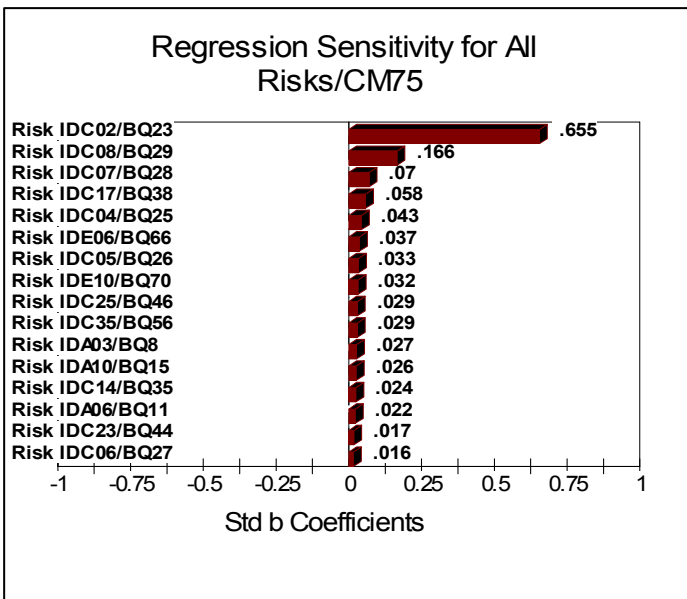
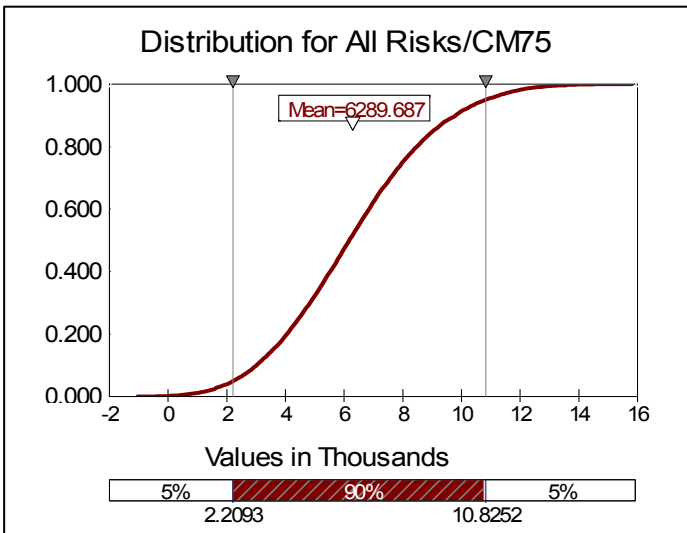
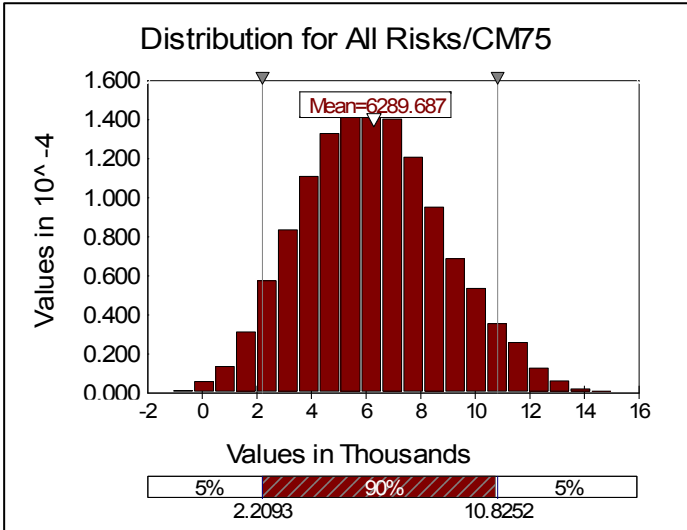


# Appendix 4.2

## Quantitative Risk Assessment



## Simulation Results for All Risks / CM75 - WP1 Preferred Scheme



Summary Information	
Workbook Name	C) Risk Register (v11PS)
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	61
Number of Outputs	2
Sampling Type	Monte Carlo
Simulation Start Time	08/04/2009 19:28
Simulation Stop Time	08/04/2009 19:29
Simulation Duration	00:00:36
Random Seed	328498078

Summary Statistics			
Statistic	Value	%tile	Value
Minimum	-£1,043	5%	£2,209
Maximum	£15,817	10%	£3,014
Mean	£6,290	15%	£3,568
Std Dev	£2,590	20%	£4,052
Variance	6707403.58	25%	£4,450
Skewness	0.234402435	30%	£4,833
Kurtosis	2.818140367	35%	£5,184
Median	£6,171	40%	£5,515
Mode	£4,693	45%	£5,852
Left X	£2,209	50%	£6,174
Left P	5%	55%	£6,498
Right X	£10,825	60%	£6,836
Right P	95%	65%	£7,185
Diff X	£8,616	70%	£7,584
Diff P	90%	75%	£8,004
#Errors	0	80%	£8,476
Filter Min		85%	£9,041
Filter Max		90%	£9,780
#Filtered	0	95%	£10,825

Sensitivity			
Rank	Name	Regr	Corr
#1	Risk IDC02 / \$B	0.655	0.641
#2	Risk IDC08 / \$B	0.166	0.148
#3	Risk IDC07 / \$B	0.070	0.051
#4	Risk IDC17 / \$B	0.058	0.051
#5	Risk IDC04 / \$B	0.043	0.030
#6	Risk IDE06 / \$B	0.037	0.030
#7	Risk IDC05 / \$B	0.033	0.040
#8	Risk IDE10 / \$B	0.032	0.023
#9	Risk IDC25 / \$B	0.029	0.023
#10	Risk IDC35 / \$B	0.029	0.037
#11	Risk IDA03 / \$B	0.027	0.021
#12	Risk IDA10 / \$B	0.026	0.024
#13	Risk IDC14 / \$B	0.024	0.019
#14	Risk IDA06 / \$B	0.022	0.031
#15	Risk IDC23 / \$B	0.017	0.005
#16	Risk IDC06 / \$B	0.016	0.008

