

Lessons learned from one of New Zealand's most challenging civil engineering projects: rebuilding the earthquake damaged pipes, roads, bridges and retaining walls in the city of Christchurch 2011 - 2016.

Risk Management Plan

Story: SCIRT Management Plans

Theme: The SCIRT Model

A plan which defines the risk and opportunity management activities to be applied by SCIRT to meet SCIRT objectives.

This document has been provided as an example of a tool that might be useful for other organisations undertaking complex disaster recovery or infrastructure rebuild programmes.

For more information about this document, visit www.scirtlearninglegacy.org.nz



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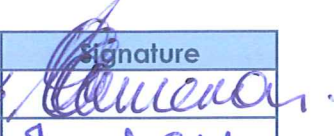
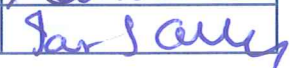
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Risk Management Plan

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ACRONYMS, ABBREVIATIONS AND DEFINITIONS

Term	Definition
AA	Alliance Agreement
Board	(Refer SCIRT Board)
CCC	Christchurch City Council
EOC	Estimated Out-turn Cost
GM	General Manager
IRMO	Infrastructure Rebuild Management Office
IST	Integrated Services Team
NZTA	New Zealand Transport Agency
NOP	Non-Owner Participant
P50	Probability that this outcome will occur 50% of the time
SCIRT	Stronger Christchurch Infrastructure Rebuild Team
SCIRT Board	The Alliance Leadership Team as identified in the Alliance Agreement
SQE	Safety Quality and Environment
TOC	Target Out-turn Cost

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Risk is a combination of the impact and likelihood of an unplanned outcome. The outcome may be desirable or undesirable so this definition encompasses both opportunities and threats.

Threats are a source of potential harm or a situation with a potential to cause loss.

Opportunities are events or situations with the potential to beneficially impact the achieving of objectives.

Risk Assessment is the formalised process of evaluating the impact and likelihood of identified threats and opportunities, together with the development of strategies as appropriate for preventative and contingent actions.

1 INTRODUCTION

1.1 PURPOSE

The purpose of this plan is to define what Risk and Opportunity Management activities are to be applied to the Stronger Christchurch Infrastructure Rebuild Team (SCIRT) and how those activities are to be undertaken to meet SCIRT objectives.

1.2 OBJECTIVES

Achievement of the Alliance Agreement (AA) objectives requires astute management of risks and opportunities.

The objective of this procedure is to provide for continual reduction in adverse residual risk throughout the life of the rebuild programme by way of risk identification, hazard elimination and minimisation of hazard consequences.

A second objective is effective and efficient management of risk cost provisions and time provisions to support quality forecasting of Projects' Out-turn Cost and Completion Date.

1.3 REQUIREMENTS

There are no specific requirements imposed by the client in the AA or by legislation.

The risk of breaching regulatory requirements must be considered in application of this plan e.g. Resource Management Act, Building Act, Canterbury Earthquake Recovery Act, and Local Government Act.

1.4 RELATIONSHIP TO OTHER MANAGEMENT PLANS

The Risk and Opportunity Management Plan has the potential to interface with all other management plans in the set because the risk register is the centralised tool for the management of risks and opportunities which could arise in any aspect of the programme.

The Financial Management Plan has a direct interface with this Risk and Opportunity Management Plan as the Programme Out-turn Cost Forecasting and Delivery TOC setting processes within that plan require the determination of specific risk allowances. The risk registers developed in accordance with this plan are required to inform those financial processes.

The Health and Safety Plan has a special interface with this plan due to the potential overlap of the Hazard Register and the Risk Register. Special attention must be paid to this interface to avoid duplication or misalignment. A similar situation can arise with any Environmental Hazard Register so this must also be managed.

Many risk treatment actions will involve insurance the management of which is within the scope of the Financial Management Plan. Many more risk treatment actions will

need to be managed during the construction process which requires close interface with the Construction Management Plan.

It is also important to recognise the role of the "Zero Harm in Design" review process contained within the Design Management Plan, which includes risk identification assessment and control processes. Liaison is needed to ensure those processes fit with this plan.

