

# Western Corridor transportation **study**

## Risk assessment workshop report

8 April 2005



# Risk assessment workshop report

Prepared for

Greater Wellington Regional Council  
and Transit New Zealand

Prepared by

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In association with

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## Executive summary

An initial Risk Assessment workshop was held on 24 February 2005. This workshop was attended by the members of the Technical Steering Group with the purpose of identifying and assessing risks that could affect the Western Corridor Transportation Study.

The workshop focussed predominately on threats to the elements, as a tool for decision making. However, an opportunity risk identification brainstorming session was held to capture the group's ideas on aspects that can be built into an element once it is assembled in a scenario.

In order to rank the identified risks, each risk was rated with a likelihood of the event occurring, and a consequence should it occur. The risk scores for each risk category were summed using a statistical average approach to provide an indication of the level of threat each element is exposed to. As a result a risk score for each element has been determined, which allows an indicative ranking to be performed.

From the analysis several trends are apparent. All elements are currently assessed to have a **very high** risk exposure category, this reflects the uncertainty inherent in the level of detail in this project. Within this category the following applies:

- Coastal highway elements generally have a higher level of risk than Transmission Gully elements. This is a reflection on the influences of external stakeholders and the higher level of uncertainty in engineering elements (i.e. geotechnical risks) due the lesser state of knowledge.
- Link Road and Parallel Road elements have a lower level of risk than the other highway elements.
- Rail improvement elements have a level of risk greater than Parallel / Link Roads, but less than Coastal Highway and Transmission Gully Routes.
- Comparison between the categories of risk shows that the commercial/ economic cost risks have a tendency to be the greatest threat to an element, followed by Engineering/Site risks.

When the project elements are combined to scenarios the resulting score regresses to the mean and no real distinction can be made between them. Given the scale of the scenarios and the current state of knowledge this appears to be a reasonable result.

It should be recognised that all the identified risks need to be managed, and should be regularly reviewed in order to assess their relative change of probability or consequence as the project proceeds through the various stages from feasibility to design through to project completion. This project will utilise the information provided from the Risk Assessment Workshop combined with other sources to assess which elements to be moved forward into scenarios. Risk Management Processes should be continued once scenarios are assembled.

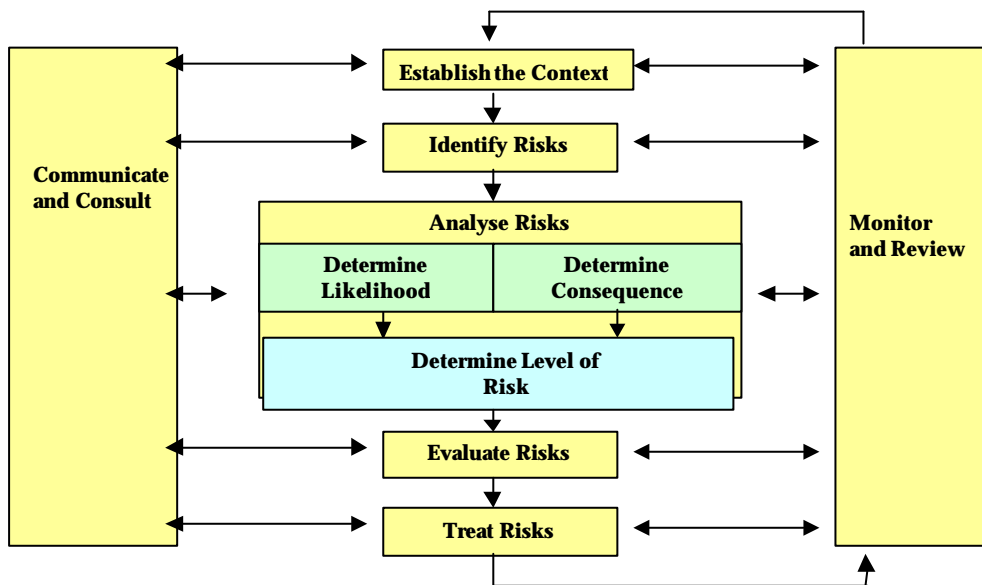
## 1. Purpose of the Risk Management System