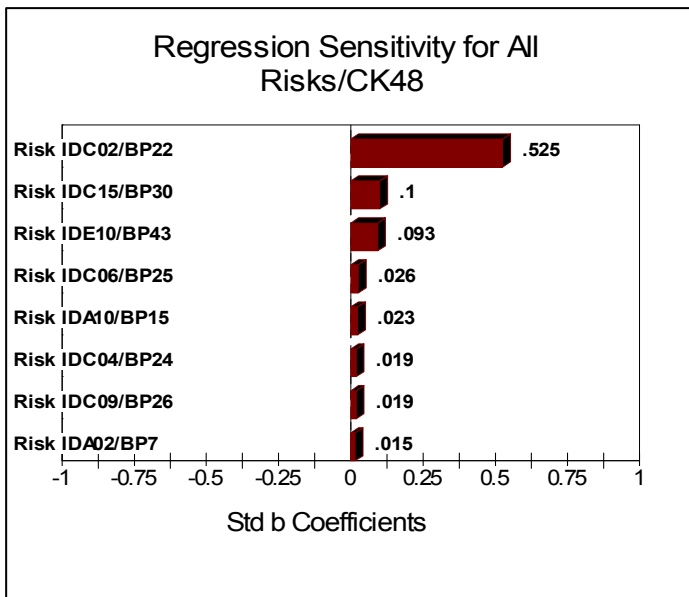
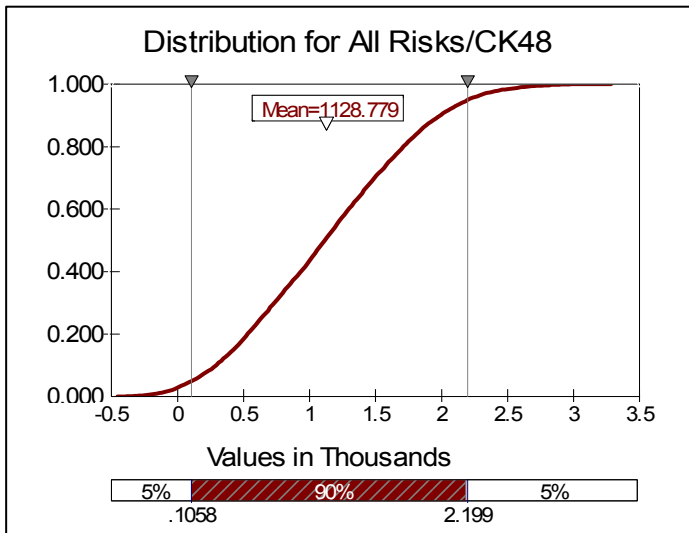
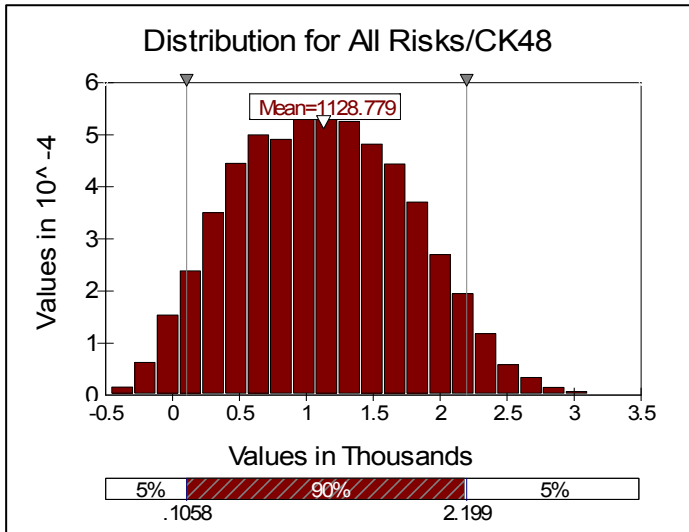
Risk ID	Context		Risk Description		Response Action Plan		Data for Quantitative Analysis (Cost £000)				Assumptions (for basis of cost and time assessment)	
	Risk Category	Risk Status	Risk Owner	Source of Risk	Consequence on Project	Specific Action	Probability (%)	Least Cost (£)	Most Likely Cost (£)	Max Cost (£)		
<b>Stage 1A - Risks Arising during Preparation and Submission of Bid for Programme Entry (and applicable to subsequent stages until closed)</b>												
A01	Management	Open	Client	Shortage of Council Funding for W/P1 prep costs	Lack of funding for consultant/specialist support = failure or delay to bid and project	Annual reports to the North Somerset Executive on major scheme funding to prioritise funding demands within the programme. Also work with Developers to secure their funding	50%	£50	£125	£250	A significant risk - requires developer funding for prep costs for ABL and CAL. Higher %, probability than LC scheme and higher costs	
A02	Management	Open	Client	Poor performance of Transport Term Consultants (Halcrow and Atkins)	Bids do not meet D/T criteria = delay to bid, threat to RFA funding and project, additional contribution required from council or re-bid required	Halcrow contract manager working one day per week in TP&P. Also additional MSBC-experienced Halcrow staff brought into the project team	10%	£50	£210	£630	Assumed 1 week, 1 month, 3 month delay respectively (on 6% construction inflation of £42m preferred scheme). No additional payments to the Term Consultant(s) would be made	
A03	Management	Open	Client	Inadequate project management effort/attention provided to complex project - DELAY and PM COST	Potentially results in slower pace of delivery & poorer quality results, could result in rejection by D/T.	Regular review of project management resources, control and roles/responsibilities	10%	£220	£655	£1,310	Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £42m preferred scheme). Assumed an extra £10k / £25k / £50k of NSC project management time respectively.	
A04	Management	Open	Client	Stakeholder engagement raises issues that need addressing - DELAY and PM COST (excluding statutory, members, public as elsewhere)	Delay as bid is re-structured and additional PM cost	Continue engagement with WAG and other suitable fora	10%	£215	£640	£1,275	Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £42m preferred scheme). No indication from current consultation that significant issues will arise, although still a risk ref request for a bus station and other unexpected objections. Objections to orders covered under 'C06'. Assumed an extra £5k / £10k / £15k of NSC project management time respectively.	
A05	Management	Open	Client	RFA status withdrawn and/or changed - DELAY and PM COST	Delay as bid is re-structured and additional PM cost	Contact SWRA secretariat in 2009; included in RFA2 Feb'09; submit bid for PE in Apr 09	25%	£220	£655	£1,310	Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £42m preferred scheme). Assumed an extra £10k / £25k / £50k of NSC project management time respectively.	
A06	Management	Open	Client	Bid not accepted by D/T (not a compliant bid or additional queries over 6 months in programme) - DELAY and PM COST	Delay as bid is re-structured and additional PM cost	Continue current approach of following guidance and keeping D/T informed through regular liaison meetings	25%	£220	£655	£1,310	Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £42m preferred scheme). Assumed an extra £10k / £25k / £50k of NSC project management and consultant time respectively.	
A07	Management	Open	Client	Change in transport legislation / policy or approach by D/T or other Government Departments	Delay to bids and additional resources to meet changed requirement	Review implications as new requirements become evident.	10%	£12	£50	£150	Assumed an extra £12k / £50k / £150k of NSC project management and consultant time respectively.	
A08	Political	Open	Client	Lack of Member support for the project - DELAY and PM COST	Delay as bid is re-structured and additional PM cost	Ongoing and regular dialogue with the Executive Member. Workshop with all Members invited.	10%	£55	£220	£645	Assumed 1 week / 1 month / 3 month delay respectively (on 6% construction inflation of £42m preferred scheme). Assumed an extra £5k / £10k / £15k of NSC project management time respectively.	
A09	Consultation	Open	Client	Not obtaining support/consents from public transport stakeholders (i.e. Network Rail, public transport operators) - DELAY and PM COST	Delay as bid is re-structured and additional PM cost	Continue dialogue and seek written support from public transport stakeholders	10%	£70	£205	£410	Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £12m ABL as part of preferred scheme). Assumed an extra £10k / £25k / £50k of NSC project management and consultant time respectively.	