2 RISK MANAGEMENT STRATEGY

2.1 BACKGROUND

These processes are an adapted combination of the existing processes of a number of the Alliance participants created to meet the specific needs of this programme described below:

- the progressive elaboration of the scope of work as an outcome of investigation activities on the four networks overlain with the influence of the Horizontal Infrastructure Recovery Strategy. This offers a greater prospect than usual, that risks will only be progressively understood rather than substantially identified at the outset.
- the unique rebuild programme delivery model with a mix of centralised activities undertaken by the Integrated Service Team and construction activities undertaken by Delivery Teams provided by the Non-owner Participant Organisations.
- this being a programme of numerous projects over an extended period which offers the prospect of buffering of risk more towards an "expected" overall outcome (P50) when compared to the potential range of influence risk might have on a stand-alone project.
- the allocation of projects amongst the Delivery Teams being a key mechanism within the commercial framework to encourage performance over the full spectrum of key result areas, with one of the measures of performance being actual out-turn cost versus target out-turn cost. This means clarity on the extent to which risk provisions are provided within those targets is important.

2.2 RISK MANAGEMENT FRAMEWORK

Risk within the programme will be managed at the following levels

- Programme level
- Project level
- Project groupings (such as central city)

The risks and their associated provisions will be tracked in Risk Registers. An overarching programme risk register will be developed and maintained for the full duration of the rebuild programme and a project risk register will be developed for each project and maintained for the duration of the project.

2.3 TOC RISK PROVISIONS

Quantitative estimates of risk event consequential costs will be stated in Risk Registers and analysed using mathematical methods to arrive at an appropriate Risk Provisions to allow in Target Out-turn Costs (TOCs) for projects and in the Programme Estimated Out-turn cost (EOC).

2.4 PROGRAMME RISKS

The SCIRT Management Team, in consultation with the Board will manage programme level risks which will include risks that are non-project specific or generic to all projects and more effectively managed at the programme level.

The Management Team will identify and assess these risks by means including joint workshops with the Board and reference to risks assessments carried out previously by IRMO and others. The risks will be collated onto a Programme Risk Register that will also outline risk ranking, required control measures, measure owners and cost provisions.

Once established, the Programme Risk Register will be reviewed and updated regularly with key risks elevated for review by the Board. A key objective of these reviews will be to confirm that the required control measures have been put in place and are effective.

2.5 PROJECT RISKS

Project Risk Registers will employ the same format as the Programme Risk Register and will be initiated as soon as projects are defined and the Design Manager and Delivery Managers jointly will ensure that these are developed during the design process to the level of detail necessary to quantify the risk provision to be included in the construction TOCs. Workshops will be held for this purpose during both Concept and Detailed Design phases and will be attended by designers, constructors, owner representatives, functional managers and others as required to ensure comprehensive risk identification and assessment. The Project ECI team will conduct a final review and revision of the Project Risk Register before presenting it to the TOC Team.

Once the project has been allocated for construction, the Delivery Team it has been allocated to becomes responsible for maintaining and updating the Project Risk Register. As the project proceeds the risk register will be updated by the Delivery Team to ensure that as risks pass, the reduction in aggregate risk exposure is recognised. Also as previously unforeseen risks are discovered these will be added.

The Delivery Team will be responsible for the implementation of risk control measures for their projects. Each Project Risk Register will be reviewed and updated on a regular basis with key risks elevated for review at Management Team and/or Board level. A primary objective of these reviews will be to confirm that the required control measures have been put in place and are effective.

Construction TOCs will generally be based on the first-time success of the assumed methodology with specific allowance for departures from these assumptions via risk provisions clearly identified in the TOC build up. Should significant risk or opportunity events eventuate, the TOC figure may need to be reset to a higher or lower value to

continue to provide a fair delivery cost target for the Delivery Team cost performance to be measured.

When risks eventuate, the Delivery Team will be responsible for tracking of the additional costs. A change to the TOC, if required, will be administered in accordance with the Work Scope change process detailed in the Financial Management Plan.

2.6 PROJECT OPERATIONAL RISKS

Project operational risks relating to construction sites concerning health, safety and environment are managed through the Health and Safety and the Environmental management plans, respectively.