Risk Management has been defined as “the culture, processes and structures that are directed towards realizing potential opportunities whilst managing adverse affects”

The *Process* of Risk Management involves the follow steps

- Establish Context – what are the objectives?
- Risk Identification – what can go wrong?
- Risk Analysis – what is the degree of risk?
- Risk Evaluation – is the degree of risk acceptable?
- Risk Treatment – what can be done to avoid, minimise or mitigate the effects of unacceptable risk?
- Monitoring – how effective are the steps of the process? Relevant at all stages.
- Communicate and Consult – sharing knowledge throughout the process with internal and external stakeholders. Relevant at all stages.

The following flow diagram summarises this process:



The above Risk Management methodology has been used as a framework for this project along with Transit’s Risk Management process Manual (AC/Man/1) guidelines.

This report lies within the “**Risk Assessment**” stage, incorporating the combined process of identification, analysis and evaluation.

## 2. Risk Assessment Workshop

An initial Risk Assessment workshop was held on 24 and 25 February attended by the members of the Technical Steering Group. The purpose of the workshop was to identify and assess risks that could affect this project. In particular the focus was in terms of individual “Elements to be considered” as identified in the *Confirmed Elements Report, 18 February 2005*. A complete list of attendees are included in Appendix 1.

## 3. Risk Context

Within the risk management process there needs to be an awareness of the objectives, obligations, expectations and risk tolerances of internal and external stakeholders that affect an event or activity. This is known as establishing the **context** for the Risk Management Process. This formed the first step of the workshop.

Each Project Element was to be considered in terms of the goals of Greater Wellington and Transit New Zealand and their policies, drivers and risk tolerance. It was stated that the risks facing external stakeholders’ were to be filtered to determine how they may affect each Project Element being reviewed.

The purpose of undertaking the Risk Assessment was discussed as being a tool used to compare the risk exposure of individual elements, and assist in the decision making process.

## 4. Risk Identification

The Transit New Zealand Risk Management Manual, Appendix 1: was used as a prompt list under the following headings:

Benefit Risks	Base Travel Demand, Growth Forecasts, Assignment, Crashes
Cost Risks	Commercial, Legal, Economic, Managerial Community, Political, Environmental, Land and Property Site Conditions, Engineering, Services, Natural Events

A full list of prompts used is included in Appendix 2.

The workshop focussed predominately on threats to the elements, as a tool for decision making. However, an opportunity risk identification brainstorming session was held to capture the group’s ideas on aspects that can be built into an element once it is assembled in a scenario. The list of ideas is recorded in Appendix 4.

## 5. Risk Analysis

Risk analysis seeks to develop an understanding of risk by consideration of the magnitude of consequences of an event, should it occur, and the likelihood of its occurrence. For this assessment the process of understanding the risks focuses on a comparative ranking between elements, and between risks.

The workshop participants have used their knowledge and experience to assess the risks which may affect the project elements. The opinion of the participants has been used to assess risks to the elements and assess the levels of probability and consequence each risk contains.

In order to rank the identified risks, each of the identified risks have been rated with a likelihood of the event occurring, along with a consequence should it occur. The Transit New Zealand Risk Management Manual uses a Semi-Quantitative mechanism to rate, score and rank risks, both as threats and opportunities. This process was used for the workshop. The scoring and rating tables are included in Appendix 2. The full list of risks and their assessed score and rank can be seen in Appendix 3.

## 6. Risk Evaluation

The risk scores for each risk category have been summed using a statistical average approach to provide an indication of the level of threat each element is exposed to. From this a risk score for each element has been obtained. The summary of this output has provided below.