A10	Consultation	Open	Client	Not obtaining support/consent from statutory consultees (e.g. HA, EA, EN) - DELAY and PM COST	Delay as bid is re-structured and additional PM cost	Contact all statutory consultees and seek written support for the bids. Continue meetings with HA	25%	£220	£655	£1,310	Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £42m preferred scheme). Additional project management costs included in P49a. Assumed an extra £10k / £25k / £50k of NSC project management and consultant time respectively.	
A11	Consultation	Open	Client	Lack of public / media support for project - DELAY and PM COST	Delay as bid is re-structured and additional PM cost	Further bespoke public consultation on Package elements as the project progresses.	10%	£55	£220	£645	Assumed 1 week / 1 month / 3 month delay respectively (on 6% construction inflation of £42m preferred scheme). Assumed an extra £5k / £10k / £15k of NSC project management time respectively.	
A12	Political	Open	Client	Changes of the Package composition and/or individual scheme elements - DELAY and PM COST	Delay as bid is re-structured and additional PM cost	Detail design and costing of Package components.	10%	£60	£235	£680	Assumed 1 week / 1 month / 3 month delay respectively (on 6% construction inflation of £42m preferred scheme). Assumed an extra £10k / £25k / £50k of NSC project management and consultant time respectively.	
<b>Stage 1B - Risks Arising after Submission of Bid for Programme Entry, to Programme Entry (and applicable to subsequent stages until closed)</b>												
B01	Management	Open	Client	Poor report from 4Ps Gateway Reviews - DELAY and PM COST	Threat of project failure or delay	Proactive project management to mitigate potential areas of concern	25%	£51	£107	£213	Assumed 1 week / 2 week / 1 month delay respectively (on 6% construction inflation of £42m preferred scheme). Assumed an extra £1k / £2k / £3k of NSC project management time respectively.	
B02	Management	Open	Client	General Election - DELAY COST	Delay in D/T decision making = delay to project in terms of Programme Entry if early election	None	10%	£210	£630	£1,260	Assumed 1 month / 3 month / 6 month delay respectively (on 6% construction inflation of £42m preferred scheme). No additional project management costs	
<b>Stage 2 - Risks Arising after Programme Entry and before Conditional Approval</b>												
C01	Technical	Open	Client	Unreliable scheme construction cost estimates (other than inflation)	Additional work on cost estimates = Delay to bids, additional resource, additional contribution required from council or re-bid required	Work up scheme details - to ensure that the estimates are as accurate as possible, use QA review positively.	10%	£100	£1,000	£3,000	Construction costs estimates now checked independently. Lowered to 5%. Additional construction costs only. No delay or additional PM costs not already covered elsewhere	
C02	Variability	Open	Client	Cost inflation either lower or higher than anticipated	Project cost may exceed Quantified Cost Estimate (QCE). NSC liability	Ensure robust estimates before submission of MSBC.	100%	£0	£0	£6,300	Cost of inflation varying from +3% (CPI) AND +3% (Construction). -1% to +2% (+5% to +8% in real terms) - all costs	
C03	Environmental	Open	Client	Finding protected species on sites (news badgers, bats etc) found after detailed enviro surveys as part of the EIA - DELAY, PM and MITIGATING MEASURE COST	Objection from statutory environmental bodies, requirement for mitigation measures = Delay and/or threat of failure for project	Surveys to take place spring 2010	25%	£21	£102	£253	No delay cost as surveys taking place Spring 2010. Assumed an extra £1k / £2k / £3k of NSC project management time respectively. Assumed cost of mitigation measures to be £20k / £100k / £250k respectively.	
C04	Technical	Open	Client	Problems in land acquisition (all schemes)	Requires negotiation or CPO = delay and cost to project	Need to confirm landowners and map highway boundaries against proposals, and consider modifications if necessary.	25%	£500	£250	£1,000	Estimate potential worst case land costs. Could also be a reduction in costs	
C05	Technical	Open	Client	Gifted land may have to be purchased (ABL only)	Additional cost and delay to the project delay and cost to project	Continued liaison with developers / landowners	25%	£100	£1,100	£2,200	Cost of land that may need to be purchased for ABL only	
C06	Technical	Open	Client	Additional processes over those allowed for (e.g. TRO, side road orders, planning permissions) - DELAY and PM COST	Requires consultation, negotiation, possibly Public Inquiry for ABL = threat of failure, delay and cost to project	Understand all Planning and Consent needs and their interactions and develop strategy for obtaining them	25%	£220	£655	£1,310	Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £42m preferred scheme). Assumed an extra £10k / £25k / £50k of NSC project management and consultant time respectively.	
C07	Ground Conditions	Open	Client	Airfield Bridge Link - Worse contaminated land on tip site than expected. MITIGATING MEASURE ONLY No additional delay or PM cost	Needs removal of spoil at extra cost and extra cost for disposal in Swindon landfill site	Early detailed land contamination survey, and design to reduce cost of land take / removal	50%	£100	£1,000	£2,000	Mitigating measure of additional treatment / disposal at licenced site over and above that in current base scheme costs	

