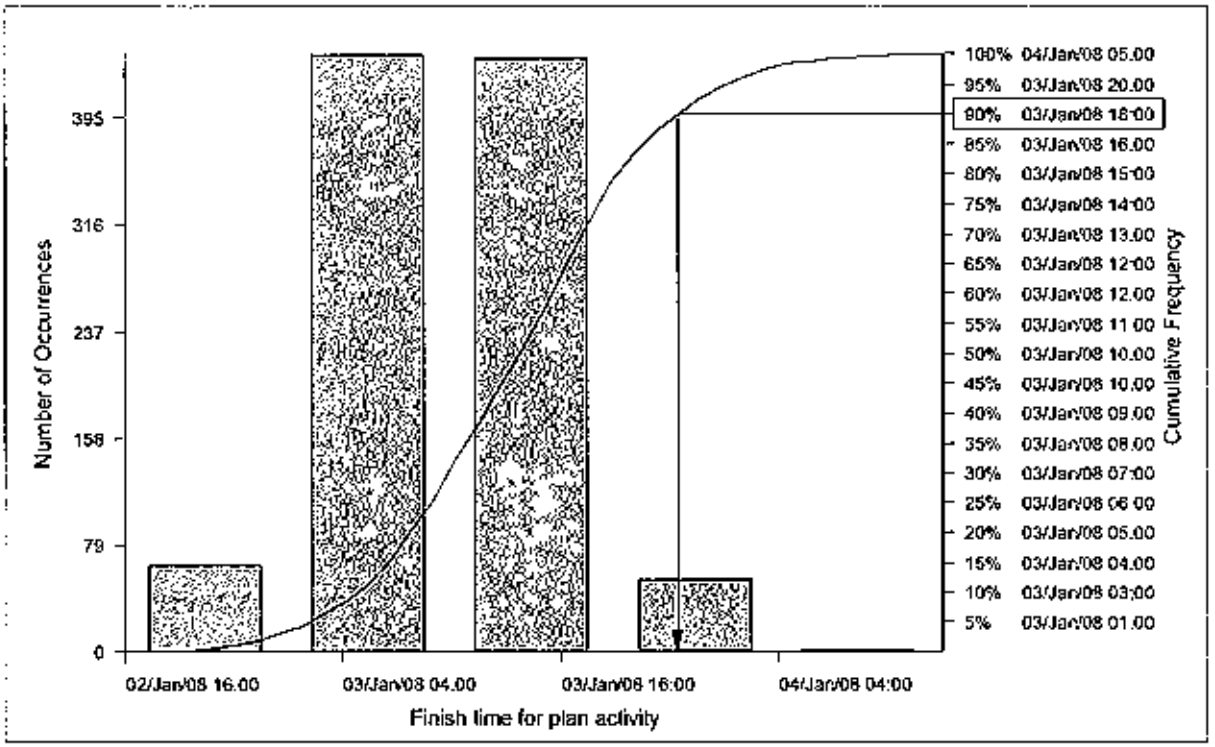
5.4 Initial plan results

Despite the issues identified above, the plan was analysed to provide an indicative baseline for future Schedule analysis.

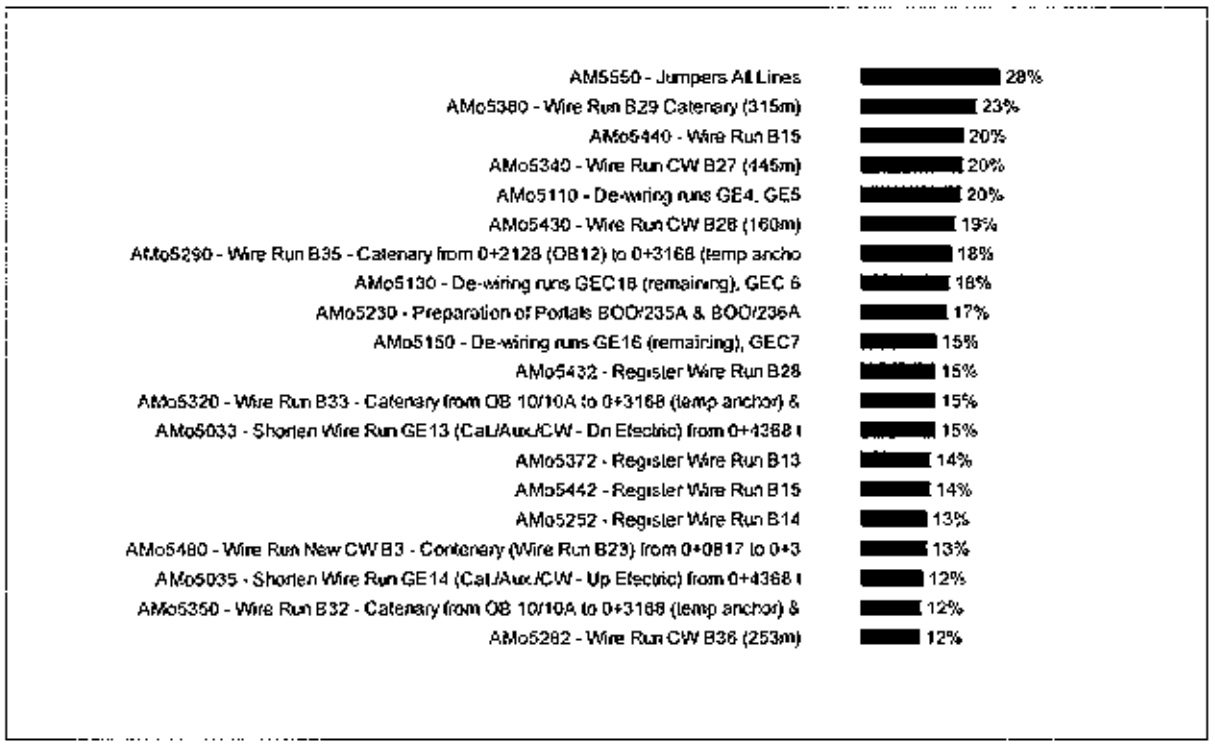
5.4.1 Plan without risk (i.e. based purely on line item uncertainty)

The previous analysis suggested a 43% likelihood of handing back the blockade at

04:00 on the 2nd January 2008. The confidence within the plan suggests that this has diminished significantly to less than 1%. The 90th percentile now suggests that the blockade will be handed back at 18:00 on the 3rd January 2007. The Cumulative S-Curve is as follows:-