	Element	Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)	Cost Risks (Commercial, Legal, Economic, Managerial)	Cost Risks (Community, Political, Environmental, land and Property)	Cost Risks (Site Conditions, Engineering, Services, Natural Events)	Sum
Coastal highway improvements	HC1	275	319	319	370	323
	HC2	275	319	319	370	323
	HC4	275	319	321	370	323
	HC5	312	284	311	307	304
	HC7	284	347	281	316	308
	HC8	284	273	223	287	268
Transmission gully highway improvements	HT1	268	307	206	308	275
	HT4	323	320	225	305	296
Link Roads	HE3	43	284	278	187	221
	HE5	13	256	162	214	185
	HE6	175	190	154	283	207
Parallel Roads	HP3	176	153	291	154	202
Travel Demand Management	TP1	275	248	201	131	221
	TR5	269	228	223	280	251
Rail Improvements	RT1	244	310	234	222	255
	RT2	244	310	234	203	251
	RT3	244	310	234	203	251
	RE1	230	304	234	203	245
	RS1	230	302	302	235	269
	RS2	230	302	302	235	269

Key	<70	70-159	160-349	350+
AC/Man/1 Classification	Moderate or less	High	Very High	Extreme



Although the table above is indicative only, it can be noted that several trends are apparent:

- All elements are currently exposed to a **very high** risk exposure in some form. This reflects the uncertainty inherent in the level of detail in this project.
- Coastal highway elements generally have a higher level of risk than Transmission Gully elements. This is a reflection on the influences of external stakeholders and the higher level of uncertainty in engineering elements (i.e. geotechnical risks) due the lesser state of knowledge.
- Link Road and Parallel Road elements have a lower level of risk than the other highway elements.
- Rail improvement elements have level of risk greater than Parallel / Link Roads, but less than Coastal Highway and Transmission Gully Routes.
- Comparison between the categories of risk shows that the commercial/ economic cost risks have a tendency to be the greatest threat to an element, followed by Engineering/Site risks.

When the project elements are combined into scenarios no real distinction can be made between the resulting scores. Given the scale of the scenarios and the current state of knowledge this appears to be a reasonable result. All scenarios scored in the vicinity of 250 and should be considered to have a very high risk profile.

The following table shows the combinations of elements that form the scenarios and the resulting statistical average scores for the scenarios.

Elements	Scenarios				
	Major PT and TDM	Major Roads	Reliability	Congestion relief	Economic Efficiency
HC1					
HC2					
HC4			323		
HC5				304	304
HC7		308	308		
HC8		268		268	
HT1		275			
HT4					
HE3			221	221	221
HE5					
HE6		207	207	207	207
HP3		202	202		
TP1					
TR5					
RT1	255		255		
RT2	251		251	251	251
RT3					
RE1					
RS1	269		269		269
RS2					
RS11*	269		269		269
<b>Sum</b>	<b>224</b>	<b>255</b>	<b>243</b>	<b>252</b>	<b>231</b>

\* Assume RS 11 similar risk profile to RS1

## **7. Monitoring, Consulting, Review**

It should be recognised that all the identified risks need to be managed, and should be reviewed at key stages in order to assess their relative change of probability or consequence as the project proceeds through the various stages from feasibility to design to project completion.

This project will use the information provided above as well as from other knowledge to assess elements to be moved forward into scenarios. Risk Management Processes should be continued once scenarios are assembled into discrete units.

Opportunity Risks should be developed as scenarios are confirmed, to maximise gains for the project.

**Appendices**

## Appendix A

### Workshop Attendees

Anthony (Tony) Brennan	(GWRC)
John Allard	(GWRC) – Thursday only
Graham Spargo	(GWRC) – Friday only
Peter Ward	(Transit New Zealand)
Catherine Worsley	(Transit New Zealand) – Thursday only
David Silvester	(Transit New Zealand) – Friday (part) only
Greg Campbell	(Wellington City Council)
Geoff Marshall	(Porirua City Council)
Peter Knight	(Kapiti Coast District Council)
Lachlan Wallach	(Upper Hutt City Council)
Don Wignall	(Land Transport New Zealand - Funding)
Tim Selby	(Land Transport New Zealand – Safety) – Thursday only
Neil Buchanan	(NZ Rail Corporation / OnTrack) – Thursday (part) only
Ross Hayward	(Toll Metro) – Thursday only
Geoff Norman	(Toll Metro)
Leena Singh	(Toll Metro) – Thursday only
Steven Knowles	(Maunsell Limited)
Darrell Statham	(Maunsell Limited)
Stephen Garlick	(Maunsell Limited) – Thursday only
Darren Cash	(Maunsell Limited)
Rachael Urquhart	(Maunsell Limited)
Paul Thomas	(Environmental Management Services Limited)
Robert Schofield	(Boffa Miskell Limited) – Friday only