Risk ID	Context		Risk Description		Response Action Plan		Data for Quantitative Analysis (Cost £000)				Assumptions (for basis of cost and time assessment)
	Risk Category	Risk Status	Risk Owner	Source of Risk	Consequence on Project	Specific Action	Probability (%)	Least Cost (£)	Most Likely Cost (£)	Max Cost (£)	
C08	Ground Conditions	Open	Client	Cross Airfield Link - Worse contaminated land on site than expected. MITIGATING MEASURE ONLY No additional delay or PM cost	Needs removal of spoil at extra cost and extra cost for disposal in Swindon landfill site	Early discussion with EA to determine their requirements. Basic cost of remedial added to scheme basic cost	50%	£500	£2,000	£5,000	Mitigating measure of additional treatment / disposal at licenced site over and above that in current base scheme costs
C09	Ground Conditions	Open	Client	Drove Roundabout - Worse contaminated land on site than expected. MITIGATING MEASURE ONLY No additional delay or PM cost	Needs removal of spoil at extra cost and extra cost for disposal in Swindon landfill site	Early detailed land contamination survey, and design to reduce cost of land take / removal	50%	£10	£50	£113	Mitigating measure of additional treatment / disposal at licenced site over and above that in current base scheme costs
C10	Ground Conditions	Open	Client	Worle Station - Worse contaminated land on site than expected. MITIGATING MEASURE ONLY No additional delay or PM cost	Needs removal of spoil at extra cost and extra cost for disposal in Swindon landfill site	Early detailed land contamination survey, and design to reduce cost of land take / removal	10%	£5	£20	£50	Mitigating measure of additional treatment / disposal at licenced site over and above that in current base scheme costs
C11	Ground Conditions	Open	Client	Airfield Bridge Link - Ground conditions worse than anticipated - DELAY, PM and MITIGATING MEASURE COST	Resulting in re-design, delays and cost increases to project	Piling chosen as part of the design. Also experience of other similar structures in the area. Commission early detailed site inspection	10%	£240	£485	£1,270	Assumed 3 month, 6 month, 12 month delay respectively (on 6% construction inflation of £12m ABL as part of preferred scheme). Assumed an extra £10k / £25k / £50k of NSC project management and consultant time respectively. Allowance for additional foundation works / piling
C12	Technical	Open	Client	Cross Airfield Link - Requirement for more attenuation measures for SuDS (drainage)	Additional cost to scheme	Early engagement of SuDS design specialists	25%	£100	£500	£1,000	Estimate of possible additional SuDS costs measures
C13	Technical	Open	Client	Inaccuracy of base mapping and land boundary/highway boundary information compared to that used for outline designs delay cost, additional PM costs and cost of new surveys	Resulting in re-design, delays and cost increases to project	Full detailed Topo Surveys to be done as part of detailed design (topo survey already done for ABL)	75%	£0	£0	£0	No delay cost as surveys to take place before detailed design commences
C14	Technical	Open	Client	Design item omission - e.g. small retaining walls (exc jct 21) - DELAY, PM and MITIGATING MEASURE COST	Additional design work & issues of variation claim by contractor	Detailed checks on design before tender.	25%	£85	£335	£880	Assumed 1 week / 1 month / 3 month delay respectively (on 6% construction inflation of £42m preferred scheme). Assumed an extra £10k / £25k / 50k of NSC project management and consultant time respectively. Cost of mitigating measures
C15	Technical	Open	Client	Construction of extended / modified embankments on either SW corner and/or NE of J21 requires special construction - DELAY, PM and MITIGATING MEASURE COST	Additional costs and delays	Consider design & construction issues in more detail.	50%	£107	£320	£755	Assumed 1 month, 6 month, 12 month delay respectively (on 6% construction inflation of £2m of Jc 21 as part of preferred scheme). Assumed an extra £10k / £25k / 50k of NSC project management and consultant time respectively. Cost of mitigating measures
C16	Technical	Open	Client	'White Light' units become a scheme requirement on Cross Airfield Link - ADDITIONAL PM AND MITIGATING MEASURE COSTS	Need for additional project management to resolve the issue and closer column spacing	Early review by experienced lighting engineers	25%	£2	£10	£30	Assumed an extra £1k / £5k / £10k of NSC project management and consultant time respectively. No significant delay costs expected. From CAL risk assessment. Cost of more lighting columns
C17	Technical	Open	Client	Airfield Bridge Link - bridge over rail line may need changes to design - DELAY, PM and MITIGATING MEASURE COST	Resulting in re-design, delays and cost increases to project	Proposed design needs early agreement with Network Rail	25%	-£300	£910	£2,420	Assumed 3 month, 6 month, 12 month delay respectively (on 6% construction inflation of £12m ABL as part of preferred scheme). Assumed an extra £20k / £50k / £100k of NSC project management and consultant time respectively. It may be possible to achieve a 20m span or have to increase this to 60m. Variance of -£500k, 500k, and £1.6m
C20	Technical	Open	Client	Need for 2 x Mast Arms for Traffic Signals for jct 21 slips - MITIGATING MEASURE	Cost increase to project	Detailed design on traffic signal head locations, design so signal heads can be seen from the middle lane on the slip roads	25%	£5	£15	£30	Cost of each additional signal mast-arm inc base and installation £15k. Two may be needed in Max cost (total £30k)
C21	Technical	Open	Client	Planning application for Gipsy site next to ABL (not yet determined)	Additional cost of compensation and/or mitigating measures	Early liaison with NSC Planning Officers to ensure any permission takes account of mitigating measures	25%	£10	£25	£50	Estimate of possible mitigating measures
C22	Technical	Open	Client	Airfield Bridge Link - problems with initially securing requisite line possessions - DELAY and PM COST	Resulting in delays and cost increases to project	Review position after appraisal of alternatives, seek early agreement with NR. Possibly up to a number of years ahead. Book up to (i.e. 8) weekend possessions if only 3 needed	10%	£361	£722	£1,443	Lead in time for possession - could be 5 years! But can be booked very early. Assumed 6 month, 12 month, 24 month delay respectively (on 6% construction inflation of £12m ABL as part of preferred scheme). Assumed an extra £1k / £2k / £3k of NSC project management time respectively. No cost of mitigating measures
C23	Procurement	Open	Client	HA requirements for construction procurement for Jct 21 only - ADDITIONAL PM COST	S278 agreement may add costs and time delays	Early discussion with HA	10%	£1	£2	£3	Officer time only - small. No additional delay cost or mitigating measures if addressed early enough
C24	Environmental	Open	Client	Discovery of noxious weeds - MITIGATING MEASURES (only)	Construction delays, extra costs & public concerns	Survey before construction to identify and eliminate delay & treat problem areas.	25%	£10	£30	£60	Based on cost of possible treatments. No delay or additional PM costs if surveys done early enough
C25	Technical	Open	Client	Cross Airfield Link - Risk of cars leaving CAL and ending up in Linear Lake.	Additional cost of safety barrier to linear lake (ref Safety Audit Stage 1). No additional PM or delay cost	Review early as part of detailed design	75%	£100	£350	£607	Cost review undertaken by Halcrow and verified by Cyril Sweett. Cost could be as much as 3796m @ £160/m (£607k)
C26	Technical	Open	Client	Cross Airfield Link - Risk of collisions between users of proposed Toucan crossings and vehicles using the CAL.	Upgrade the proposed Toucan crossings to dual staggered crossings (ref Stage 1 safety audit). No additional PM or delay cost	Review early as part of detailed design	75%	£40	£80	£120	Cost review undertaken by Halcrow and verified by Cyril Sweett. Additional cost of crossings £20k each.
C27	Technical	Open	Client	Cross Airfield Link - Risk of collisions between users on both roundabouts 2 and 3.	Upgrade the proposed roundabouts to larger size (ref Stage 1 safety audit). No additional PM or delay cost	Review early as part of detailed design	75%	£125	£175	£250	Cost review undertaken by Halcrow and verified by Cyril Sweett. Cost for each roundabout could be as high as £125k. Risk / costs ref roundabouts 1 and 4 to be borne by the developer.
C28	Technical	Open	Client	Cross Airfield Link - Risk of collisions between pedestrians and cyclists crossing roundabouts 3.	Add controlled crossings on the three arms of roundabout 3 (ref Stage 1 safety audit). No additional PM or delay cost	Review early as part of detailed design	75%	£30	£60	£90	Cost review undertaken by Halcrow and verified by Cyril Sweett. Costs split by 1 crossing (£30k), 2 crossings, or 3 crossings
C29	Technical	Open	Client	Cross Airfield Link - risk that the existing PROW cannot be diverted around the proposed linear lake due to objections etc	Requirement for a new footbridge / structure over the linear lake (ref Stage 1 safety audit). No additional PM or delay cost	Review early as part of detailed design	75%	£60	£60	£60	Cost review undertaken by Halcrow and verified by Cyril Sweett. Same cost assumed for all - either it is needed or it is not
C30	Technical	Open	Client	Cross Airfield Link - risk that the headroom of the proposed Rhyme culvert under the CAL is not sufficient.	Requirement for raising the carriageway, with additional earthworks and safety barrier (ref Stage 1 safety audit). No additional PM or delay cost	Review early as part of detailed design	50%	£50	£75	£100	Cost review undertaken by Halcrow and verified by Cyril Sweett.