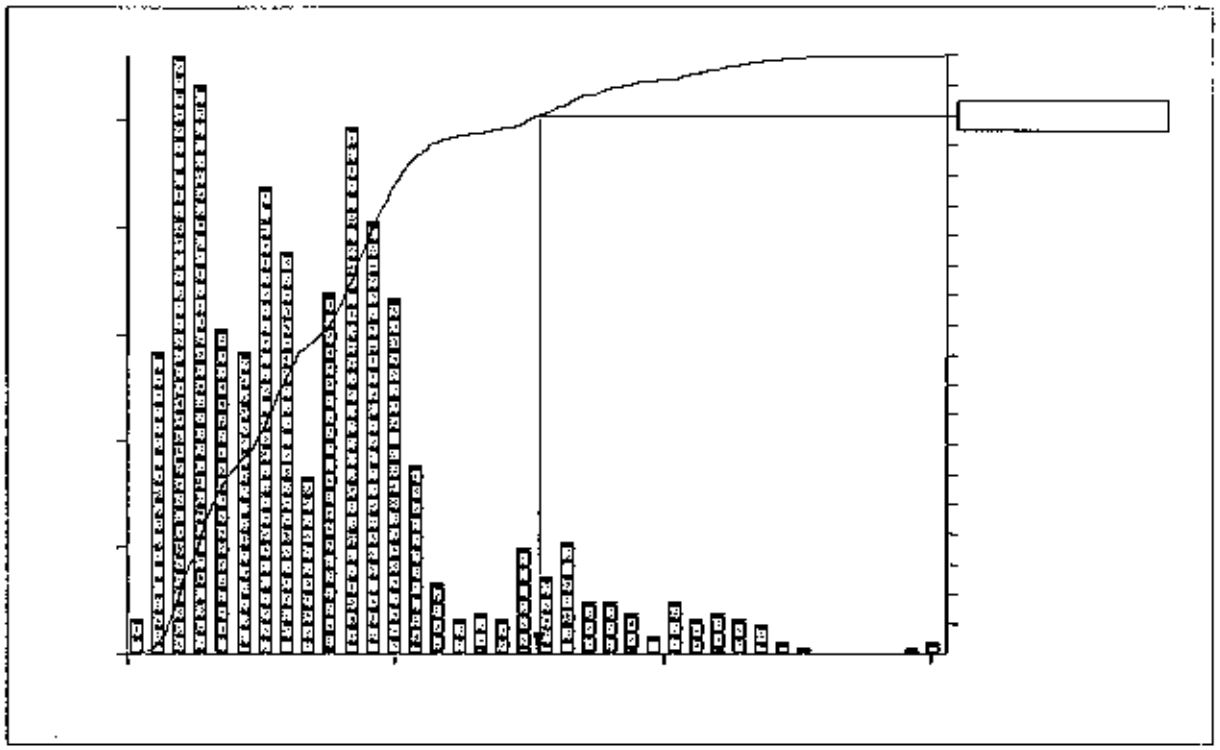


The Top 20 activities driving this output are detailed below:-

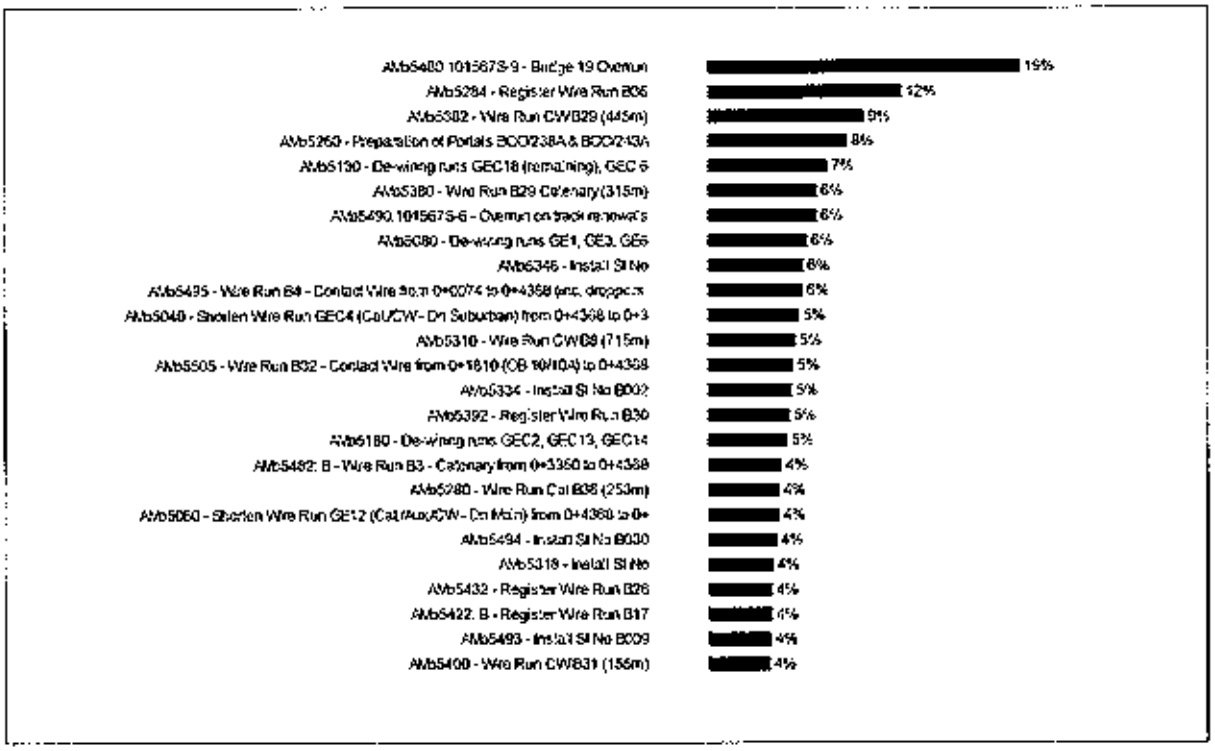


5.4.2 Plan with risk (i.e. with all modelled risk being linked to relevant activities)

The plan completion date is significantly influenced by the inclusion of risks within the plan. They cause the **90th Percentile** completion date to be pushed back to the 9th January 2008 at 22:00. The cumulative S-curve is as follows:-



The top 25 risks and line items influencing the project are:-


AMb5480 101567S-9 - Bridge 19 Overrun
19%
AMb5284 - Register Wire Run B06
12%
AMb5382 - Wire Run CWB29 (445m)
9%
AMb5260 - Preparation of Portals BOD238A & BOD243A
8%
AMb5130 - De-wiring runs GEC16 (normal wiring), GEC 6
7%
AMb5380 - Wire Run B29 Catenary (315m)
6%
AMb5490 101567S-6 - Overrun on track renewals
6%
AMb5080 - De-wiring runs GE1, GE3, GE5
6%
AMb5346 - Install SI No
6%
AMb5495 - Wire Run B4 - Contact Wire from 0+0074 to 0+4358 (inc. droppers
6%
AMb5040 - Shorten Wire Run GEC4 (Cat/CW - Dn Suburban) from 0+4368 to 0+3
5%
AMb5310 - Wire Run CWB8 (715m)
5%
AMb5505 - Wire Run B32 - Contact Wire from 0+1610 (OB 16/10A) to 0+4358
5%
AMb5334 - Install SI No B002
5%
AMb5392 - Register Wire Run B30
5%
AMb5180 - De-wiring runs GEC2, GEC13, GEC14
5%
AMb5482 B - Wire Run B3 - Catenary from 0+3350 to 0+4358
4%
AMb5280 - Wire Run Cat B36 (253m)
4%
AMb5060 - Shorten Wire Run GE12 (Cat/Aux/CW - Dn Main) from 0+4360 to 0+
4%
AMb5494 - Install SI No B030
4%
AMb5318 - Install SI No
4%
AMb5432 - Register Wire Run B26
4%
AMb5422 B - Register Wire Run B17
4%
AMb5493 - Install SI No B009
4%
AMb5400 - Wire Run CWB31 (156m)
4%

6 Summary of Actions

The following actions were recorded in the workshop. Owners were assigned from people within the room. These actions should be entered in to the project plan where capital expenditure or time is taken to complete the action.

Action	Owner	Close Out Date
Points operators to be assigned to each team in the plan	Gilles Chareyre	Xmas Blockade
Richard Murphy to define contingency plans in the event of third parties disrupting the project.	Richard Murphy	By Next QSRA
Study to be planned and undertaken on Fumes in pre-possessions for works being undertaken under Station Canopy	Mick O'Brien	Week 19
Kate Warner to be contacted regarding vehicular access to the station.	Richard Murphy	ASAP
Decision to be made on whether to amalgamate worksites.	TBC	TBA
All relevant parties to attend Schedule QRA for Bridge 19. James Arzur-Kean to coordinate.	James Arzur-Kean	18th July 2007
Contractor to confirm that hot works are not going to be used within finalised methodology.	Gilles Chareyre	By Next QSRA
Network Rail to consider possibility of obtaining a SPS machine in order to de-risk the programme.	Mick O'Brien	By Next QSRA
Mick O'Brien to ensure that all enabling isolations go as far as Bow Neutral Section	Mick O'Brien	By Next QSRA
Arrange for a machine to pass through the site to check condition of existing equipment during dilapidation surveys.	Mick O'Brien	In advance of dilapidation surveys.
QSRA to be arranged following the Bridge 19 QRA	James Arzur-Kean	TBA
AMEC SPIE to produce road map of Wheeler Street to define how traffic movements are to be carried out.	Gilles Chareyre	ASAP
Richard Murphy to make a decision whether a contingency supply of ceramic beads are to be provided.	Richard Murphy	TBA
John Buckner to submit a TQ in relation to the buried services information.	John Buckner	TBA
Investigation to be undertaken on cables at Norton Folgate to ascertain whether they are live or not.	TBC	TBA

7 Assumptions and Constraints

7.1 Assumptions

The following assumptions were made for the purpose of this analysis. These assumptions are potentially risks that could occur and actions may need to be taken to reduce their likelihood of occurrence or impact.

- No further product approvals are currently planned and, even if they became required, these would not impact on the project.
- The contractor is sufficiently familiar with the design as it is based mainly on standard components.
- Access to the blockade will be confirmed.
- The Bridge 19 team will liaise with the local authority regarding noise.
- The OLE rewiring team will be given appropriate priority within the blockade.
- Access to the worksite will not be restricted by RRV movements to neighbouring worksites.
- There will not be any problems encountered in removing scrap material from the worksite.
- No problems will be encountered in gaining security clearance for worksite personnel.
- There are sufficient Network Rail design resources to cover the project.
- Any damage caused to surrounding infrastructure will not delay works being undertaken on the project.

7.2 Constraints

The following constraints for possession working were confirmed in the meeting:

Possession time	Possession lines	Worksites
01:15 to 06:00 – 22/12/07	Liverpool Street to Bow – Mains/Electrics	WS A (OLE) – 0mp to 0m75ch (Mns) 0mp to 2m69ch (Electrics)
06:00 to 12:00 – 22/12/07	Liverpool Street to Bow – Electrics	WS A (OLE) – 0mp to 0m63ch (Electrics)
12:00 22/12/07 to 02:00 23/12/07	Liverpool Street to Bow – Electrics	WS A (OLE) – 0mp to 0m43ch D&U Electrics WS B (Bridge 19) – 0m48ch to 0m63ch D&U Electrics
02:00 23/12/2007 to 12:00 23/12/2007	Liverpool Street to Bow – Mains Electrics Liverpool Street to Hackney Downs – Subs/Fasts	WS A (OLE) – 0mp to 0m43ch D&U Electrics WS B (Bridge 19) – 0m48ch to 0m63ch D&U Electrics
12:00 23/12/2007 to 12:00 30/12/2007	Liverpool Street to Bow – Mains/Electrics Liverpool Street to Hackney Downs – Subs/Fasts	WS A (OLE) – 0mp to 0m43ch D&U Electrics WS B (Bridge 19) – 0m48ch to 0m63ch D&U Electrics WSC – 0m69ch to 2m69cm/2m60cm (Elec/Mn/Subs/Fasts)
12:00 30/12/2007 to 03:30 02/01/2007	Liverpool Street to Bow – Mains/Electrics Liverpool Street to Hackney Downs – Subs/Fasts	WS A (OLE) – 0mp to 1m D&U Electrics WS C (Track Renewals) – 1m05ch to 3m40ch/2m20ch (Elec/Mn/Subs/Fasts)

8. Appendix A - Qualitative Impact Matrix

Probability

	Probability		
	Min	Most likely	Max
Very Low	0%	2.5%	5%
Low	5%	7.5%	10%
Medium	10%	17.5%	25%
High	25%	37.5%	50%
Very High	50%	75.0%	100%

Impact

	Impact (Days)		
	Min	Most likely	Max
Very Low	0	0d5hrs	0d10hrs
Low	0d10hrs	0d15hrs	0d20hrs
Medium	0d20hrs	1d6hrs	2d2hrs
High	2d2hrs	3d3hrs	4d4hrs
Very High	6days 6hrs	9days9hrs	12days12hrs

9 Appendix B – Programme

101567 – Liverpool Street OLE Renewals – Blockade Plan

Activity level detail can be provided on request.