2.7 PROJECT AREA REGISTER

Where a need is identified to report to a group of stakeholders then a subset of the projects may be used for reporting purposes. These will be a copy from either the programme or project level risk registers as these will always be the most up to date record of truth.

The intensive work in the central city during 2013/14 generated the need for a risk register which was used to keep relevant stakeholders informed for this specific part of the programme.

3 RISK ASSESSMENT PROCESS

This procedure describes the risk assessment and control planning process to be implemented for both programme and project level risks.

This procedure is consistent with the principles defined in AS/NZ 4360:2004. It encompasses:

- Risk identification (hazard, cause and consequence)
- Risk registers (development and monitoring)
- Risk assessment (ranking pre and post cause and consequence mitigation)
- Risk mitigation and control (allocation of responsibility, action plans)

The process requires steps to be undertaken as follows and its central document is the Risk Register.

3.1 RISK (THREAT OR OPPORTUNITY) IDENTIFICATION

Identify all threats and opportunities associated with the programme or project, their causes and consequences for each of the programme's key result areas.

Threat/opportunity identification is the process of determining what may happen, where, when, why and how. It encompasses determination of the potential causes and consequences of the threat/opportunity together with identification of the threat/opportunity itself.

Essentially, every person involved in the rebuild programme is responsible for threat/opportunity identification and input in this respect is to be drawn from as many sources as reasonably possible.

This process may involve outside agencies and stakeholders such as the Client, local authorities, designers and other consultants.

The tools and techniques used to identify threats/opportunities include:

3.1.1 Checklists

Using generic checklists, such as the Prompt List appended to the NZTA Risk Management Process Manual, can help in threat/opportunity identification, but such lists are not to be taken as complete lists of typical project risks or used as a substitute for programme or project focussed workshops

For the initial development of SCIRT Risk Registers, reference was made to risk registers prepared for the rebuild works by Asset Owners, IRMO and their consultants prior to SCIRT taking responsibility for programme management.

3.1.2 Workshops

Multidisciplinary workshops involving experienced and well-informed participants will be used to identify risks. These will be planned and formal, and include personnel covering all aspects of the project (estimating, engineering, commercial, construction, operations, communications, consenting and safety, quality and environment). They will be chaired by either an experienced facilitator or a person well familiar with work of the nature of the programme or project.

Workshops involving the Management Team and Board will identify programme level risks. The project design process requires two constructability and risk workshops, one for each of the concept and detailed design stages, to identify project risks.

3.1.3 Judgements Based on Experience and Records

Judgements based on experience are a key element in the identification of risks. It should be recognised, however, that past experience and records may not indicate the total range of possibilities. Each project must be considered uniquely in its own right. Questions asked will include: "What could go wrong?" and "How could it go wrong?" "What opportunities are available?"

3.2 RISK REGISTER ENTRY

All threats/opportunities, as and when identified, are entered into the appropriate Risk Register and given a unique reference number relevant to the section into which they have been placed.

Risks are classified as emerging (E), live (L), parked (P) or closed (C) (as defined in the NZTA Risk Management Process Manual) and their associated causes and consequences are added to the register. The number of risks in each class is automatically totalled and presented with the Summary Data at the bottom of the register.

Although most risks can be placed in more than one section they are only entered once, after which they are never deleted. They are to remain on the SCIRT Risk Register for auditing purposes;

The form of the register classifies risks to the specific programme key result areas:

- Health & Safety
- Image / Reputation
- Environment
- Stakeholder Interest
- Cost
- Time
- Quality
- Constructability

3.3 RISK RANKING DETERMINATION

The impact and likelihood of each threat/opportunity is then assessed and ranked before any mitigation or control measures are applied and then again assuming agreed measures had been implemented. Impact is assessed, as applicable, in one or more of 8 categories; Health & Safety, Image/Reputation, Environmental, Stakeholder Interest, Cost, Time, Quality and Constructability.

During this review, or at any other step in the risk management process, other risks may be identified and added to the register as appropriate.

Links between risks also need to be identified and due allowance or adjustment made for these, for example:

- The mitigation of one risk may transform it into or develop another risk,
- The impact of one risk may preclude or downgrade the impact of others (i.e. delay occurring for one reason may mitigate or negate against the impact of delay for other reasons).