Risk ID	Context		Risk Description			Response Action Plan		Data for Quantitative Analysis (Cost £000)				Assumptions (for basis of cost and time assessment)
	Risk Category	Risk Status	Risk Owner	Source of Risk	Consequence on Project	Specific Action	Probability (%)	Least Cost (£)	Most Likely Cost (£)	Max Cost (£)		
C31	Technical	Open	Client	Cross Airfield Link - Additional work required to existing Rhynes to enable CAL to be constructed	Additional work required to existing Rhynes. No additional PM or delay cost	Review early as part of detailed design	25%	£20	£60	£100	Cost estimate by Halcrow and verified by Cyril Sweett.	
C32	Technical	Open	Client	Cross Airfield Link - Encountering buried structures from previous land uses	Additional excavation work required. No additional PM or delay cost	Detailed survey as part of detailed design	25%	£10	£30	£50	Cost estimate by Halcrow and verified by Cyril Sweett.	
C33	Technical	Open	Client	Cross Airfield Link - Encountering archaeologically significant artefacts - DELAY and MITIGATING MEASURE	Archaeological survey required. No additional PM cost	Detailed survey as part of detailed design	25%	£55	£160	£320	Cost estimate by Halcrow and verified by Cyril Sweett. Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £10m CAL as part of preferred scheme).	
C34	Technical	Open	Client	Cross Airfield Link - risk of flooding of CAL from storm waters	Storm drainage infrastructure required. No additional PM cost	Review early as part of detailed design	25%	£50	£150	£300	Cost estimate by Halcrow and verified by Cyril Sweett.	
C35	Technical	Open	Client	Cross Airfield Link - rise in landfill tax (could increase at £8t/year to 2013)	Additional cost of disposal of material. No additional PM cost	Review early as part of detailed design and reuse on site wherever possible (such as ABL)	25%	£100	£300	£640	Cost estimate by Halcrow and verified by Cyril Sweett. 16000t at £8t/year to 2013 = £640k. Percentage only 25% as a good chance of re-use elsewhere on site and may not be as high increase as this	
C36	Technical	Open	Client	Cross Airfield Link - rise in aggregate tax (could be 40p increase per m3 to 2013)	Additional cost of aggregates. No additional PM cost	Review early as part of detailed design	50%	£2	£8	£16	Cost estimate by Halcrow and verified by Cyril Sweett. 38887m3 assume 40p increase per m3 to 2013.	
<b>Stage 3 - Risks Arising between Conditional Approval and Full Approval (Procurement)</b>												
D01	Technical	Open	Client	Slower and/or different pace of development due to recession	Potential developer contributions reduced = Undermines the rationale for the project	Promote the benefits of Weston for employment-led regeneration.	80%	£0	£0	£0	No mitigating measures	
<b>Stage 4 - Risks Arising During Construction</b>												
E01	Technical	Open	Client	Airfield Bridge Link - problems with utilising line possessions during construction (including on the night) - DELAY, PM and MITIGATING MEASURE COST	Resulting in delays (need to secure alternative possessions) and cost increases to project	Delay cost inc constructions teams and equipment (cranes etc)	75%	£51	£102	£203	Based on cost of re-hiring construction equipment and extra construction staff costs. Based on advice from NSC and experience elsewhere. Relatively little extra NSC PM costs. 10% probability only of payment needed to NR. Cancelled line possessions much more likely to be by NR than NSC	
E02	Technical	Open	Client	Airfield Bridge Link and Cross Airfield Link - Wartime bombs on site - DELAY, PM and MITIGATING MEASURE COST	Delay to programme, additional PM cost and costs associated with removal	Early survey of wartime records and liaison with MoD on mitigating measures	20%	£34	£67	£133	Assumed 1 week / 2 week / 1 month delay respectively (on 6% construction inflation of £22m preferred scheme - CAL and ABL).	
E03	Environmental	Open	Client	Pollution of watercourses from construction activity	Extra costs, legal action delays to programme	Ensure contractor takes pre-emptive action. Also ensure contractors have responsibility in the contracts	10%	£1	£2	£3	Small cost to NSC. No significant delay costs, and mitigating measures to be taken by the contractor. Assumed an extra £1k / £2k / £3k of NSC project management time respectively. No cost of mitigating measures	
E04	Impact	Open	Client	Traffic delays during construction of on highway improvements	Construction delays, extra costs & public concerns	Prepare construction traffic management plan & advance publicity.	10%	£5	£20	£40	Assume off-peak working on critical sections (Jct 21 and Gateway) at extra cost. No significant delay costs or additional PM costs	
E05	Delivery	Open	Client	Shortage of materials or skilled labour (2012 - 2015)	Delay to programme	No specific action appropriate, but keep under review	10%	£0	£0	£0	Assume zero at present given the current economic situation and likely availability of labour in 2011 onwards (post Olympics construction). Keep in so it can be regularly reviewed	
E06	Technical	Open	Client	Unidentified utilities encountered during construction	Delay to programme, redesign & extra costs	Full searches on utility companies have been done. Possibly liaison with local utilities staff as well	50%	£100	£250	£1,000	The potential costs of additional diversions considered to be £100k / £250k / £1000k. Mainly mitigating measures but includes a small allowance for delay and additional PM costs	
E07	Technical	Open	Client	Delay in diversion of utilities - DELAY and PM COST	Delay in Programme	Seek early programming	10%	£211	£632	£1,263	Assumed 1 month / 3 month / 6 month delay respectively (on 6% construction inflation of £42m preferred scheme). Assumed an extra £1k / £2k / £3k of NSC project management time respectively. No cost of mitigating measures	
E08	Environmental	Open	Client	Adverse weather (risk of flooding of works etc)	Delay in Programme	To take into account in contract conditions so the contractor is liable and prepare contingency plans	10%	£0	£0	£0	Cost to be taken into account in contract and in costing estimates. No additional PM or delay costs	
E09	Technical	Open	Client	Contractor misses TMA booking for works	Delay to programme, redesign & extra costs	Early programming and discussion with Traffic Manager. Contracts to ensure this cost is taken by the contractor	10%	£0	£0	£0	No cost to NSC, cost to be borne by contractor	
E10	Delivery	Open	Client	Less construction work able to take place at M5 Jct 21 in the daytime than anticipated. DELAY, PM and MITIGATING MEASURE COST	Need for more night working	Early planning with the HA and other network stakeholders on permitted dayworking and measures to reduce impact on traffic during weekends, holidays, busy periods. Need for extra payments to contractors for night time working	50%	£531	£912	£1,223	Assumed 3 months, 6 months, 12 months delay respectively (on 6% construction inflation of £2m o Jct 21). Assumed an extra £1k / £2k / £3k of NSC project management time respectively. Night time working extra pay premium and need for additional lighting and site management £500k, £850k and £1,100 respectively	