#### Apologies:

Dave Watson	(GWRC)
Joe Hewitt	(GWRC)
Anthony Cross	(GWRC)
Rhona Nicol	(GWRC)
Bob Alkema	(Land Transport New Zealand – Funding)
Lyle Earl	(Hutt City Council)
Seamus O’Sullivan	(Toll Freight)

## Appendix B

### Prompt List used for Risk Assessment workshop

Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)

- Base Travel Demand
- Growth Forecasts
- Assignment
- Crashes
- Other

Cost Risks (Commercial, Legal, Economic, Managerial)

- Project Scope
- Team Relationships (Performance, Communications etc)
- Funding
- Procurement
- Legislative/Regulation Issues
- Document Control
- Market Issues
- Programming Issues
- Insolvency (Contractor)
- Contractual Claim/Dispute
- Health and Safety
- Inadequate QC/QA
- Post-Construction Liability
- Other

Cost Risks (Community, Political, Environmental, land and Property)

- Community
- Industrial Action by Others
- Ecological Issues
- Impact on Public Health
- Heritage Issues (Historic Places Trust)
- Resource Management Act Consents
- Building Consent
- Land - Designation
- Land - Purchase
- Political
- Other

Cost Risks (Site Conditions, Engineering, Services, Natural Events)

Project Scope Definition (Unscheduled Items)

Design Standards (Definition)

Client Initiated Changes

New/Change in Technology

Topographical Data

Site/Ground Conditions

Design Issues

Design Changes

Redesign / Rework

Buildability

Traffic Management

Impact of Value Engineering (Risk/Opportunity Assessment)

Changes Arising from Safety Audits

Issues - Pavement/Surfacing

Issues - Structures

Traffic Control and Lighting

Services

Natural Events

Other

## Appendix C

### Risk Rating and scoring tables

**Table 1a: Rating the Likelihood (L) of a Threat**  
 (Generally applicable to a passive process)

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

**Table 1b: Rating the Likelihood (L) of an Opportunity**  
 (Generally applicable to an active process)

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



Table 2: Rating the Consequence

	Descriptor	Health & Safety	Image / Reputation	Environment	Stakeholder Interest	Cost	Time	Rating
Threat	Substantial	Multiple fatalities	International Media Cover	Permanent widespread ecological damage	Commission of Inquiry	+\$10M	Many years	100
	Major	Several fatalities	Sustained National Media Cover	Heavy ecological damage, costly restoration	Ministerial Inquiry	+ \$1M to \$10M	Years	70
	Medium	Serious Injuries	Regional Media Cover or Short Term National Cover	Major but recoverable ecological damage	Ministerial Questions or 3 <sup>rd</sup> party investigation	+ \$100k to \$1M	Months	40
	Minor	Minor Injuries	Local Media Cover	Limited but medium-term negative effects	Official Information Request	+ \$10k to \$100k	Weeks	10
	Negligible	Slight Injuries	Brief Local Media Cover	Short-term damage	Minor Complaint	+ \$0 to \$10k	Days	1
Opportunity	Negligible	Prevention of Slight Injuries	Brief Local Media Cover	Short-term enhancement	Letter of support	- \$0 to \$10k	Days	-1
	Minor	Prevention of Minor Injuries	Local Media Cover	Limited but medium-term enhancement	Submission in support for RMA and LTMA	- \$10k to \$100k	Weeks	-10
	Medium	Prevention of Serious Injuries	Regional Media Cover or Short Term National Cover	Medium to long term ecological enhancement	Champions in community	- \$100k to \$1M	Months	-40
	Major	Saving of Several fatalities	Sustained National Media Cover	Long Term and important ecological enhancement	Small financial contribution	- \$1M to \$10M	Years	-70
	Substantial	Saving of Multiple fatalities	International Media Cover	Permanent widespread ecological enhancement	Large financial contribution	-\$10M	Many Years	-100