Enabling works

Date	Works being undertaken
W19 12hr possession	Trial Holes on 206A-212A
	Dewiring GEC1,3
	Wiring B1,2
	Creating uninsulated overlaps
W20 12hr possession	Foundations for bases 206A,207A
	Dewiring GEC10
	Wiring B6
	Temporary anchors on Down Suburban
	Creating uninsulated overlaps
W21 5hr possession	OLE Support
W22 5hr possession	Trial Hole for 235A and 243A
W23 12hr possession	Temporary anchors on Up Suburban
	Dewiring GEC18
	Wiring B10
	Foundations for bases 208A,209A
	Installing Electric TTC on Up and Down 228A,229A
W24 12hr possession	Foundations for base 211A, 212A
	Dewiring GE2
	Wiring B11
	Temporary anchors
W25 12hr possession	Foundation for base 235A
	Dewiring GEC5
	Wiring B21
	Temporary anchors
	Installing new TTC & Transfer wires 211A, 212A
W28 12hr possession	Foundation for base 243A
	Dewiring GEC12
	Wiring B24
	Installing new TTC & Transfer wires 206A, 207A
W31 12hr possession	Dewire run GEC15, 16
	Wiring B25, B26
	Install new TTC & Transfer Wires 208A, 209A
W35 27hr possession	Temporary anchors
	Transfer Switch from 208 – 209A

	OLE Structures removal -207,208,209 (Portals)
W36 27hr possession	OLE Structures removal – 211,212 (portals)
W37 32hr possession	**Works not specified**
W38 29 & 33hr possession	**Works not specified**

Blockade

Type of Works	Specific Line Items	
Dewiring	Dewiring Run GE10 Dewiring Run GE11 Dewiring Run GE13&GE14 (remaining) Dewiring Runs GE1, GE3, GE6 Dewiring Runs GEC4, GE12 (remaining) Dewiring Runs GE8-9 Dewiring Runs GE4, GE5 Dewiring Runs GE7 Dewiring Runs GE18 (remaining), GE6 Dewiring Runs GEC8,9 Dewiring Runs GEC2, GEC13, GEC14 Dewiring Runs GEC11, GE15	
Wiring	Wire Run B18 Wire Run B19 Wire Run B9 Wire Run B12 Wire Run B23 Wire Run B7 Wire Run B33 Wire Run B20 Wire Run B27 Wire Run B32 Wire Run B13 Wire Run B29 Wire Run B3 Wire Run B32 Wire Run B34	Wire Run B14 Wire Run B22 Wire Run B36 Wire Run B35 Wire Run B5 Wire Run B8 Wire Run B30 Wire Run B31 Wire Run B16 Wire Run B17 Wire Run B28 Wire Run B15 Wire Run B4 Wire Run B33 Wire Run B35
Shortening Wire Runs	GE13 GE14 GEC4 GEC18 GE12 GE16	
Others	Portal preparation 235A, 236A, 238A, 243A Portal Installation 235A, 236A, 243A Panning – All Lines from Buffer stop to OB10/10A Re-connect feeding jumpers @ BOO/248 Section Insulation Final Settings Jumpers All Lines Final Panning from 0+0074 to 0+4600 Section proving by NWR Stand-by team for 1st trains RRV removal from worksite.	

10. Appendix C – Modelling Details

Each of the risks were modelled in the plan in different ways, the following table provides a summary of what assumptions were made:-

Risk	Activities Linked in Plan	Probability and Impact based upon Qualitative Analysis
101567S-1 – RRV Derailments at points	0730,0740,0750,0760,0770 (These are all Hammock tasks designed to accept the overall risks)	5% in each phase of the works (Delay per occurrence 10h min, 15h ml, 20h max)
101567S-2 – Third parties disrupting the project	0730,0740,0750,0760,0770 (These are all Hammock tasks designed to accept the overall risks)	20% in each phase of the works (Delay per occurrence 20h min, 23h ml, 1d2h max)
101567S-3 – Spillages from the Fuel Bowzer	0730,0740,0750,0760,0770 (These are all Hammock tasks designed to accept the overall risks)	20% in each phase of the works (Delay per occurrence 0h min, 5h ml, 10h max
101567S-4 – Fumes resulting from working within an enclosed environment	AMo5120,AMo5210, AMo5212,AMo5250,AMo5252, AMo5372,AMo5370,AMo5440, AMo5442,AMo5420,AMo5422, AMo5412,AMo5410 (These are all activities within the station).	5% chance during each activity (Delay per occurrence 10h min, 15h ml, 20h max)
101678S-5 – Vehicular access to the station	AMo5120,AMo5210, AMo5212,AMo5250,AMo5252, AMo5372,AMo5370,AMo5440, AMo5442,AMo5420,AMo5422, AMo5412,AMo5410 (These are all activities within the station).	2% chance during each activity (Delay per occurrence 10h min, 15h ml, 20h max)
101567S-6 – Marker board standard requires splicing of wire runs	AMo4000,AMo5480 (These are the first activities within key phases of the works)	5% chance during each activity (Delay per occurrence 2d2h min, 3d3h ml, 4d4h max)
101567S-7 – Overrun on track renewals element of the project	AMo4950 (This is the first activity once track renewals handback the possession)	40% chance (Delay 1d2h, 1d14h, 2d2h)
101567S-8 – Issues arising from interface with LFB	AMo5120,AMo5210, AMo5212,AMo5250,AMo5252, AMo5372,AMo5370,AMo5440, AMo5442,AMo5420,AMo5422, AMo5412,AMo5410 (These	2% chance during each activity (Delay per occurrence 10h min, 15h ml, 20h max)

	are all activities within the station).	
101567S-9 – Bridge 19 overrun	AMo5480 (This is the first Bridge 19 activity)	40% chance (Delay 2d2h min, 3d3h ml, 4d4h max)
101567S-10 – Contractor and resource availability for Christmas	Not modelled in plan as further discussion required	Not modelled in plan as further discussion required.
101567S-11 – Failure to complete enabling works in pre-possessions	Not modelled in plan as further discussion required	Not modelled in plan as further discussion required.
101567S-12 – Condition of existing equipment	AMo5482,AMo5485, AMo5490,AMo5492 (Wire Runs B3, B4)	10% chance per event (Delay 0h min, 5h ml, 10h max)
101567S-13 – Security/accident issues	Not modelled in plan as further discussion required.	Not modelled in plan as further discussion required.
101567S-14 – Delays in obtaining an isolation for the works	AMo4000 (This is the first Shorten Wire activity in the possession)	40% chance of occurrence (Delay 0h min, 5h ml, 10h max)
101567S-15 – Plant failure during blockade)	0730,0740,0750,0760,0770 (These are all Hammock tasks designed to accept the overall risks)	20% chance of occurrence per phase (Delay 0h min, 5h ml, 10h max)
101567S-16 – Theft and vandalism during the site works	0730,0740,0750,0760,0770 (These are all Hammock tasks designed to accept the overall risks)	10% chance of occurrence per phase (Delay 0h min, 5h ml, 10h max)
101567S-17 – Outside party approvals	Not modelled in plan as show-stopper risk	Not modelled in plan as show-stopper risk
101567S-18 – Testing and commissioning of new system	AM5570 – Section Proving	20% chance during event (Delay 10h min, 15h ml, 20h max)
101567S-19 – Unforeseen ground conditions	Not modelled in plan as further investigation to analyse effect of pre-possession opportunities needs to be carried out.	Not modelled in plan as further investigation to analyse effect of pre-possession opportunities needs to be carried out.

101567
GE OLE Renewals
Time Analysis
QSRA Report

Document Control	
File name & Location	c:\documents and settings\jarzurke\desktop\101567- ge ohle renewals\sqra - ge\ge ole renewals qsra report - august phase 3.doc
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Prepared by: James Arzur-Kean (Risk & Value Analyst)	
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Version Control

Version	Comments	Author	Date
Draft	Draft for R&V Team approval	James Arzur-Kean	29/08/2007
Version 1	Issued to Project Manager	James Arzur-Kean	
Version 2	Revised programme		

Contents

1 Executive Summary

This reports details the third attempt at undertaking a Schedule Risk Analysis on the GE OLE Renewals programme. All line item uncertainties and risks have been reviewed by the contractor and Network Rail and the qualitative risks identified in the first meeting have been refined and linked to planned activities.

The following table details the results of the analysis and how it has changed since the previous workshop (**it must be emphasised that these results do not include the impact of treatment actions**):-

Plan	% Confidence of handing back before blockade finish	Planned finish	P50 Finish	P90 Finish
1st Attempt – no risk	43%	2nd January 2007 04:00	2nd January 2007 03:00 **1 hour early**	2nd January 2007 08:00 **4 hours late**
2nd Attempt – no risk	>99%	2nd January 2007 04:00	1st January 2007 6:30 **21 hours 30 minutes early**	1st January 2007 07:45 **20 hours 15 minutes early**
2nd Attempt – risk adjusted	93%	2nd January 2007 04:00	1st January 2008 06:45 **21 hours 15 minutes early**	1st January 2008 12:00 **2 Days 17 hours 15 minutes late**

This result suggests that the key priorities for the project team are (a) to reduce the time necessary to complete specific activities within the plan (please refer to the Tornado Graph for the 2nd Attempt – no risk) and (b) to reduce the risks associated with the completion of those activities, particularly in relation to the interfaces of the project with Bridge 19, Track Renewals and other third parties. Efforts have already been made in this respect and work is continuing. Indeed, the team have formulated

a number of proposals which would allow all parties to save time and gain efficiencies within the plan (See Section 5.2).

The next QSRA will aim to reflect the team's ideas regarding treatment actions within the plan through (a) the construction of a target risk plan, (b) the inclusion of opportunities; (c) the consideration of line item uncertainty on each item in the place and (d) the analysis of all risks within the plan on a quantitative basis.

Further work in the plan needs to be undertaken to model the impact of the failure to complete work in pre-possessions and an agenda item will be tabled at the next meeting in order to discuss this in further detail.

2 Background

This workshop follows a previous QSRA conducted on the GE OLE Renewals programme, completed on 29th June 2007.

Project 101567 concerns major OLE rewiring and rationalisation work being undertaken on the Great Eastern main line out of Liverpool Street to Shenfield and then on to Chelmsford and Southend Victoria. The scope of the works include:-

- Stage 1 - Renewal of the Fixed Termination (FT) system with a Modern Equivalent Form from Liverpool Street to Bridge 19 (0.75miles) during an 11 Day blockage of the line at Christmas 2007. This will also include de-wiring and rewiring of Bridge 19.
- Stage 2 - Renewal of the Fixed Termination systems with an Auto Tensioned (AT) system between Bridge 19 and Shenfield by 2010.
- And finally, Stage 3 - Renewal of the Fixed Termination system with an AT system between Shenfield and Chelmsford by 2012 and Shenfield to Southend Victoria by 2018.

This SQRA mainly focuses on the Stage 1, the blockade.

Key possession dates in advance of the Christmas Blockade are as follows:-

1. 12hr possession in Week 19 – 5 August 2007
2. 12hr possession in Week 20 – 12 August 2007
3. 5hr possession in Week 21 – 18 August 2007
4. 5hr possession in Week 22 – 26 August 2007
5. 12hr possession in Week 23 – 02 September 2007
6. 12hr possession in Week 24 – 09 September 2007
7. 12hr possession in Week 25 – 16 September 2007
8. 12hr possession in Week 28 – 07 October 2007
9. 12hr possession in Week 31 – 28 October 2007
10. 27hr possession in Week 35 – 24/25 November 2007
11. 27hr possession in Week 36 – 1/2 December 2007

12. 32hr possession in Week 37 – 08-10 December 2007
13. 29 & 33hr possession in Week 38 – 15-17 December 2007

The Christmas Blockade 2007 is due to run from 01:15 on 22nd December 2007 to 04:00 on 2nd January 2008

This will be followed by 27 hour weekend possessions throughout all of 2008. Additional possessions will also be required during the 2009 calendar year, which have not yet been identified.