3.3.1 Likelihood Assessment

The likelihood of each threat and opportunity occurring is assessed and then Rated using the tables in the following tables.

Table 1 - Threat Likelihood assessment table

Threat Likelihood	Probability (for short term activities such as asset improvement)	Frequency (for long term activities such as in asset management and corporate business)	Description	Likelihood
Likely	>50%	Greater than once per year	The threat can be expected to occur or a very poor state of knowledge has been established on the threat	5
Quite Common	20%-50%	Once per 1-2 years	The threat will quite commonly occur or a poor state of knowledge has been established on the threat	4
Unlikely	10%-20%	Once per 3-5 years	The threat may occur occasionally or a moderate state of knowledge has been established on the threat	3
Unusual	1%-10%	Once per 5 years	The threat could infrequently occur or a good state of knowledge has been established on the threat	2
Rare	<1%	Less than once per 5 years	The threat may occur in exceptional circumstances or a very good state of knowledge has been established on the threat	1

Table 2 - Opportunity Likelihood assessment table

Opportunity Likelihood	Probability (for short term activities such as asset improvement)	Description	Likelihood
Almost certain	>90%	The opportunity is almost certain to be realised or a very high degree of confidence in delivering the gains has been established on the opportunity	5
Expected	75%-90%	The opportunity is expected to be realised in most circumstances or a high degree of confidence in delivering the gains has been established on the opportunity	4
Likely	50%-75%	The opportunity will probably be realised or a moderate degree of confidence in delivering the gains has been established on the opportunity	3
Unlikely	25%-50%	The opportunity is unlikely to be realised or a low degree of confidence in delivering the gains has been established on the opportunity	2
Very Unlikely	<25%	The opportunity is very unlikely to be realised or a very low degree of confidence in delivering the gains has been established on the opportunity	1

3.3.2 Impact Assessment

The severity of the impact of each threat and opportunity is assessed and scored according to relevant tables in the appended register. Where a threat or opportunity has no impact in a particular context that context is left blank (unscored).

Table 3 - Threat impact assessment table

Descriptor	Assessment	Health & Safety	Image / Reputation	Environment	Stakeholder Interest	Cost	Time	Quality	Programme	Severity
Threat	Substantial	Multiple fatalities	International media cover	Permanent widespread ecological damage	Commission of Inquiry	+\$250M	More than a Year	Catastrophic – Complete rebuild/replacement of a network	> 12 Months	100
	Major	Fatality or Life-Changing Injuries	Sustained National media cover	Long term and important ecological damage	Ministerial Inquiry	+\$50M to \$250M	Less than a Year	Substantial defect - large scale rework on a network	3 Months to 12 Months	70
	Medium	Serious injuries	Regional media cover or short term national cover	Medium to long term ecological damage	Ministerial Questions or 3rd party investigation	+\$5M to \$50M	Less than a Month	Significant defect – substantial work to be redone/ replaced	1 to 3 Months	40
	Minor	Minor injuries	Local media cover	Limited but medium term damage	Official Information Request	+\$500k to \$5M	Less than a Week	Moderate defect – work to be re-done or replaced	1 to 3 Weeks	10
	Negligible	Slight injuries	Brief local media cover	Short term damage	Minor Complaint	+\$0 to \$500k	Less than a Day	Minor defect or shortfall – repair or corrective action required	<Week	1

Table 4 - Opportunity impact assessment table

Descriptor	Assessment	Health & Safety	Image / Reputation	Environment	Stakeholder Interest	Cost	Time	Quality	Programme	Severity
Opportunity	Negligible	Prevention of slight injuries	Brief local media cover	Short term enhancement	Letter of support	-\$0 to -\$100k	Days		0 to 1 month gain	-1
	Minor	Prevention of minor injuries	Local media cover	Limited but medium term enhancement	Submission in support for RMA and LTMA	-\$100k to -\$1M	Weeks		1 - 2 month gain	-10
	Medium	Prevention of serious injuries	Regional media cover or short term national cover	Medium to long term ecological enhancement	Champions in community	-\$1M to -\$10M	Months		2 - 4 month gain	-40
	Major	Saving of several fatalities	Sustained National media cover	Long term and important ecological enhancement	Small financial contribution	-\$10M to \$100M	Years		4 - 6 months gain	-70
	Substantial	Saving of multiple fatalities	International media cover	Permanent widespread ecological enhancement	Large financial contribution	-\$100M	Many years		> 6 months gain	-100