Table 3a: Threat Categories, with suggested Treatment Types

← MITIGATE WHENEVER POSSIBLE

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

↑ MINIMISE WHENEVER POSSIBLE

Table 3b: Opportunity Categories, with Suggested Treatment Types

→ ENHANCE WHEREVER POSSIBLE

Likelihood	CONSEQUENCES (gain)				
	Negligible (-1)	Minor (-10)	Medium (-40)	Major (-70)	Substantial (-100)
Almost Certain (5)	-5 Low Opportunity <b>ACCEPT ACTIVELY - ENHANCE</b>	-50 Moderate Opportunity <b>ACCEPT ACTIVELY - ENHANCE</b>	-200 Very high Opportunity <b>ACCEPT ACTIVELY - ENHANCE</b>	-350 Extreme Opportunity <b>ACCEPT ACTIVELY - ENHANCE</b>	-500 Extreme Opportunity <b>ACCEPT ACTIVELY</b>
Expected (4)	-4 Low Opportunity <b>ACCEPT ACTIVELY - ENHANCE/MAXIMISE</b>	-40 Moderate Opportunity <b>ACCEPT ACTIVELY - ENHANCE/MAXIMISE</b>	-160 Very High Opportunity <b>ACCEPT ACTIVELY - ENHANCE/MAXIMISE</b>	-280 Very high Opportunity <b>ACCEPT ACTIVELY - ENHANCE/MAXIMISE</b>	-400 Extreme Opportunity <b>ACCEPT ACTIVELY - ENHANCE</b>
Likely (3)	-3 Negligible Opportunity <b>ACCEPT PASSIVELY</b>	-30 Moderate Opportunity <b>ACCEPT PASSIVELY</b>	-120 High Opportunity <b>ACCEPT ACTIVELY - ENHANCE/MAXIMISE</b>	-210 Very high Opportunity <b>ACCEPT ACTIVELY - ENHANCE/MAXIMISE</b>	-300 Very high Opportunity <b>ACCEPT ACTIVELY - MAXIMISE</b>
Unlikely (2)	-2 Negligible Opportunity <b>REJECT</b>	-20 Low Opportunity <b>ACCEPT PASSIVELY</b>	-80 High Opportunity <b>ACCEPT PASSIVELY</b>	-140 High Opportunity <b>ACCEPT PASSIVELY</b>	-200 Very high Opportunity <b>ACCEPT ACTIVELY - MAXIMISE</b>
Very Unlikely (1)	-1 Negligible Opportunity <b>REJECT</b>	-10 Low Opportunity <b>REJECT</b>	-40 Moderate Opportunity <b>REJECT</b>	-70 High Opportunity <b>ACCEPT PASSIVELY</b>	-100 High Opportunity <b>ACCEPT ACTIVELY - MAXIMISE</b>