3 Methodology

A Quantitative Schedule Risk Analysis (QSRA) workshop was held by the Scheme Project Manager Richard Murphy at James Forbes House on 22nd August 2007 to review the scoped works, programme and risks in respect of the 2007/2008 Christmas blockade for the GE OLE Renewals project.

Duration uncertainty and discrete risks were identified and their likelihood of occurrence and impacts were assessed. Representatives of both the client and contractor AMEC SPIE were present and all participated in the deliberations.

The objectives of the meeting were to:

- Identify the probability of completing the scoped works within the blockade
- identify and list all assumptions and constraints
- identify actions to be undertaken to increase the probability of project success

The risks to the project were identified in a brainstormed session.

Each risk was then analysed to understand the probability of occurrence and impact of the risks on the project outcome. A risk owner was allocated and a treatment strategy decided upon.

Evaluation was conducted using Monte Carlo analysis, using Pertmaster software, 5,000 simulations were used. The tornado graph was created to identify the uncertainty that has the most influence on the project.

4 Attendees

Name	Position	Company
Richard Murphy	Scheme Project Manager	Network Rail
Mick O'Brien	Construction Manager	Network Rail
Gilles Chareyre	Project Manager	Colas Rail
John Buckner	Construction Engineer	Colas Rail

5 Results

5.1 Risks

The workshop participants reviewed and reassessed the risks identified in the previous workshop. The revised modelling is specified in Appendix C. The following opportunities have not yet been modelled:-

1. Possibility of splicing contact wire at O/B 18 for the Subs and Electrics;
2. Possibility of getting steel installed on O/B 19 before handback of the worksite from Bridge 19 team
3. Possibility of gaining access to part of Bridge 19 worksite to install SPS (may need to arrange for steel delivery to be moved)
4. Possibility of completing panning on the last 6 runs in Bridge 19 worksite (e.g. the Subs up to the Tunnel) to save approximately 2 hours of working time.

5.2 Line Item Duration Uncertainty

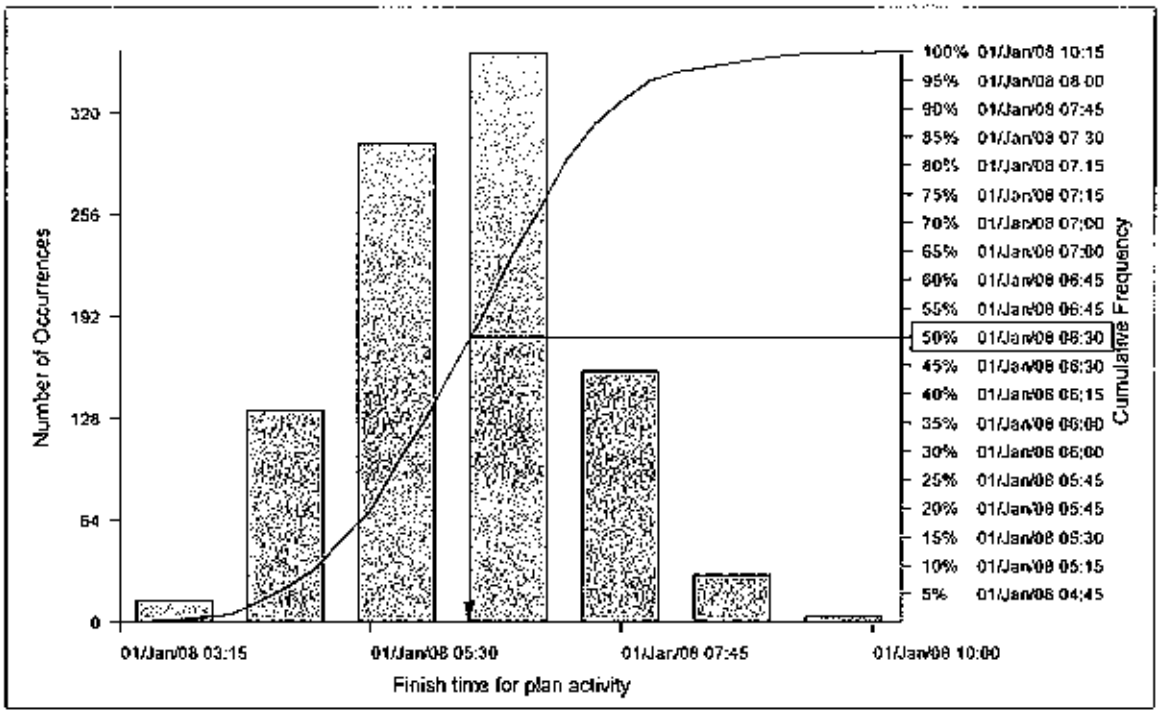
The project team then progressed to review the duration uncertainty on each line item within the plan. A large number of amendments, including deletions, were made from the previous QSRA.

5.3 Initial plan results

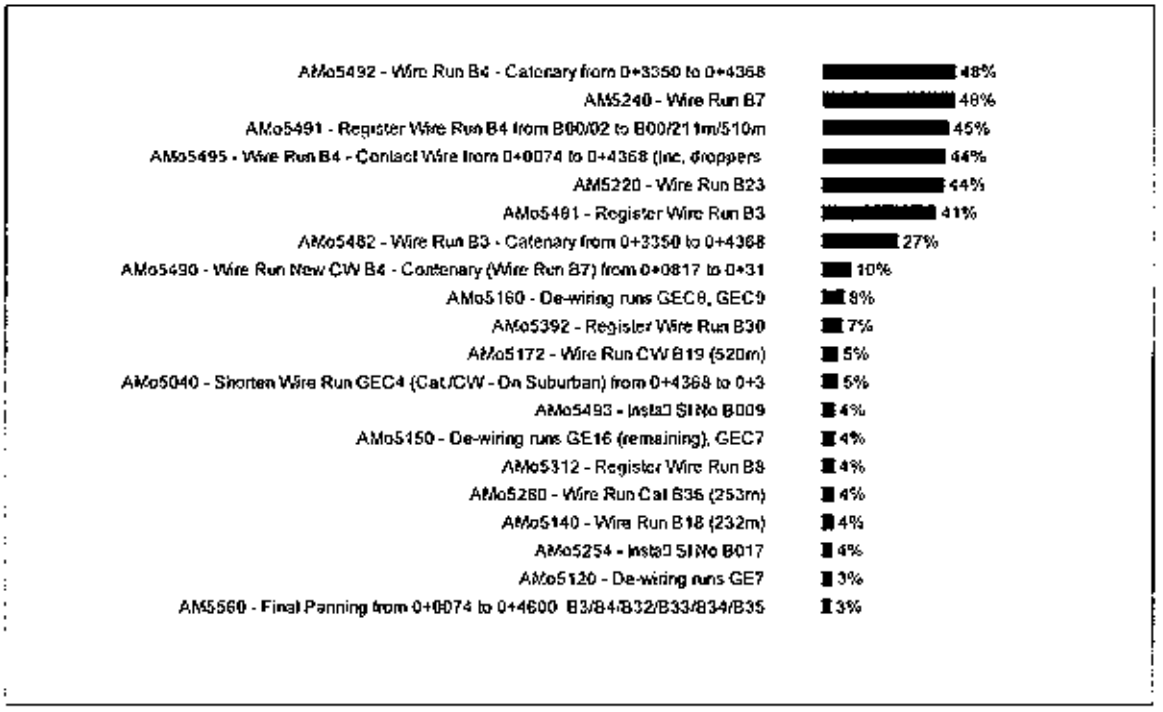
Using the information provided above, a schedule risk analysis was undertaken to establish both the probability of completing the plan without the influence of risks (i.e. if everything went as expected), as well as the probability of completing the plan with risks linked to the relevant activities. All analysis was undertaken against the "**End of Blockade**" finish milestone in the plan.

5.3.1 Plan without risk (i.e. based purely on line item uncertainty)

The previous analysis suggested a 43% likelihood of handing back the blockade at 04:00 on the 2nd January 2008. The **90th percentile** now suggests that the blockade will be handed back at 08:00 on the 1st January 2007 (i.e. 20 hours early). The Cumulative S-Curve is as follows:-



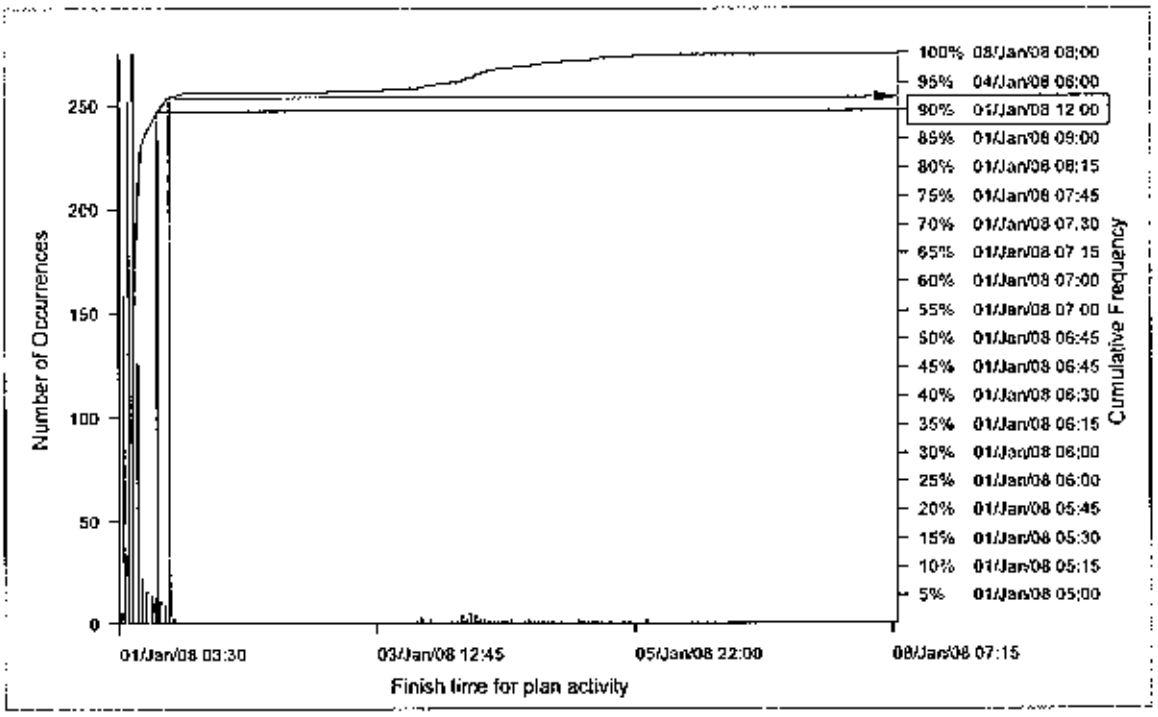
The Top 20 activities driving this output are detailed below:-