3.3.3 Risk Ranking

Using the input from the tables, formulae embedded in the Risk Register the overall severity for each risk is determined by:

- identifying the context with the highest impact rating and then
- inputting both this assessment and the likelihood assessment values into the Risk Matrix table within the register
- automatically categorises risks as negligible, low, medium, high, very high and extreme.

Note – When inserting additional lines, copy and paste a complete line as this will ensure that the formulae will also remain correct and the assessment process automatic. Similarly, inserting new lines into the body of the register will also preserve the integrity of the summary data and related graphs.

The Risk Register undertakes this exercise on the likelihood and impact inputs both pre and post mitigation, it thus determines both the **inherent** severity ranking and the **residual** severity ranking of each risk.

Table 5 - Risk Matrix

		Severity				
		1	10	40	70	100
Likelihood	1	N	L	M	H	H
	2	N	L	H	H	VH
	3	N	M	H	VH	VH
	4	L	M	H	VH	E
	5	L	M	VH	E	E

Key

E	Extreme Risks
VH	Very High Risks
H	High Threat Risks
M	Moderate Risks
L	Low Risks
N	Negligible Risks

With the matrix ranking being established and presented in this way it is possible to make direct comparisons of risks associated with different elements of the programme or project.

The Risk Register, in its Summary Data section also presents the total number of risks falling into each category both before and after mitigation measures have been put in place. Thus providing an overview of the project's risk profile and tracking the change in this profile as a result of these measures.

3.4 CAUSE AND CONSEQUENCE MITIGATION

Preventive or reactive control measures are required to eliminate or mitigate each threat or enhance each opportunity. Having identified the causes and consequences of the threat, the appropriate control measures to prevent or mitigate them are determined. Control Measures are subdivided into two categories:

3.4.1 Cause control measures

Those that prevent the cause arising or eliminate it entirely and are therefore preventive. Cause control measures reduce the **likelihood** of the risk occurring.

The following two tables display the control measures for Threats and Opportunities these are to be viewed as a guide, any deviations from these should be documented.

Table 6 - Consequences Matrix

	Consequences (loss)				
Likelihood	Negligible (1)	Minor (10)	Medium (40)	Major (70)	Substantial (100)
Likely (5)	5 Low Threat ACCEPT ACTIVELY -Enhance systems to minimise potential -Accept -Repair	50 Moderate Threat ACCEPT ACTIVELY -Enhance systems to minimise potential -Insure	200 Very High Threat AVOID -Immediate action -Enhance systems to minimise potential	350 Extreme Threat AVOID -Immediate action -Cease activity	500 Extreme Threat AVOID -Immediate action -Cease activity
Quite Common (4)	4 Low Threat ACCEPT ACTIVELY -Enhance systems to minimise potential -Accept -Repair	40 Moderate Threat ACCEPT ACTIVELY -Enhance systems to minimise potential -Insure	160 High Threat ACCEPT ACTIVELY OR TRANSFER -Immediate action -Insure -Contingency Plans	280 Very High Threat AVOID -Immediate action -Contingency Plans	400 Extreme Threat AVOID -Immediate action -Cease activity
Unlikely (3)	3 Negligible Threat ACCEPT PASSIVEY -Repair	30 Moderate Threat ACCEPT ACTIVELY -Enhance systems to minimise potential -Insure -Contingency Plans	120 High Threat ACCEPT ACTIVELY OR TRANSFER -Immediate action -Insure -Contingency Plans	210 Very High Threat AVOID -Immediate action -Avoid -Contingency Plans	300 Very High Threat AVOID -Immediate action -Avoid -Contingency Plans
Unusual (2)	2 Negligible Threat ACCEPT PASSIVEY -Repair	20 Low Threat ACCEPT ACTIVELY OR TRANSFER -Repair	80 High Threat ACCEPT ACTIVELY OR TRANSFER -Monitor -Insure -Contingency Plans	140 High Threat AVOID OR TRANSFER -Monitor -Insure -Contingency & Disaster Plans	200 Very High Threat AVOID OR TRANSFER -Monitor -Insure -Contingency & Disaster Plans
Rare (1)	1 Negligible Threat ACCEPT PASSIVEY -Repair	10 Low Threat ACCEPT ACTIVELY OR TRANSFER -Repair	40 Moderate Threat ACCEPT ACTIVELY -Enhance systems to minimise potential -Insure	70 High Threat AVOID OR TRANSFER -Monitor -Insure -Contingency & Disaster Plans	100 High Threat AVOID OR TRANSFER -Monitor -Insure -Contingency & Disaster Plans