DASHBOARD INFORMATION	59	Open Risks
	34	Closed Risks
	93	

## Simulation Results for All Risks / CK48 - WP1 Low Cost Option



Summary Information	
Workbook Name	C) Risk Register (v11LC-
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	34
Number of Outputs	2
Sampling Type	Monte Carlo
Simulation Start Time	08/04/2009 19:10
Simulation Stop Time	08/04/2009 19:10
Simulation Duration	00:00:36
Random Seed	1

Summary Statistics			
Statistic	Value	%tile	Value
Minimum	-£454	5%	£106
Maximum	£3,281	10%	£291
Mean	£1,129	15%	£423
Std Dev	£644	20%	£531
Variance	415170.7685	25%	£633
Skewness	0.142595534	30%	£734
Kurtosis	2.447865234	35%	£832
Median	£1,117	40%	£936
Mode	£1,499	45%	£1,026
Left X	£106	50%	£1,117
Left P	5%	55%	£1,205
Right X	£2,199	60%	£1,297
Right P	95%	65%	£1,395
Diff X	£2,093	70%	£1,489
Diff P	90%	75%	£1,599
#Errors	0	80%	£1,710
Filter Min		85%	£1,835
Filter Max		90%	£1,989
#Filtered	0	95%	£2,199

Sensitivity			
Rank	Name	Regr	Corr
#1	Risk IDC02 / \$B	0.525	0.500
#2	Risk IDC15 / \$B	0.100	0.093
#3	Risk IDE10 / \$B	0.093	0.086
#4	Risk IDC06 / \$B	0.026	0.020
#5	Risk IDA10 / \$B	0.023	0.016
#6	Risk IDC04 / \$B	0.019	0.017
#7	Risk IDC09 / \$B	0.019	0.023
#8	Risk IDA02 / \$B	0.015	0.015
#9	Risk IDA01 / \$B	0.000	0.010
#10	Risk IDA03 / \$B	0.000	0.004
#11	Risk IDA04 / \$B	0.000	-0.009
#12	Risk IDA05 / \$B	0.000	0.012
#13	Risk IDA06 / \$B	0.000	0.011
#14	Risk IDA07 / \$B	0.000	-0.003
#15	Risk IDA08 / \$B	0.000	-0.003
#16	Risk IDA09 / \$B	0.000	0.004