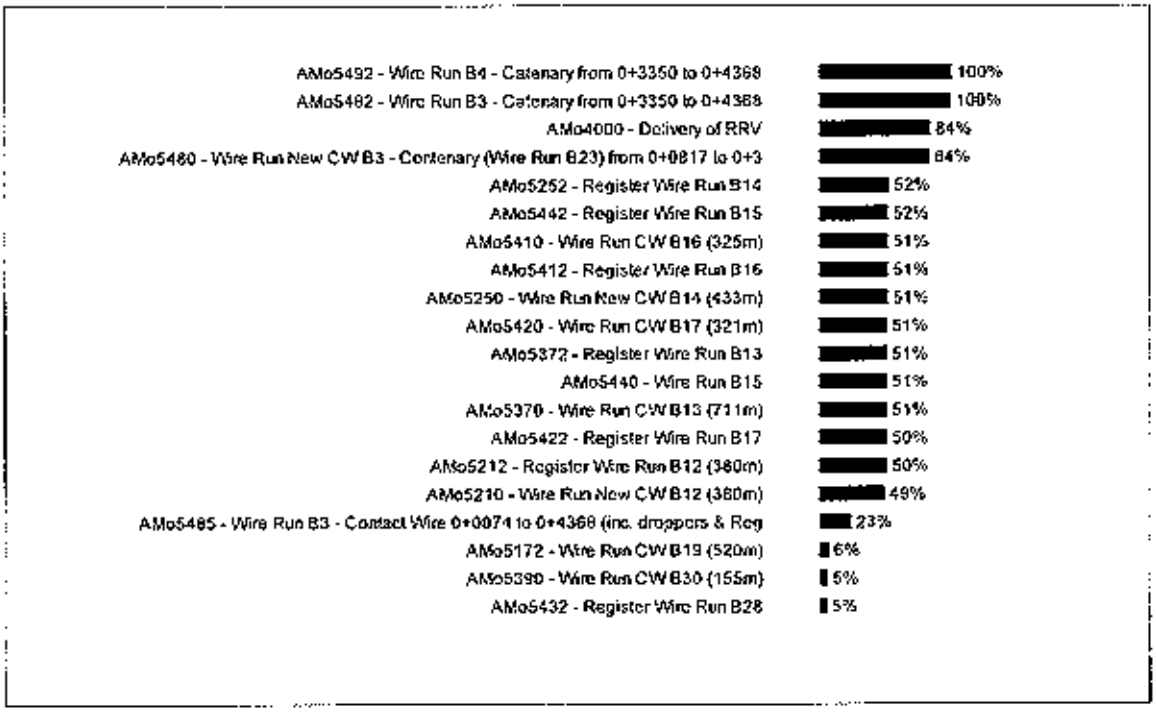
5.4.2 Plan with risk (i.e. with all modelled risk being linked to relevant activities)

The plan completion date is significantly influenced by the inclusion of risks within the plan. They cause the **95th Percentile** completion date to be pushed back to the 4th January 2008 at 06:00, however the likelihood of handing back on the 2nd January

2008 at 04:00 is now 93%. The cumulative S-curve is as follows:-



The top 25 risks and line items influencing the project are:-



6 Summary of Actions

As the workshop was run by the Project Manager, actions were not captured in this report.

7 Assumptions and Constraints

7.1 Assumptions

The following assumptions were established in the previous workshop. These are still considered to be assumptions that stand going forward:

- No further product approvals are currently planned and, even if they became required, these would not impact on the project.
- The contractor is sufficiently familiar with the design as it is based mainly on standard components.
- Access to the blockade will be confirmed.
- The Bridge 19 team will liaise with the local authority regarding noise.
- The OLE rewiring team will be given appropriate priority within the blockade.
- Access to the worksite will not be restricted by RRV movements to neighbouring worksites.
- There will not be any problems encountered in removing scrap material from the worksite.
- No problems will be encountered in gaining security clearance for worksite personnel.
- There are sufficient Network Rail design resources to cover the project.
- Any damage caused to surrounding infrastructure will not delay works being undertaken on the project.

7.2 Constraints

The following constraints for possession working were confirmed in the meeting:

Possession time	Possession lines	Worksites
01:15 to 06:00 – 22/12/07	Liverpool Street to Bow – Mains/Electrics	WS A (OLE) – 0mp to 0m75ch (Mns) 0mp to 2m69ch (Electrics)
06:00 to 12:00 – 22/12/07	Liverpool Street to Bow – Electrics	WS A (OLE) – 0mp to 0m63ch (Electrics)
12:00 22/12/07 to 02:00 23/12/07	Liverpool Street to Bow – Electrics	WS A (OLE) – 0mp to 0m43ch D&U Electrics WS B (Bridge 19) – 0m48ch to 0m63ch D&U Electrics
02:00 23/12/2007 to 12:00 23/12/2007	Liverpool Street to Bow – Mains Electrics Liverpool Street to Hackney Downs – Subs/Fasts	WS A (OLE) – 0mp to 0m43ch D&U Electrics WS B (Bridge 19) – 0m48ch to 0m63ch D&U Electrics
12:00 23/12/2007 to 12:00 30/12/2007	Liverpool Street to Bow – Mains/Electrics Liverpool Street to Hackney Downs – Subs/Fasts	WS A (OLE) – 0mp to 0m43ch D&U Electrics WS B (Bridge 19) – 0m48ch to 0m63ch D&U Electrics WSC – 0m69ch to 2m69cm/2m60cm (Elec/Mn/Subs/Fasts)
12:00 30/12/2007 to 03:30 02/01/2007	Liverpool Street to Bow – Mains/Electrics Liverpool Street to Hackney Downs – Subs/Fasts	WS A (OLE) – 0mp to 1m D&U Electrics WS C (Track Renewals) – 1m05ch to 3m40ch/2m20ch (Elec/Mn/Subs/Fasts)

8. Appendix A - Qualitative Impact Matrix

Probability

	Probability		
	Min	Most likely	Max
Very Low	0%	2.5%	5%
Low	5%	7.5%	10%
Medium	10%	17.5%	25%
High	25%	37.5%	50%
Very High	50%	76.0%	100%

Impact

	Impact (Days)		
	Min	Most likely	Max
Very Low	0	0d5hrs	0d10hrs
Low	0d10hrs	0d15hrs	0d20hrs
Medium	0d20hrs	1d6hrs	2d2hrs
High	2d2hrs	3d3hrs	4d4hrs
Very High	6days 6hrs	9days9hrs	12days12hrs

9 Appendix B – Programme

101567 – Liverpool Street OLE Renewals – Blockade Plan

Activity level detail can be provided on request.

Enabling works

Date	Works being undertaken
W19 12hr possession	Trial Holes on 206A-212A
	Dewiring GEC1,3
	Wiring B1,2
	Creating uninsulated overlaps
W20 12hr possession	Foundations for bases 206A,207A
	Dewiring GEC10
	Wiring B6
	Temporary anchors on Down Suburban
	Creating uninsulated overlaps
W21 5hr possession	OLE Support
W22 5hr possession	Trial Hole for 235A and 243A
W23 12hr possession	Temporary anchors on Up Suburban
	Dewiring GEC18
	Wiring B10
	Foundations for bases 208A,209A
	Installing Electric TTC on Up and Down 228A,229A
W24 12hr possession	Foundations for base 211A, 212A
	Dewiring GE2
	Wiring B11
	Temporary anchors
W26 12hr possession	Foundation for base 235A
	Dewiring GEC5
	Wiring B21
	Temporary anchors
	Installing new TTC & Transfer wires 211A, 212A
W28 12hr possession	Foundation for base 243A
	Dewiring GEC12
	Wiring B24
	Installing new TTC & Transfer wires 206A, 207A
W31 12hr possession	Dewire run GEC15, 16
	Wiring B25, B26
	Install new TTC & Transfer Wires 208A, 209A
W35 27hr possession	Temporary anchors
	Transfer Switch from 208 – 209A

	OLE Structures removal -207,208,209 (Portals)
W36 27hr possession	OLE Structures removal – 211,212 (portals)
W37 32hr possession	**Works not specified**
W38 29 & 33hr possession	**Works not specified**

Blockade

Type of Works	Specific Line Items	
Dewiring	Dewiring Run GE10 Dewiring Run GE11 Dewiring Run GE13&GE14 (remaining) Dewiring Runs GE1, GE3, GE6 Dewiring Runs GEC4, GE12 (remaining) Dewiring Runs GE8-9 Dewiring Runs GE4, GE5 Dewiring Runs GE7 Dewiring Runs GE18 (remaining), GE6 Dewiring Runs GEC8,9 Dewiring Runs GEC2, GEC13, GEC14 Dewiring Runs GEC11, GE15	
Wiring	Wire Run B18 Wire Run B19 Wire Run B9 Wire Run B12 Wire Run B23 Wire Run B7 Wire Run B33 Wire Run B20 Wire Run B27 Wire Run B32 Wire Run B13 Wire Run B29 Wire Run B3 Wire Run B32 Wire Run B34	Wire Run B14 Wire Run B22 Wire Run B36 Wire Run B35 Wire Run B5 Wire Run B8 Wire Run B30 Wire Run B31 Wire Run B16 Wire Run B17 Wire Run B28 Wire Run B15 Wire Run B4 Wire Run B33 Wire Run B35
Shortening Wire Runs	GE13 GE14 GEC4 GEC18 GE12 GE16	
Others	Portal preparation 235A, 236A, 238A, 243A Portal Installation 235A, 236A, 243A Panning – All Lines from Buffer stop to OB10/10A Re-connect feeding jumpers @ BOO/248 Section Insulation Final Settings Jumpers All Lines Final Panning from 0+0074 to 0+4600 Section proving by NWR Stand-by team for 1st trains RRV removal from worksite.	