Table 7 - Loss Matrix

Likelihood	Consequences (gain)				
	Negligible (-1)	Minor (-10)	Medium (-40)	Major (-70)	Substantial (-100)
Likely (5)	-5 Low Opportunity ACCEPT ACTIVELY - ENHANCE	-50 Moderate Opportunity ACCEPT ACTIVELY - ENHANCE	-200 Very High Opportunity ACCEPT ACTIVELY - ENHANCE	-350 Extreme Opportunity ACCEPT ACTIVELY - ENHANCE	-500 Extreme Opportunity ACCEPT ACTIVELY
Quite Common (4)	-4 Low Opportunity ACCEPT ACTIVELY - ENHANCE/MAXIMISE	-40 Moderate Opportunity ACCEPT ACTIVELY - ENHANCE/MAXIMISE	-160 High Opportunity ACCEPT ACTIVELY - ENHANCE/MAXIMISE	-280 Very High Opportunity ACCEPT ACTIVELY - ENHANCE/MAXIMISE	-400 Extreme Opportunity ACCEPT ACTIVELY - ENHANCE
Unlikely (3)	-3 Negligible Opportunity ACCEPT PASSIVELY	-30 Moderate Opportunity ACCEPT PASSIVELY	-120 High Opportunity ACCEPT ACTIVELY - ENHANCE/MAXIMISE	-210 Very High Opportunity ACCEPT ACTIVELY - ENHANCE/MAXIMISE	-300 Very High Opportunity ACCEPT ACTIVELY - MAXIMISE
Unusual (2)	-2 Negligible Opportunity REJECT	-20 Low Opportunity ACCEPT PASSIVELY	-80 High Opportunity ACCEPT PASSIVELY	-140 High Opportunity ACCEPT PASSIVELY	-200 Very High Opportunity ACCEPT ACTIVELY - MAXIMISE
Rare (1)	-1 Negligible Opportunity REJECT	-10 Low Opportunity REJECT	-40 Moderate Opportunity REJECT	-70 High Opportunity ACCEPT PASSIVELY	-100 High Opportunity ACCEPT ACTIVELY - MAXIMISE

3.4.2 Consequence control measures

Those which deal with the consequences of the risk should it arise either through failure of the cause controls, or some other mechanism. Consequence control measures do not reduce the likelihood of a risk occurring but they do reduce the **severity** of the consequences flowing from the risk.

Risk control measures applicable to both cause and consequence are listed below in the preferred "order of priority" for implementation, with examples of considerations under each:

Elimination

Consider design, methodology, documentation (appropriate sign-offs, peer reviews etc.), alteration to contract terms, financial precautions e.g. hedging and protective systems.

Isolation

Isolating the threat from persons, work or property by physical barrier, space or time separation e.g. traffic management.

Minimisation

Exposure may be reduced by way of:

- **Design:** threats to be designed out and/or control measures to be designed in.
- **Methodology:** testing, commissioning and inspection.
- **Substitution:** replacing the material, method or process with a less hazardous one.

Administration

Procedural control covers activities such as adjusting the time or conditions of threat exposure, training, work instructions, written procedures, safety and environmental analysis, contingency and/or disaster recovery planning.

Transfer

Consider contract, subcontract, supply or joint venture terms and arrangements. Be aware that transfer does not (usually) reduce the overall level of risk to the project as a whole.