Risk ID	Context		Risk Description		Response Action Plan		Data for Quantitative Analysis (Cost £000)				Assumptions (for basis of cost and time assessment)	
	Risk Category	Risk Status	Risk Owner	Source of Risk	Consequence on Project	Specific Action	Probability (%)	Least Cost (£)	Most Likely Cost (£)	Max Cost (£)		
<b>Stage 1A - Risks Arising during Preparation and Submission of Bid for Programme Entry (and applicable to subsequent stages until closed)</b>												
A01	Management	Open	Client	Shortage of Council Funding for WP1 prep costs	Lack of funding for consultant/specialist support = failure or delay to bid and project	Annual reports to the North Somerset Executive on major scheme funding to prioritise funding demands within the programme. Also work with Developers to secure their funding	10%	£12	£50	£150	Risk now very low for LC	
A02	Management	Open	Client	Poor performance of Transport Term Consultants (Halcrow and Atkins)	Bids do not meet DT criteria = delay to bid, threat to RFA funding and project, additional contribution required from council or re-bid required	Halcrow contract manager working one day per week in TP&P. Also additional MSBC-experienced Halcrow staff brought into the project team	10%	£12	£50	£150	Assumed 1 week, 1 month, 3 month delay respectively (on 6% construction inflation of £10m low cost scheme). No additional payments to the Term Consultant(s) would be made	
A03	Management	Open	Client	Inadequate project management effort/attention provided to complex project - DELAY and PM COST	Potentially results in slower pace of delivery & poorer quality results, could result in rejection by DT.	Regular review of project management resources, control and roles/responsibilities	10%	£52	£155	£310	Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £10m low cost scheme). Assumed an extra £2k / £5k / £10k of NSC project management time respectively.	
A04	Management	Open	Client	Stakeholder engagement raises issues that need addressing - DELAY and PM COST (excluding statutory, members, public as elsewhere)	Delay as bid is re-structured and additional PM cost	Continue engagement with WAG and other suitable fora	10%	£51	£152	£303	Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £10m low cost scheme). No indication from current consultation that significant issues will arise, although still a risk ref request for a bus station and other unexpected objections. Objections to Orders covered under 'CO6'. Assumed an extra £1k / £2k / £3k of NSC project management time respectively.	
A05	Management	Open	Client	RFA status withdrawn and/or changed - DELAY and PM COST	Delay as bid is re-structured and additional PM cost	Contact SWRA secretariat in 2009; included in RFA2 Feb09; submit bid for PE in Apr 09	10%	£60	£175	£350	Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £10m low cost scheme). Assumed an extra £10k / £25k / £50k of NSC project management time respectively.	
A06	Management	Open	Client	Bid not accepted by DT (not a compliant bid or additional queries over 6 months in programme) - DELAY and PM COST	Delay as bid is re-structured and additional PM cost	Continue current approach of following guidance and keeping DT informed through regular liaison meetings	25%	£60	£175	£350	Assumed 1 month / 3 months / 6 month delay respectively (on 6% construction inflation of £10m low cost scheme). Assumed an extra £10k / £25k / £50k of NSC project management and consultant time respectively.	
A07	Management	Open	Client	Change in transport legislation / policy or approach by DT or other Government Departments	Delay to bids and additional resources to meet changed requirement	Review implications as new requirements become evident. Submit before Apr 09 to avoid mandatory changes	10%	£10	£25	£50	Assumed an extra £10k / £25k / £50k of NSC project management and consultant time respectively.	
A08	Political	Open	Client	Lack of Member support for the project - DELAY and PM COST	Delay to bid and project and additional PM cost	Ongoing and regular dialogue with the Executive Member. Workshop with all Members invited.	10%	£13	£52	£153	Assumed 1 week / 1 month / 3 month delay respectively (on 6% construction inflation of £10m low cost scheme). Assumed an extra £1k / £2k / £3k of NSC project management time respectively.	
A09	Consultation	Open	Client	Not obtaining support/consents from public transport stakeholders (i.e. Network Rail, public transport operators) - DELAY and PM COST	Delay to bid and project and additional PM cost	Continue dialogue and seek written support from public transport stakeholders	10%	£55	£160	£315	Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £10m of low cost scheme). Assumed an extra £5k / £10k / £15k of NSC project management and consultant time respectively.	
A10	Consultation	Open	Client	Not obtaining support/consent from statutory consultees (e.g. HA, EA, EN) - DELAY and PM COST	Delay to bid and project and additional PM cost	Contact all statutory consultees and seek written support for the bids. Continue meetings with HA	25%	£52	£155	£310	Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £10m of LC scheme). Assumed an extra £2k / £5k / £10k of NSC project management and consultant time respectively.	
A11	Consultation	Open	Client	Lack of public / media support for project - DELAY and PM COST	Delay to bid and project and additional PM cost	Further bespoke public consultation on Package elements as the project progresses.	10%	£17	£60	£165	Assumed 1 week / 1 month / 3 month delay respectively (on 6% construction inflation of £10m low cost scheme). Assumed an extra £5k / £10k / £15k of NSC project management time respectively.	
A12	Political	Open	Client	Changes of the Package composition and/or individual scheme elements - DELAY and PM COST	Delay to bid and project and additional PM cost	Detail design and costing of Package components.	10%	£22	£75	£200	Assumed 1 week / 1 month / 3 month delay respectively (on 6% construction inflation of £10m low cost scheme). Assumed an extra £10k / £25k / £50k of NSC project management and consultant time respectively.	
<b>Stage 1B - Risks Arising after Submission of Bid for Programme Entry, to Programme Entry (and applicable to subsequent stages until closed)</b>												
B01	Management	Open	Client	Poor report from 4Ps Gateway Reviews - DELAY and PM COST	Threat of project failure or delay	Proactive project management to mitigate potential areas of concern	10%	£13	£26	£53	Assumed 1 week / 2 week / 1 month delay respectively (on 6% construction inflation of £10m LC option). Assumed an extra £1k / £2k / £3k of NSC project management time respectively. 10% only for LC Option	
B02	Management	Open	Client	General Election - DELAY COST	Delay in DT decision making = delay to project in terms of Programme Entry if early election	None	10%	£50	£150	£300	Assumed 1 month / 3 month / 6 month delay respectively (on 6% construction inflation of £10m Low Cost scheme). No additional project management costs	
<b>Stage 2 - Risks Arising after Programme Entry and before Conditional Approval</b>												
C01	Technical	Open	Client	Unreliable scheme construction cost estimates (other than inflation)	Additional work on cost estimates = Delay to bids, additional resource, additional contribution required from council or re-bid required	Work up scheme details - to ensure that the estimates are as accurate as possible, use QA review positively.	10%	£100	£250	£500	Construction costs estimates now checked independently. Lowered to 10%. Additional construction costs only. No delay or additional PM costs not already covered elsewhere	
C02	Variability	Open	Client	Cost inflation either lower or higher than anticipated	Project cost may exceed Quantified Cost Estimate (QCE) - NSC liability	Ensure robust estimates before submission of MSBC.	100%	-£600	£0	£1,260	Cost of inflation varying from +3% (CPI) AND +3% (Construction). -1% to +2% (+5% to +8% in real terms) - all costs	
C03	Environmental	Open	Client	Finding protected species on sites (news, badgers, bats etc) found after detailed enviro surveys as part of the EIA - PM and MITIGATING MEASURE COSTS	Objection from statutory environmental bodies. Requirement for mitigation measures = Delay and/or threat of failure for project. Need for additional project management to resolve the issue. Requirement for mitigation measures	Surveys to take place spring 2010	25%	£11	£52	£103	No delay cost as surveys taking place Spring 2010. Assumed an extra £1k / £2k / £3k of NSC project management time respectively. Assumed cost of mitigation measures to be £10k / £50k / £100k respectively.	
C04	Technical	Open	Client	Problems in land acquisition (all schemes)	Requires negotiation or CPO = delay and cost to project	Need to confirm landowners and map highway boundaries against proposals, and consider modifications if necessary.	25%	-£100	£50	£200	Estimate potential worst case land costs. Could also be a reduction in costs	
C06	Technical	Open	Client	Additional processes over those allowed for (e.g. TRO, side road orders, planning permissions) - DELAY and PM COST	Requires consultation, negotiation, etc - threat of delay and cost to project	Understand all Planning and Consent needs and their interactions and develop strategy for obtaining them	25%	£55	£162	£325	Assumed 1 month, 3 month, 6 month delay respectively (on 6% construction inflation of £10m Low Cost Scheme). Assumed an extra £5k / £12k / £25k of NSC project management and consultant time respectively.	
C09	Ground Conditions	Open	Client	Drove Roundabout - Worse contaminated land on site than expected. MITIGATING MEASURE ONLY No additional delay or PM cost	Needs removal of spoil at extra cost and extra cost for disposal in Swindon landfill site	Early detailed land contamination survey, and design to reduce cost of land take / removal	50%	£10	£50	£113	Mitigating measure of additional treatment / disposal at licenced site over and above that in current base scheme costs [£112.5k in the base cost]	
C10	Ground Conditions	Open	Client	Worle Station - Worse contaminated land on site than expected. MITIGATING MEASURE ONLY No additional delay or PM cost	Needs removal of spoil at extra cost and extra cost for disposal in Swindon landfill site	Early detailed land contamination survey, and design to reduce cost of land take / removal	10%	£5	£20	£50	Mitigating measure of additional treatment / disposal at licenced site over and above that in current base scheme costs	