10. Appendix C – Modelling Details

Each of the risks were modelled in the plan in different ways, the following table provides a summary of what assumptions were made:-

Risk	Activities Linked in Plan	Probability and Impact based upon Qualitative Analysis
101567S-1 – RRV Derailments at points	0730,0740,0750,0760,0770 (These are all Hammock tasks designed to accept the overall risks)	5% in each phase of the works (Delay per occurrence 10h min, 15h ml, 20h max)
101567S-2 – Third parties disrupting the project	0730,0740,0750,0760,0770 (These are all Hammock tasks designed to accept the overall risks)	0% in each phase of the works (Delay per occurrence 20h min, 23h ml, 1d2h max)
101567S-3 – Spillages from the Fuel Bowzer	0730,0740,0750,0760,0770 (These are all Hammock tasks designed to accept the overall risks)	20% in each phase of the works (Delay per occurrence 0h min, 5h ml, 10h max
101567S-4 – Fumes resulting from working within an enclosed environment	AMo5120,AMo5210, AMo5212,AMo5250,AMo5252, AMo5372,AMo5370,AMo5440, AMo5442,AMo5420,AMo5422, AMo5412,AMo5410 (These are all activities within the station).	5% chance during each activity (Delay per occurrence 10h min, 15h ml, 20h max)
101678S-5 – Vehicular access to the station	AMo5120,AMo5210, AMo5212,AMo5250,AMo5252, AMo5372,AMo5370,AMo5440, AMo5442,AMo5420,AMo5422, AMo5412,AMo5410 (These are all activities within the station).	0% chance during each activity (Delay per occurrence 10h min, 15h ml, 20h max)
101567S-6 – Marker board standard requires splicing of wire runs	AMo4000,AMo5480 (These are the first activities within key phases of the works)	5% chance during each activity (Delay per occurrence 2d2h min, 3d3h ml, 4d4h max)
101567S-7 – Overrun on track renewals element of the project	AMo4950 (This is the first activity once track renewals handback the possession)	0% chance (Delay 1d2h, 1d14h, 2d2h)
101567S-8 – Issues arising from interface with LFB	AMo5120,AMo5210, AMo5212,AMo5250,AMo5252, AMo5372,AMo5370,AMo5440, AMo5442,AMo5420,AMo5422, AMo5412,AMo5410 (These	2% chance during each activity (Delay per occurrence 10h min, 15h ml, 20h max)

	are all activities within the station).	
101567S-9 – Bridge 19 overrun	AMo5480 (This is the first Bridge 19 activity)	0% chance (Delay 2d2h min, 3d3h ml, 4d4h max)
101567S-10 – Contractor and resource availability for Christmas	Not modelled in plan as further discussion required	Not modelled in plan as further discussion required.
101567S-11 – Failure to complete enabling works in pre-possessions	Not modelled in plan as further discussion required	Not modelled in plan as further discussion required.
101567S-12 – Condition of existing equipment	AMo5482,AMo5485, AMo5490,AMo5492 (Wire Runs B3, B4)	10% chance per event (Delay 0h min, 5h ml, 10h max)
101567S-13 – Security/accident issues	Not modelled in plan as further discussion required.	Not modelled in plan as further discussion required.
101567S-14 – Delays in obtaining an isolation for the works	AMo4000 (This is the first Shorten Wire activity in the possession)	40% chance of occurrence (Delay 0h min, 5h ml, 10h max)
101567S-15 – Plant failure during blockade)	0730,0740,0750,0760,0770 (These are all Hammock tasks designed to accept the overall risks)	20% chance of occurrence per phase (Delay 0h min, 5h ml, 10h max)
101567S-16 – Theft and vandalism during the site works	0730,0740,0750,0760,0770 (These are all Hammock tasks designed to accept the overall risks)	10% chance of occurrence per phase (Delay 0h min, 5h ml, 10h max)
101567S-17 – Outside party approvals	Not modelled in plan as show-stopper risk	Not modelled in plan as show-stopper risk
101567S-18 – Testing and commissioning of new system	AM5570 – Section Proving	20% chance during event (Delay 10h min, 15h ml, 20h max)
101567S-19 – Unforeseen ground conditions	Not modelled in plan as further investigation to analyse effect of pre-possession opportunities needs to be carried out.	Not modelled in plan as further investigation to analyse effect of pre-possession opportunities needs to be carried out.

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Bill Emery
Chief Executive
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13 August 2007

Dear Bill

Portsmouth Resignalling

I write with regard to your letter and notice of 30 July 2007 in which you set out ORR's proposal to impose a penalty of £2.4m on Network Rail in respect of a contravention of Condition 7 of our network licence following failures associated with the delivery of the Portsmouth resignalling scheme.

Clearly, we are very disappointed that ORR considers it to be necessary to impose a fine of this magnitude on Network Rail as a result of this licence breach. We are also concerned about the potential implications for the level of fine in the event of a future licence breach.

We readily accept that the failures associated with the delivery of this project have caused disruption for both train operators and passengers. However, we believe that we have taken every step possible to mitigate the level of this disruption and that this matter should be viewed taking into account our previous successful delivery of a number of major projects. It is on this basis that we consider the level of ORR's proposed fine to be disproportionate.

We note however, that in proposing this fine, ORR has given regard to both the steps that we have taken to mitigate the effect on passengers and the lessons we have learnt from this project. ORR states in its notice that the proposed penalty relates to the conduct of Network Rail between September and December 2006. In particular, in proposing this fine, ORR has referred to our failure to identify effectively the risks associated with the project, to develop adequate contingency plans to address the possibility of extended disruption to services and to manage the project (and in particular our contractor) competently. We have already set out our views on these matters in previous correspondence and it does not seem to be productive to revisit these issues again here.

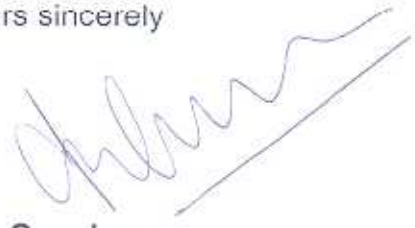
Continued over ...

The lessons that we have learnt at Portsmouth will be applied to future major resignalling schemes and we will be putting additional checks and balances in position to minimise the risk of similar problems occurring again in the future. We will correspond with ORR as regards the implementation of these lessons learnt in due course.

Whilst we are very disappointed by ORR's decision with regard to this matter, I should emphasise that Network Rail takes its obligations as set out under its network licence extremely seriously. We fully appreciate that it is of the utmost importance for Network Rail to comply (and to be seen to be complying) with its licence obligations and we will complete the resignalling work at Portsmouth by the end of October. You will be aware that this date has been agreed following consultation with train operators with a view to minimising the impact of these works on passengers.

Separately we are now reviewing our approach to risk. Moving forward, it will be vital to ensure that we do not expose ourselves to project risks, which (if these risks materialise) could result in us failing to meet the needs of our customers and consequently result in the possibility of licence breach. It is likely that ORR's conclusion in respect of Portsmouth will force Network Rail to become more risk averse as we seek to avoid the possibility of licence breach. We question if this is really the right way forward for an industry that faces considerable challenges in the years ahead especially in terms of providing additional capacity to meet growing demand at an affordable price. As explained in previous correspondence, we will write separately on Network Rail's approach to risk going forward, setting out our concerns. In conjunction with this we will set out our views in relation to reform of the licence and the related policy matters concerning breach of licence and the establishment of appropriate penalties in various circumstances.

Yours sincerely



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OFFICE OF RAIL REGULATION

6 September 2007

Iain Coucher Esq
Chief Executive
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40 Melton Street
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Dear Iain

PORTSMOUTH RESIGNALLING

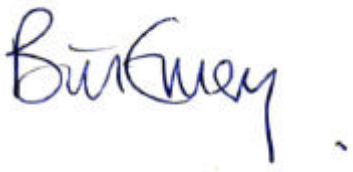
You wrote to me on 13 August with your representations on the notice we published on 30 July.

After considering your representations, we have decided to confirm the penalty of £2.4m. As you acknowledge, the factors you refer to in your letter had already been known through previous correspondence and meetings, and we took account of them in arriving at the penalty described in our notice of 30 July and in reducing the level from £6m to £2.4m.

I would like to respond to the point you make about risk and the declaration of a breach "forcing" you to become more risk averse. As we have said before, the breach and our decision to impose a penalty are about failure to identify and assess risk properly and to mitigate its effect, and not about the level of risk you assume. We see this as a very important distinction, and I would like to discuss this with you.

I am placing a copy of this letter on our website.

Yours sincerely



Bill Emery

NOTICE, IN ACCORDANCE WITH SECTION 57C OF THE RAILWAYS ACT 1993, AS AMENDED, OF THE OFFICE OF RAIL REGULATION'S DECISION TO IMPOSE A PENALTY ON NETWORK RAIL INFRASTRUCTURE LIMITED

6 September 2007

1. This document constitutes a notice, given in accordance with section 57C(6) of the Railways Act 1993, as amended (the "Act"), stating that:

   a) the Office of Rail Regulation ("ORR") has imposed a penalty of £2,400,000 on Network Rail Infrastructure Limited ("Network Rail");

   b) the penalty is in respect of a contravention by Network Rail of Condition 7 of its network licence;

   c) the contravention is in respect of the Portsmouth resignalling project ("the Project") and comprised Network Rail making decisions which put it at risk of failing to meet the reasonable requirements of its customers over a significant period of time, without taking all reasonable steps to evaluate and mitigate the risk involved. ORR informed Network Rail on 5 June 2007 of its decision that Network Rail had breached its network licence. The acts and omissions which, in the opinion of ORR, constituted the contravention and justify the imposition of the penalty are more fully set out in paragraphs 10 to 12 of this notice;

   d) the other facts which, in the opinion of ORR, justify the imposition of the penalty are set out in paragraphs 13-57 of this notice;

   e) the penalty, which ORR has decided to impose on Network Rail, relates solely to the past conduct of Network Rail between September 2006 and December 2006, and it is without prejudice to any other enforcement action and/or penalty which ORR might deem appropriate in relation to Network Rail's completion of the Project. Network Rail has assured ORR that the Project will be complete by 29 October 2007, and ORR reserves its position with regard to any failure by Network Rail to meet this, or any revised, completion date of the Project; and

   f) in accordance with the Act, the penalty should be paid to the Department for Transport. The penalty must be paid by 21 September 2007 to the Department for Transport by BACS transfer to account number 19761000 (sort code 10-14-99).

2. This notice follows publication of a notice under section 57C of the Act on 30 July 2007 describing ORR's intention to impose a penalty on Network Rail. Representations on this notice were received from Network Rail on 13 August 2007. No other representations were received.

3. ORR has taken account of Network Rail's representations. ORR considers that its assessment of the position, in particular Network Rail's failure: (i) to identify the risks effectively and to develop adequate mitigation measures to address the

possibility of extended disruption to services and the potential effect on third parties; and (ii) to manage the Project competently, remain as stated in its earlier notice. Furthermore, Network Rail has stated that it took action to mitigate the effect of the breach. ORR has already considered the mitigating effect of the circumstances of this case in reducing the sum from £6,000,000 to £2,400,000.