Note that although insurance is a form of risk transfer, it is not a control method and the risk management process must be undertaken on the basis of "acting uninsured".

Multiple control measures may need to be considered for particularly significant threats.

3.4.3 Practicability of Control Measures

A further consideration in relation to control measures is their practicability. As a general rule, and in the case of purely financial risks, the control measures adopted will be commensurate with the degree of risk and the cost (in terms of money, time or trouble) of mitigating its impact. A higher risk will justify higher mitigation costs but if the costs of certain precautions are disproportionately high in relation to the likely reduction in the risk, such precaution will be considered to be impracticable.

However, this principle may not be appropriate for risks associated with Health and Safety or the Environment.

3.5 RESPONSIBLE PERSON (RISK OWNER)

Each risk will be allocated to a person (Owner) who will be responsible for its management and for ensuring the chosen control measures are implemented and monitored. This assignment will be made on the basis of the person best positioned or most able to manage the risk in question and this assignment may change throughout the "life" and development of the threat. The "Owner" will have sufficient authority to ensure the required actions are implemented to control the outcome of the risk.

4 PERFORMANCE MONITORING AND REVIEW

4.1 RISK MONITORING

Having put the control measures in place the next step is to monitor and review their effectiveness. Risk Owners will establish and set in place monitors for determining control measure effectiveness.

Each of the control measures will be assessed to determine the monitors that are, or are to be put, in place to ensure that the mitigation measures are being carried out and that they are effective. These monitors must address the questions, how do we know:

- We are doing what we planned to do?
- That the control measures are being implemented as planned?
- That these measures have eliminated or reduced exposure to the threat to acceptable levels?

Monitors may include inspection and test plans, programmes, snagging lists, correspondence, meetings, budgets, audits, measures (noise, survey, pressure, levels etc.), records, statistics, comparisons, sampling, through to direct monitoring of a particular part of the project.

The following categories of effectiveness will be input into the risk register:

Table 8 - The Risk Control Effectiveness

Controls	Examples of Impact
Strong	Significant attention given to the risk. Have undertaken all feasible economic controls. Are maintaining an ongoing monitoring system.
Moderate	Controls in place provide a reasonable certainty of control, although will not allow management of all potential risk events.
Weak	Controls in place are insufficient to prevent or mitigate this risk.
Uncontrollable	Outside the control of the organisation in respect of likelihood, although there is the ability to manage the consequences.

Where a particular control measure is to be included within a management plan, construction procedure or other document, reference to this document shall also be included in the "Monitors" column.

4.2 RISK REVIEW

Risk Registers will be working documents and will be regularly reviewed and updated accordingly to maintain a clear understanding of current levels of risk exposure.

The Programme Risk Register will be reviewed and updated by the Management Team on a monthly basis with key risks elevated for review by the Board. Reviews may include further workshops as may be required to identify and assess risks arising from changing circumstances or significant events.

Each Project Risk Register will be jointly reviewed and updated during the project construction phase by the Delivery Team and Delivery Project Coordinator on a monthly basis with key risks elevated for review by the Delivery Managers and, if required, the Management Team. Additional workshops or other re-assessment of risks will be carried whenever there is an event that may have significant impact on a project's risk profile, such as changes or developments in:

- Design
- Scope
- Schedule
- Methodology
- Specification
- Parties (Designers, Delivery Team, subcontractors, suppliers etc.).

Risk Owners will be responsible for the review and re-assessment of the risks they have ownership of and Project Coordinators may involve such other participants in the review process as may be of value to it.

4.3 REVIEW OF RISK CONTROL MEASURES

Control measures may prove to be inappropriate or risks may change with time. A measure is excessive or inadequate if it does not, or no longer, represents value for money or effort, although this principle may not be appropriate for risks associated with Health and Safety or the Environment.

Where the control methods are determined to be excessive or inadequate, the risk management process will be repeated and updated or new control methods will be developed.

Any required actions will be recorded in the "Upgrade Control/Implement Monitor" column and a due date for implementing the action is also to be assigned. This date is to be set in order to ensure, where possible, that the action is complete prior to the risk becoming active. Review also requires entry of the actual close out date, when this has occurred.