Risk ID	Context		Risk Description		Response Action Plan		Data for Quantitative Analysis (Cost £000)				Assumptions (for basis of cost and time assessment)	
	Risk Category	Risk Status	Risk Owner	Source of Risk	Consequence on Project	Specific Action	Probability (%)	Least Cost (£)	Most Likely Cost (£)	Max Cost (£)		
<b>Stage 1A - Risks Arising during Preparation and Submission of Bid for Programme Entry (and applicable to subsequent stages until closed)</b>												
C13	Technical	Open	Client	Inaccuracy of base mapping and land boundary/highway boundary information compared to that used for outline designs delay cost, additional PM costs and cost of new surveys	Resulting in re-design, delays and cost increases to project	Full detailed Topo Surveys to be done as part of detailed design (topo survey already done for ABL)	75%	£0	£0	£0	No delay cost as surveys are to take place before detailed design commences. Keep in to ensure the risk is addressed	
C14	Technical	Open	Client	Design item omission - e.g. small retaining walls (exc Jct 21) - DELAY, PM and MITIGATING MEASURE COST	Additional design work & issues of variation claim by contractor, including PM cost and cost of the new measures	Detailed checks on design before tender.	25%	£119	£75	£200	Assumed 1 week / 1 month / 3 month delay respectively (on 6% construction inflation of £10m Low Cost). Assumed an extra £2k / £5k / £10k of NSC project management and consultant time respectively. Also cost of mitigating measures	
C15	Technical	Open	Client	Construction of extended / modified embankments on either SW corner and/or NE of J21 requires special construction - DELAY, PM and MITIGATING MEASURE COST	Additional costs and delays	Consider design & construction issues in more detail.	50%	£107	£320	£755	Assumed 1 week, 1 month, 3 months delay respectively (on 6% construction inflation of £2m of Jct 21 as part of LC scheme). Assumed an extra £5k / £10k / £25k of NSC project management and consultant time respectively. Also cost of mitigating measures	
C20	Technical	Open	Client	Need for 2 x Mast Arms for Traffic Signals for Jct 21 slips - MITIGATING MEASURE	Cost increase to project	Detailed design on traffic signal head locations, design so signal heads can be seen from the middle lane on the slip roads	25%	£5	£15	£30	Cost of each additional signal mast-arm inc base and installation £15k. Two may be needed in Max cost (total £30k)	
C23	Procurement	Open	Client	HA requirements for construction procurement for Jct 21 only - ADDITIONAL PM COST	S278 agreement may add costs and time delays	Early discussion with HA	10%	£1	£2	£3	Officer time only - small. No additional delay cost or mitigating measures if addressed early enough	
C24	Environmental	Open	Client	Discovery of noxious weeds - MITIGATING MEASURES (only)	Construction delays, extra costs & public concerns	Survey before construction to identify and eliminate delay & treat problem areas.	25%	£1	£2	£4	Based on cost of possible treatments. No delay or additional PM costs if surveys done early enough	
<b>Stage 3 - Risks Arising between Conditional Approval and Full Approval (Procurement) - None not already noted above</b>												
<b>Stage 4 - Risks Arising During Construction</b>												
E03	Environmental	Open	Client	Pollution of watercourses from construction activity	Extra costs, legal action delays to programme	Ensure contractor takes pre-emptive action. Also ensure contractors have responsibility in the contracts	10%	£1	£2	£3	Small cost to NSC. No significant delay costs, and mitigating measures to be taken by the contractor	
E04	Impact	Open	Client	Traffic delays during construction of on highway improvements	Construction delays, extra costs & public concerns	Prepare construction traffic management plan & advance publicity.	10%	£5	£20	£40	Assume off-peak working on critical sections (Jct 21) at extra cost. No significant delay costs or additional PM costs	
E05	Delivery	Open	Client	Shortage of materials or skilled labour (2012 - 2015)	Delay to programme	No specific action appropriate, but keep under review	10%	£0	£0	£0	Assume zero at present given the current economic situation and likely availability of labour in 2011 onwards (post Olympics construction). Keep in so it can be regularly reviewed	
E06	Technical	Open	Client	Unidentified utilities encountered during construction	Delay to programme, redesign & extra costs	Full searches on utility companies have been done. Possibly liaison with local utilities staff as well	50%	£20	£50	£100	The potential costs of additional diversions considered to be £20k / £50k / £100k. Mainly mitigating measures but includes a small allowance for delay and additional PM costs	
E07	Technical	Open	Client	Delay in diversion of utilities - DELAY and PM COST	Delay in Programme	Seek early programming	10%	£13	£52	£153	Assumed 1 week / 1 month / 3 month delay respectively (on 6% construction inflation of £10m low cost scheme). Assumed an extra £1k / £2k / £3k of NSC project management time respectively. No cost of mitigating measures	
E08	Environmental	Open	Client	Adverse weather (risk of flooding of works etc)	Delay in Programme	To take into account in contract conditions so the contractor is liable and prepare contingency plans	10%	£0	£0	£0	Cost to be taken into account in contract and in costing estimates. No additional PM or delay costs	
E09	Technical	Open	Client	Contractor misses TMA booking for works	Delay to programme, redesign & extra costs	Early programming and discussion with Traffic Manager. Contracts to ensure this cost is taken by the contractor	10%	£0	£0	£0	No cost to NSC, cost to be borne by contractor	
E10	Delivery	Open	Client	Less construction work able to take place at M5 Jct 21 in the daytime than anticipated. DELAY, PM and MITIGATING MEASURE COST	Need for more night working	Early planning with the HA and other network stakeholders on permitted dayworking and measures to reduce impact on traffic during weekends, holidays, busy periods. Need for extra payments to contractors for night time working	50%	£531	£912	£1,223	Assumed 3 months, 6 months, 12 months delay respectively (on 6% construction inflation of £2m of Jct 21). Assumed an extra £1k / £2k / £3k of NSC project management time respectively. Night time working extra pay premium and need for additional lighting and site management £500k, £850k and £1,100 respectively	

DASHBOARD INFORMATION	35	Open Risks
	27	Closed Risks
	62	