4. ORR has therefore decided to confirm the penalty of £2,400,000 described in the notice published on 30 July 2007.

Relevant legal provisions

5. Under section 57A of the Act, ORR may levy a penalty of such amount as is reasonable if it is satisfied that the licence holder is contravening or has contravened a licence condition. The amount may not exceed 10 per cent of the licence holder's turnover defined in accordance with the Railways Act 1993 (Determination of Turnover) Order 2005 (SI 2005 No 2185). In broad terms, the Order defines applicable turnover as turnover on regulated activity in Great Britain in the business year preceding the penalty notice under section 57C, plus, where the contravention lasted for more than a year, an additional sum for such additional period (provided that the total sum is not more than double the preceding business year's turnover). Network Rail's turnover for 2006-2007 on regulated activity was approximately £5.5 billion.

6. No penalty may be imposed in respect of a contravention unless a notice is served on the licence holder within two years of the time of the contravention.

7. Under section 57A(6) of the Act, ORR shall not impose a penalty if it is satisfied that the most appropriate way of proceeding is under the Competition Act 1998. In this case ORR considers that the issue is one of a breach of a specific licence obligation and is not satisfied that it is most appropriate to proceed under the Competition Act 1998.

8. The relevant condition of Network Rail's licence is Condition 7.

9. Condition 7 requires Network Rail, by virtue of paragraph 2, to:

> "take such steps as are necessary or expedient so as to achieve the purpose to the greatest extent reasonably practicable having regard to all relevant circumstances including the ability of the licence holder [Network Rail] to finance its licensed activities".

"The purpose" referred to in paragraph 2 of Condition 7 is defined in paragraph 1, and is:

> "to secure:
>
> (a) the operation and maintenance of the network;
>
> (b) the renewal and replacement of the network; and
>
> (c) the improvement, enhancement and development of the network,

in each case in accordance with best practice and in a timely, efficient and economical manner so as to satisfy the reasonable requirements of persons providing services relating to railways and funders in respect of:

(i) the quality and capability of the network; and

(ii) the facilitation of railway service performance in respect of services for the carriage of passengers and goods by railway operating on the network."

The Contravention

10. On 5 June 2007 ORR wrote to Network Rail informing it of ORR's decision that Network Rail's planning and executing of the Project was in breach of Condition 7 of its network licence and set out its reasons for this decision.[1]

11. ORR concluded that Network Rail contravened Condition 7 by failing to comply with the duty and achieve the purpose to the greatest extent reasonably practicable having regard to all relevant circumstances including the ability of the licence holder to finance its licensed activities. In particular, between September 2006 and December 2006, Network Rail failed to secure the operation and maintenance of the network and the renewal and replacement of the network in accordance with best practice and in a timely, efficient and economical manner, and made decisions about the planning and execution of the Project which put it at material risk of failing to meet the reasonable requirements of its train operator customers over a significant period of time, without taking all reasonable steps to identify, properly evaluate and mitigate the risks involved.

12. Two particular areas of concern led ORR to its conclusion. The first was Network Rail's assessment of risk and the effect on third parties. ORR considered that Network Rail had failed to identify the risks effectively and to develop adequate mitigation measures, including contingency plans, to address the possibility of extended disruption to services and the potential effect of this on third parties. The second was Network Rail's failure to manage the Project competently. In particular, ORR considered that Network Rail had failed properly to assess the plans and scrutinise the work of its contractor, to the extent that one would expect of an infrastructure manager striving for best practice, even after it became aware that there was a high level of risk to the Project and given the relative inexperience of its contractor in delivering works of this nature.

Network Rail representations on penalty

13. Network Rail's response to the notice of 30 July 2007 proposing the penalty, which was received by ORR on 13 August 2007, states that it considers the level of ORR's penalty to be disproportionate in the circumstances of the case.

14. Network Rail accepts that the failures associated with the delivery of the Project have caused disruption for both train operators and passengers. However,

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[1] http://www.rail-reg.gov.uk/server/show/nav.158

Network Rail believes it has taken every step possible to mitigate this level of disruption and that its previous successful delivery of a number of major projects should be taken into account. It is on this basis that Network Rail considers the level of penalty to be disproportionate.

15. Network Rail also notes that ORR has given regard to steps that it has taken to mitigate the effect on passengers and the lessons it has learnt from this project.

16. In addition, Network Rail states that it has already set out its views on the ORR's reasons for proposing the penalty in previous correspondence. In this regard, ORR has received letters from Network Rail on 30 April 2007, 11 May 2007 and 12 June 2007 and a meeting took place with ORR on 8 May 2007. ORR has taken these comments into account in its decision on the licence breach and its proposal in its notice of 30 July 2007 to impose a penalty.

17. Network Rail's full representations can be viewed on the ORR website.

Whether to impose a penalty

18. Section 57B(3) of the Act provides that, in deciding whether to impose a penalty, and in determining the amount of any penalty, ORR must have regard to any statement of policy published at the time when the contravention occurred. In April 2006, ORR published its economic Enforcement Policy and Penalties Statement.[2]

19. At paragraph 5 of ORR's Penalties Statement, ORR states that, in deciding whether to impose a penalty, it will act in accordance with its duties under section 4 of the Act and will take account of five principles of good regulation: proportionality, targeting, consistency, transparency, and accountability.

20. ORR also says in its Penalties Statement that the penalty should be proportionate to the nature and severity of the contravention. In paragraph 7 of the Penalties Statement ORR has stated that it will consider, in particular:

    (a) the seriousness of the breach;

    (b) whether the breach or possibility of the breach would have been apparent to a diligent licence holder;

    (c) culpability;

    (d) the extent to which a penalty or reasonable sum would provide additional incentives on the licence holder to remedy the breach;

    (e) the impact the breach has had on third parties;

    (f) whether the licence holder has profited from the breach; and

[2] http://www.rail-reg.gov.uk/upload/pdf/287a.pdf

(g) the licence holder's record of compliance or non-compliance with this and other obligations and the need to provide an incentive for it to comply with its licence obligations generally.

21. On this basis, following its decision that Network Rail has contravened Condition 7, ORR has decided that it should impose a penalty on Network Rail. This notice relates solely to the past conduct of Network Rail between September 2006 and December 2006, and it is without prejudice to any other enforcement action and/or penalty that ORR might deem appropriate in relation to Network Rail's completion of the Project. Network Rail has assured ORR that the Project will be complete by 29 October 2007, and ORR reserves its position with regard to any failure by Network Rail to meet this, or any revised, completion date of the Project.

22. In reaching this decision, ORR has had regard to its economic Enforcement Policy and Penalties Statement which is considered in more detail below.

(a) Seriousness of the breach

23. The consequences of the breach have affected a limited part of the network - the route section between Fratton and Portsmouth Harbour. The standard train service is eight trains per hour in each direction, serving a variety of destinations. Following the blockade on 1 - 4 February 2007 during which no trains ran, the service was initially restricted to three trains each way per hour for around two months, before being increased to five trains per hour.

24. ORR considers that the success of the Project depended on thoroughly sound project management and decision-making and that in this case Network Rail's internal risk assessment was deficient. ORR considers that, if Network Rail's risk assessment approach is not reviewed and strengthened, there is a risk of further similar problems, potentially affecting wider areas of the network and larger numbers of operators and passengers. ORR therefore believes it important to demonstrate to Network Rail that it must manage its projects and make decisions in a way which adequately identifies and mitigates risks and which reflect the potential effect on third parties.

25. ORR considers that the wider context is important. The planned volume of signalling renewals has risen threefold in four years and Network Rail plans to sustain high volumes for many years to come. Network Rail is rightly growing and developing its supply base – and the appointment of the Portsmouth contractor was part of this development programme – but it needs to manage the inherent risks in so doing, in a way which it notably failed to achieve on this project. Projects must not be allowed to get to the point where the only options are to carry on with inadequately assessed and mitigated risks, or to cancel, with all the consequences on specialist resources and the knock-on impacts to the overall renewals programme.

(b) Whether the breach or possibility of the breach would have been apparent to a diligent licence holder

26. ORR considers that the breach or possibility of the breach would have been apparent to a diligent licence holder. This is because Network Rail's experience

of the blockade overrun in a previous signalling scheme at Sandbach-Wilmslow should have put it on notice of the risk of serious disruption to train operators and passengers if a signalling project is poorly managed.

(c) Culpability

27. ORR considers that Network Rail is culpable in that it failed to carry out an adequate risk assessment to inform its decisions. Even though its contractor carrying out the work may be at fault for the delays in completing the work on time, ORR considers that Network Rail should have managed its contractor more effectively and is responsible.

(d) The extent to which a penalty would provide additional incentives on the licence holder to remedy the breach

28. This is a past breach and ORR considers that Network Rail is now taking all reasonable steps to mitigate its effect.

(e) The impact the breach has had on third parties

29. ORR considers that the breach has had an adverse impact on train operators and on passengers (although the effect on operators has been mitigated by payment of compensation), which Network Rail has accepted. ORR estimates that more than 3 million [3] passenger journeys may have been affected in some way by the overrun of the Project and the reduced level of train service from the beginning of January 2007 until full services are restored in October 2007, after a further full blockade affecting all services for six days. To put this into context, some 3 million passenger journeys were made on the network each day in 2006-2007.

(f) Whether the licence holder has profited from the breach

30. Network Rail has not profited from the breach.

(g) The licence holder's record of compliance or non-compliance with this and other obligations and the need to provide an incentive for it to comply with its licence obligations generally

31. Network Rail stated in its representations that this Project should be viewed taking into account its previous successful delivery of a number of major projects. ORR has considered Network Rail's record of compliance generally and also in relation to previous signalling projects.

32. In this regard, ORR considers that Network Rail's experience of the blockade overrun at Sandbach-Wilmslow is relevant, for the reasons set out in paragraph 26 above.

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[3] This estimate includes not only those whose direct trains have been cancelled but also those who have suffered increased journey times and reduced frequencies.

33. In addition, ORR considers that Network Rail should have understood from ORR's decision to impose a penalty in April 2006 in relation to infrastructure capability that ORR expects Network Rail to be proactive in taking all reasonable steps to achieve the purpose of Condition 7. ORR considers that an appropriate penalty would signal again to Network Rail, the industry and rail users that ORR expects Network Rail to take compliance with its licence obligations seriously.

34. Since the Sandbach-Wilmslow incident did not lead to Network Rail addressing fully weaknesses in its risk assessment of signalling projects, ORR considers it essential to provide an effective incentive for Network Rail to do so. ORR considers that the imposition of this penalty will have a strong reputational effect on Network Rail.

Calculation of the amount payable

35. In calculating the amount payable, ORR has stated in its Penalties Statement that it will consider:

    (a) proportionality;

    (b) mitigating and aggravating factors; and

    (c) financing issues.