↑ MAXIMISE WHENEVER POSSIBLE

## **Appendix D**

### **Risk Register and Assessment sheets**



Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unusual	1% - 10%	2	Redo the base modelling investigation	Major	70	140	25	High
1.2	Growth Forecasts	growth forecasts are inadequately low	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport facility	Substantial	100	400	3	Extreme
1.3	Assignment / Mode Choice	under estimation of mode share off road	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport	Major	70	280	6	Very High
1.4	Crashes		T	Unusual	1% - 10%	2		Substantial	100	200	20	Very High
1.5	Other - Oil Shock		T	Rare	<1%	1		Negligible	1	1	32	Negligible
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on local roads than anticipated	T	Likely	>50%	5	health & safety - more accidents, ped accidents?	Major	70	350	4	Extreme
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Quite Common	20% - 50%	4	reputation / image	Medium	40	160	24	Very High
2.3	Funding	funding is unavailable	T	Likely	>50%	5	project doesn't proceed	Substantial	100	500	1	Extreme
2.4	Procurement	limited amount of rail design and construction expertise in NZ.	T	Unusual	1% - 10%	2	time delay to contract	Major	70	140	25	High
2.5	Legislative/Regulation Issues	Resources may not be readily available	T	Unusual	1% - 10%	2	project delayed or scope affected	Major	70	140	25	High
2.6	Document Control	unforeseen legislation (new)										
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Substantial	100	500	1	Extreme
2.8	Programming Issues	Programming of construction work around existing rail services. Will be practically impossible to replace all rail services with buses during construction phase.	T	Likely	>50%	5		Medium	40	200	20	Very High
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Likely	>50%	5	injury occurs	Medium	40	200	20	Very High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Quite Common	20% - 50%	4	legal action and political protest	Major	70	280	6	Very High
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Unlikely	10% - 20%	3		Major	70	210	14	Very High
3.4	Impact on Public Health	construction activity greater than anticipated	T	Unlikely	10% - 20%	3		Medium	40	120	28	High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Unlikely	10% - 20%	3	change location of road	Major	70	210	14	Very High
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Quite Common	20% - 50%	4	time and cost over base case 5yrs	Major	70	280	6	Very High
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Quite Common	20% - 50%	4	delays to programme and increased costs for land purchase	Major	70	280	6	Very High
3.10	Political	loss of political support (no unity)	T	Unlikely	10% - 20%	3	delays to project & revision of objectives	Major	70	210	14	Very High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	6	Very High
4.2	Design Standards (Definition)	changes to current design standards	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	6	Very High
4.3	Client Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	6	Very High
4.6	Site/Ground Conditions	Unstable rock in hillside above construction site	T	Unlikely	10% - 20%	3	delays to project and increased costs	Major	70	210	14	Very High
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	No unique risk	T	Quite Common	20% - 50%	4		Major	70	280	6	Very High
4.9	Redesign / Rework (combined with 4.8)	No unique risk										
4.10	Buildability	No unique risk										
4.11	Traffic Management - bus replacements	Replacing some existing rail services with buses during construction phase. Limited availability of buses. Road congestion delaying bus leg of journey and adversely affecting connections with rail services.	T	Likely	>50%	5		Medium	40	200	20	Very High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)	No unique risk										
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Medium	40	80	29	High
4.14	Issues - Pavement/Surfacing Ballast/Rails		T	Unlikely	10% - 20%	3		Major	70	210	14	Very High
4.15	Issues - Structures		T	Unlikely	10% - 20%	3		Substantial	100	300	5	Very High
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Minor	10	20	31	Low
4.17	Services		T	Unusual	1% - 10%	2		Medium	40	80	29	High
4.18	Natural Events	No unique risk	T	Unlikely	10% - 20%	3		Major	70	210	14	Very High
4.19	Other	No unique risk										

Date of Risk Review: 24/02/2005  
 Compiled by: Darren Cash  
 Contributors:

Threat	Likely	>50%	5
	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unusual	1% - 10%	2	Redo the base modelling investigation	Major	70	140	24	High
1.2	Growth Forecasts	growth forecasts are inadequately low	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport facility	Substantial	100	400	3	Extreme
1.3	Assignment / Mode Choice	under estimation of mode share off road	T	Unlikely	10% - 20%	3	don't have sufficient travel capacity so need new transport	Major	70	210	15	Very High
1.4	Crashes		T	Unusual	1% - 10%	2		Substantial	100	200	18	Very High
1.5	Other - Oil Shock		T	Rare	<1%	1		Negligible	1	1	32	Negligible
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on local roads than anticipated	T	Likely	>50%	5	health & safety - more accidents, ped accidents?	Major	70	350	4	Extreme
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Quite Common	20% - 50%	4	reputation / image	Medium	40	160	22	Very High
2.3	Funding	funding is unavailable	T	Likely	>50%	5	project doesn't proceed	Substantial	100	500	1	Extreme
2.4	Procurement	limited amount of rail design and construction expertise in NZ.	T	Unusual	1% - 10%	2	time delay to contract	Major	70	140	24	High
2.5	Legislative/Regulation Issues	Resources may not be readily available	T	Unusual	1% - 10%	2	project delayed or scope affected	Major	70	140	24	High
2.6	Document Control	unforeseen legislation (new)										
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Substantial	100	500	1	Extreme
2.8	Programming Issues	Programming of construction work around existing rail services. Will be practically impossible to replace all rail services with buses during construction phase.	T	Likely	>50%	5		Medium	40	200	18	Very High
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Likely	>50%	5	injury occurs	Medium	40	200	18	Very High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Likely	>50%	5	legal action and political protest	Major	70	350	4	Extreme
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Likely	>50%	5		Major	70	350	4	Extreme
3.4	Impact on Public Health	construction activity greater than anticipated	T	Quite Common	20% - 50%	4		Medium	40	160	22	Very High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Quite Common	20% - 50%	4	change location of road	Major	70	280	12	Very High
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Likely	>50%	5	time and cost over base case 5yrs	Major	70	350	4	Extreme
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Likely	>50%	5	delays to programme and increased costs for land purchase	Major	70	350	4	Extreme
3.10	Political	loss of political support (no unity)	T	Unlikely	10% - 20%	3	delays to project & revision of objectives	Major	70	210	15	Very High
3.11	Other											
3.14	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Likely	>50%	5	delays to project and increased costs	Major	70	350	4	Extreme
4.2	Design Standards (Definition)	changes to current design standards	T	Likely	>50%	5	delays to project and increased costs	Major	70	350	4	Extreme
4.3	Client Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Likely	>50%	5	delays to project and increased costs	Major	70	350	4	Extreme
4.6	Site/Ground Conditions	Risk lower than RT1	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	24	High
4.7	Design Issues (combined with 4.6)	No unique risk										
4.8	Design Changes	No unique risk										
4.9	Redesign / Rework (combined with 4.8)	No unique risk										
4.10	Buildability	No unique risk										
4.11	Traffic Management - bus replacements, TSRs	Replacing some existing rail services with buses during construction phase. Limited availability of buses. Road congestion delaying bus leg of journey and adversely affecting connections with rail services. Temporary speed restrictions will apply to rail services passing the station site during construction phase.	T	Likely	>50%	5		Medium	40	200	18	Very High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)	No unique risk										
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Medium	40	80	30	High
4.14	Issues - Pavement/Surfacing		T	Unlikely	10% - 20%	3		Medium	40	120	28	High
4.15	Issues - Structures		T	Quite Common	20% - 50%	4		Major	70	280	12	Very High
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Minor	10	20	31	Low
4.17	Services		T	Unlikely	10% - 20%	3		Medium	40	120	28	High
4.18	Natural Events	No unique risk	T	Unlikely	10% - 20%	3		Major	70	210	15	Very High
4.19	Other	No unique risk										