5 MANAGEMENT PLAN CONTROL

5.1 AUTHORISATION

Initial authorisation is in accordance with the AA, Section 6.1.1. All plans are also authorised by the General Manager and will be submitted to the Board for approval in the first Board meeting following the execution of the AA.

Subsequent revisions to plans will be authorised by the GM unless the GM deems the revision requires endorsement by the Board.

5.2 DISTRIBUTION

The Plan is a controlled document and shall be distributed and revised in accordance with the SCIRT Quality Management Plan. Hardcopies are Un-Controlled copies. The Controlled copies are maintained in "Project Centre" which is a secure website which supports various project management functions for the Programme including "configuration management" i.e. version control of documents.

5.3 AUDITING

Systematic internal audits will be undertaken to monitor compliance with this plan and to allow the plan to be assessed for suitability, relevance and effectiveness. The auditor will be a suitable person appointed by the SQE Manager who is independent of the activity being audited.

Various audits are undertaken, including but not limited to:

- IST-level Internal Audits
- NOP-level Internal Audits
- External Audits

Refer to Quality Plan Audit section for more details

5.4 MANAGEMENT PLAN REVIEW AND REVISION

This management plan is a dynamic document that is current at the time of issue. The process for monitoring and review of the plan or its implementation and operation are detailed within the SCIRT Quality Management Plan.

SCIRT management will conduct reassessments of this plan for the purpose of continuous Improvement. The review will consider the results of management monitoring, audit results, analysis of data, corrective and preventive actions as well as feedback from the Board, Management Team, IST, Design Team, Delivery Teams and site personnel. The frequency of the review will typically be as detailed in the Review and Audit section of the Quality Plan

Revisions to any management plan will always involve the Quality Manager who will take responsibility for ensuring the management plan set remains co-ordinated when revisions occur.

The document may be revised and updated in response to areas identified for improvement, such as;

- Changes in the Requirements and Minimum Standards defined in Schedule 5 of the AA
- Substantial changes in design or scope, construction sequence, staging, methodology, process or resource
- Requests by any Statutory Authority
- Internal and external audits
- Suggestions and comments from personnel
- Preventative action following a non-conformance
- Necessity for corrective action
- Senior management review
- Recommendations of the Independent Design Verifier, Independent Estimator or Strategic Review Panel

6 RECORDS AND REPORTING

6.1 SCIRT PROGRAMME RISK REGISTER

The primary record of all risk and opportunity management activity on the rebuild programme will be the programme and project risk registers. These will be maintained as live documents receiving regular scheduled reviews by risk owners and by formal internal audits.

The Risk Register is to reside on an accessible SCIRT IT platform to allow the Management Team to readily update it.

6.2 PROGRAMME MONTHLY REPORT

The Alliance Manager will include a section in each Programme Monthly Report presenting;

- The Summary Data from the Programme Risk Register in the form of residual extreme or very high programme risks.
- Discussion of any change in risk provision since last report.

Risk Registers will collate information contained within them and include Summary Data providing an overview of the total number of Active and Closed Risks and of the programme or project's risk profile both pre (inherent risk) and post (residual risk) control measures.

Risk profiles will be presented using the matrix system, which will provide the number and % of inherent and residual risks by severity category.

7 ROLES AND RESPONSIBILITIES

Risk Management Plan	Role									
Responsibility	Alliance Manager	Human Resources Manager	Community Stakeholder Manager	SQE Manager	Delivery Managers	Professional Services Manager	CCC Interface Manager	Value Manager	Commercial Manager	Delivery Team
Plan Issue/Revision authorisation	Own				Assist	Assist		Assist	Assist	
Programme Risk Identification and Assessment	Assist	Assist	Assist	Assist	Assist	Assist	Assist	Assist	Own	
Project Risk Identification and Assessment			Assist	Assist	Assist	Own	Assist	Assist	Assist	Own
Risk Monitoring	as assigned on Risk Register									
Auditing				Own						
Plan Review				Own						
Risk Register Maintenance Design Phase					Assist	Own			Assist	Assist
Risk Register Maintenance Construction Phase					Assist				Assist	Own
Programme Monthly Report						Assist		Assist	Own	