Proportionality

36. ORR has stated, in paragraph 10 of its Penalties Statement, that its principal objective in setting a penalty or imposing a reasonable sum will be to incentivise compliance with the relevant condition or requirement.

Context for Network Rail

37. When considering how to incentivise a company such as Network Rail, ORR notes that the impact of a penalty is likely to be largely reputational rather than financial. In this case ORR considers that a penalty must be sufficiently high to send a message to Network Rail that it must address the weaknesses in its risk assessment and decision making, while also being proportionate to the breach and consistent with the other factors in ORR's Penalties Statement.

38. ORR can impose a penalty of up to 10% of turnover. However, in ORR's judgement, the principles and approach set out in the Penalties Statement and ORR's duties set out in section 4 of the Act, would rarely merit a penalty approaching that level, although each case will, of course, be considered on its merits at the time.

39. To arrive at the penalty in the current case, ORR has considered, broadly, and without prejudice to future decisions, how breaches by a company such as Network Rail, with its current financial structure, might be categorised by reference to their level of seriousness. ORR considers that "seriousness" would be likely to be judged by a number of factors, depending on the facts of the individual case, including the impact of the breach on train operators and passengers.

40. A “trivial” breach would not usually merit a penalty, although ORR would consider the merits of a penalty in relation to each individual case. For “minor” breaches, the range of penalty, where Network Rail has not profited from the breach and before any aggravating or mitigating factors are taken into account, might be up to £2m, although ORR would consider the circumstances of each individual case.

41. In this case, ORR considers that the breach is not trivial and is more than minor. It has led to real disruption to some train operators and passengers, for a period of some months, and if repeated, the breach could have a much greater impact on third parties and on Network Rail’s signalling programme generally. However, the effect of the breach in this case has been limited to those services between Fratton and Portsmouth and there is now a service, albeit a reduced one, operating. ORR therefore considers that this breach should not be classified as one of the most serious breaches but it considers that it is more than a minor breach and is moderately serious. In exercising its judgment, ORR considers that this breach would merit a penalty somewhere in the range of £2-10 million.

42. Paragraph 10 of the Penalties Statement states that the starting point for any potential penalty or sum imposed should be an amount greater than any benefit for the licence holder from not having been compliant in the first place, such that it will be more expensive for the licence holder to have been or continue to be in breach of its licence condition than to comply. Paragraph 11 of the Penalties Statement sets out factors that ORR shall have regard to when setting the level of penalty. ORR has considered all the information made available by Network Rail. This information is considered below against the factors set out in paragraphs 10 and 11 of the Penalties Statement.

The benefit to the licence holder from non-compliance

43. From information provided by Network Rail, ORR understands that Network Rail has incurred substantial additional costs because of the breach. Network Rail has stated that it may be able to recoup some of its costs in compensation, but will still have incurred significant additional costs. It is therefore clear that Network Rail has not benefited from the breach.

The cost of compliance

44. To ensure compliance, Network Rail might have employed external project managers who would have properly assessed the risks and developed appropriate mitigation plans.[4] Alternatively, Network Rail might have postponed the work. Network Rail has informed ORR that if it had done so, it would have incurred costs for the planned possessions, although these costs may have been recoverable in compensation.[5] Deferring the possession may also have had implications for Network Rail’s wider signalling programme, but ORR does not have any information quantifying these factors and therefore does not propose to

[4] ORR estimates that this may have cost between £1m and £2m for twelve months’ work.

[5] Network Rail has provided estimated costs in this regard but has asked ORR to regard them as confidential, which ORR has accepted.

take them into account. ORR therefore estimates that Network Rail may have incurred slightly higher costs on the Project if it had complied with its network licence but that these would be significantly less than the additional costs incurred by Network Rail.

The costs to third parties

45. These fall into two categories:

- train operators: ORR understands that train operators are being compensated under Part G of the network code and under Schedule 4 of track access contracts. The adverse net financial effect on operators is therefore unlikely to be significant; and

- passengers: ORR has formed an estimate of the cost of additional disruption to passengers. This is based on the use of industry methodology and takes account of the number of passengers affected in some way by the overrun and the impact of their journeys. ORR assessed this to be between £5-8 million, for disruption to over 3 million passenger journeys. [6]

Desirability of deterring contraventions of relevant licence conditions

46. ORR's primary objective in setting a penalty is to incentivise compliance and to deter contraventions of licence conditions. ORR considers that the fact that, as a result of this particular breach, Network Rail will probably have to bear significant costs does not give it the same incentive to comply with its licence conditions in future as a penalty imposed by its regulator. ORR therefore considers that a penalty is desirable in this case to deter future contraventions.

47. ORR has estimated that Network Rail may have incurred slightly higher costs on the Project if it had complied with its network licence. However, (see paragraph 44), as this figure may not be material and because Network Rail has actually incurred a far greater sum than this because of the breach, ORR does not consider this assists to a great extent in assessing what level of penalty would deter future contraventions.

48. Finally, as ORR stated above, over 3 million passenger journeys may have been affected since January 2007. ORR has estimated that the cost to passengers of the breach might amount to a sum in the region of £5-8 million. Although this sum does not directly assist ORR in calculating what penalty is appropriate to deter Network Rail from contravening its licence again, ORR considers that it assists it to assess how serious the breach is and hence what might be the appropriate level of penalty in this case.

Conclusion on proportionality

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[6] ORR used standard railway industry tools (MOIRA and the Passenger Demand Forecasting Handbook) to arrive at this calculation. The impact on all passengers on the routes was assessed.

49. The breach of Condition 7 covered by this notice is a past breach. Network Rail has not benefited from it; indeed it has incurred significant costs as a result. However, Network Rail's signalling programme is an important part of its renewal of the network and this breach has had an adverse impact on stakeholders in the area. ORR considers that if similar events occurred elsewhere on the network they could affect the deliverability of Network Rail's whole signalling renewal strategy and could also have a greater impact on train services and rail users.

50. Ultimately, ORR considers that the appropriate penalty, while informed by the various financial and economic calculations above, has to be a matter of judgement and not arithmetic. Taking all factors into account, ORR considers that, within the range of £2-10 million that it would normally consider appropriate for a "moderately serious" breach, a figure of £6 million is in its view proportionate.

Mitigating and Aggravating Factors

51. ORR considers that the applicable level of mitigation or aggravation will be a question of fact and judgement for each case.

Mitigating Factors

52. Paragraph 13 of its Penalties Statement sets out factors that ORR may consider as mitigation. In this case, ORR considers that there are two mitigating factors. These are:

    (a) any remedial steps the licence holder may have taken to rectify the breach, including whether these were initiated proactively by the licence holder or in response to ORR's actions

    Network Rail submitted in its representations that it has taken every step possible to mitigate the level of disruption. ORR considers that since January 2007 Network Rail has taken remedial steps to mitigate the effect of the breach and to complete the work, largely on a proactive basis. These have included installing temporary signalling at a cost of £6.3 million to increase the number of services running from 3 per hour to 5 per hour since April 2007. ORR considers that the extensive work which Network Rail has undertaken means mitigation should be applied under this heading.

    (b) any steps taken to minimise the risk of the breach recurring

    Network Rail has confirmed in writing that it is applying the lessons of Portsmouth to future major signalling projects, and that it will be putting additional checks and balances in position to minimise the risk of similar problems occurring again in the future. ORR therefore considers this is a mitigating factor.

53. There are two other mitigating factors listed in paragraph 13 of ORR's Penalties Statement which are co-operation with ORR's investigation and evidence that the breach was genuinely accidental or inadvertent. ORR does not consider that in this case these factors should contribute to mitigation of the level of penalty.

Aggravating Factors

54. Paragraph 15 of the Penalties Statement sets out the factors that ORR may consider as aggravating. These are: (a) whether any infringement is deliberate or reckless; (b) repeated or continuing infringement of this or other obligations, particularly if subsequent breaches occur after the licence holder becomes aware of, or is made aware of, the initial infringement; (c) the extent of involvement of directors or senior management in the action of inaction which caused the breach or their lack of involvement in action to remedy the breach; (d) the absence of internal procedures intended to prevent infringements occurring and the extent to which organisational weaknesses may result in repeated infringements of the same type by the same licence holder; and (e) evidence that the licence holder attempted to conceal the infringement from ORR.

55. ORR considers that although a number of the aggravating factors listed above are relevant to this case, they have contributed to the finding of a breach and/or the assessment of its seriousness and have therefore already been taken into account.

Conclusion on Mitigating and Aggravating Factors

56. ORR therefore considers that there are two significant mitigating factors in this case. The fact that Network Rail has been proactive in seeking to mitigate the effects of the breach and its readiness to apply the lessons from Portsmouth should, in ORR's view, result in a significant reduction in the penalty. Taking these together and, in particular, focusing on the amount of work that Network Rail has undertaken to remedy the effect of the breach, ORR has decided that the penalty should be reduced by 60% to £2,400,000.

Conclusion on the amount of the penalty

57. For the reasons set out above, and having taken account of representations duly made and not withdrawn on the notice published on 30 July 2007, ORR has decided that the amount of the penalty should be £2,400,000.

Financing Issues

58. In ORR's Penalties Statement, ORR notes that it has a duty under section 4 of the Act not to make it unduly difficult for a network licence holder to finance those activities in relation to which ORR has functions. In the case of Network Rail, this duty might have a bearing on the level of penalty ORR might impose. In this case, ORR does not consider that the level of penalty would make it unduly difficult for the licence holder to finance its activities and considers it consistent with its duties under sections 4(1)(b) (to promote the use of the network for the carriage of passengers and goods), 4(1)(c) (promoting efficiency and economy) and 4(1)(g) (enabling persons providing railway services to plan their businesses with a reasonable degree of assurance).

Conclusion

59. Having regard to ORR's duties in section 4 of the Act, the factors listed in paragraph 7 of ORR 's Penalties Statement, representations received and for the reasons set out above, ORR has decided that it should impose a penalty in respect of Network Rail's contravention of Condition 7 as described in this notice.

60. ORR has considered Network Rail's representation that a penalty of £2,400,000 would be disproportionate. However, as Network Rail itself acknowledges, ORR has already considered the mitigating effect of the circumstances of the case in arriving at this sum and ORR does not consider that Network Rail has offered any additional reasons why it should not impose the proposed penalty or why it should reduce the amount. Therefore, for the reasons set out above and having regard to the factors listed in ORR's Penalties Statement and to Network Rail's turnover in 2006-07, which was approximately £5.5 billion, ORR has imposed a penalty of £2,400,000.

Bill Emery

Chief Executive of the Office of Rail Regulation