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	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unusual	1% - 10%	2	Redo the base modelling investigation	Major	70	140	22	High
1.2	Growth Forecasts	Impact higher than HC4 if growth forecasts are under estimated	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport facility. Higher than HC4	Substantial	100	400	3	Extreme
1.3	Assignment / Mode Choice	under estimation of mode share off road. Threat less than RT1	T	Unlikely	10% - 20%	3	don't have sufficient travel capacity so need new transport facility.	Major	70	210	12	Very High
1.4	Crashes		T	Unusual	1% - 10%	2		Substantial	100	200	18	Very High
1.5	Other - Oil Shock		T	Rare	<1%	1		Negligible	1	1	32	Negligible
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on local roads than anticipated	T	Likely	>50%	5	health & safety - more accidents, ped accidents?	Major	70	350	4	Extreme
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Quite Common	20% - 50%	4	reputation / image	Medium	40	160	21	Very High
2.3	Funding	funding is unavailable	T	Likely	>50%	5	project doesn't proceed	Substantial	100	500	1	Extreme
2.4	Procurement	limited amount of rail design and construction expertise in NZ. Resources may not be readily available	T	Unusual	1% - 10%	2	time delay to contract	Major	70	140	22	High
2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Unusual	1% - 10%	2	project delayed or scope affected	Major	70	140	22	High
2.6	Document Control											
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Substantial	100	500	1	Extreme
2.8	Programming Issues	Programming of construction work around existing rail services. No electric units currently operate north of Paraparaumu, therefore it will be easier to programme work around existing freight and long distance rail services during construction phase.	T	Unlikely	10% - 20%	3		Medium	40	120	26	High
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Likely	>50%	5	injury occurs	Medium	40	200	18	Very High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Quite Common	20% - 50%	4	legal action and political protest	Major	70	280	6	Very High
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Unlikely	10% - 20%	3		Major	70	210	12	Very High
3.4	Impact on Public Health	construction activity greater than anticipated	T	Unlikely	10% - 20%	3		Medium	40	120	26	High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Unlikely	10% - 20%	3	change location of road	Major	70	210	12	Very High
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Quite Common	20% - 50%	4	time and cost over base case 5yrs	Major	70	280	6	Very High
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Quite Common	20% - 50%	4	delays to programme and increased costs for land purchase	Major	70	280	6	Very High
3.10	Political	loss of political support (no unity)	T	Unlikely	10% - 20%	3	delays to project & revision of objectives	Major	70	210	12	Very High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	6	Very High
4.2	Design Standards (Definition)	changes to current design standards	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	6	Very High
4.3	Client Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	6	Very High
4.6	Site/Ground Conditions	Risk lower than RT1	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	22	High
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	No unique risk	T	Unusual	1% - 10%	2		Medium	40	80	28	High
4.9	Redesign / Rework (combined with 4.8)	No unique risk										
4.10	Buildability	No unique risk										
4.11	Traffic Management - bus replacements, TSRs	Replacing some existing rail services with buses during construction phase. Limited availability of buses. Road congestion delaying bus leg of journey and adversely affecting connections with rail services. Temporary speed restrictions will apply to rail services passing the station site during construction phase.	T	Likely	>50%	5		Medium	40	200	18	Very High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)	No unique risk										
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Medium	40	80	28	High
4.14	Issues - Pavement/Surfacing Ballast/Rails		T	Unlikely	10% - 20%	3		Major	70	210	12	Very High
4.15	Issues - Structures		T	Unlikely	10% - 20%	3		Substantial	100	300	5	Very High
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Minor	10	20	31	Low
4.17	Services		T	Unusual	1% - 10%	2		Medium	40	80	28	High
4.18	Natural Events	No unique risk	T	Unlikely	10% - 20%	3		Major	70	210	12	Very High
4.19	Other	No unique risk										

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Threat	Likely	>50%	5
	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unusual	1% - 10%	2	Redo the base modelling investigation	Major	70	140	23	High
1.2	Growth Forecasts	growth forecasts are inadequately low	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport facility	Substantial	100	400	3	Extreme
1.3	Assignment / Mode Choice	under estimation of mode share off road	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport	Major	70	280	6	Very High
1.4	Crashes		T	Unusual	1% - 10%	2		Substantial	100	200	18	Very High
1.5	Other - Oil Shock		T	Rare	<1%	1		Negligible	1	1	32	Negligible
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on local roads than anticipated	T	Likely	>50%	5	health & safety - more accidents, ped accidents?	Major	70	350	4	Extreme
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Quite Common	20% - 50%	4	reputation / image	Medium	40	160	22	Very High
2.3	Funding	funding is unavailable	T	Likely	>50%	5	project doesn't proceed	Substantial	100	500	1	Extreme
2.4	Procurement	limited amount of rail design and construction expertise in NZ.	T	Unusual	1% - 10%	2	time delay to contract	Major	70	140	23	High
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2.6	Document Control	unforeseen legislation (new)										
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Substantial	100	500	1	Extreme
2.8	Programming Issues	Programming of construction work around existing rail services. Will be practically impossible to replace all rail services with buses during construction phase.	T	Likely	>50%	5		Medium	40	200	18	Very High
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Likely	>50%	5	injury occurs	Medium	40	200	18	Very High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Quite Common	20% - 50%	4	legal action and political protest	Major	70	280	6	Very High
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Unlikely	10% - 20%	3		Major	70	210	13	Very High
3.4	Impact on Public Health	construction activity greater than anticipated	T	Unlikely	10% - 20%	3		Medium	40	120	27	High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Unlikely	10% - 20%	3	change location of road	Major	70	210	13	Very High
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3.10	Political	loss of political support (no unity)	T	Unlikely	10% - 20%	3	delays to project & revision of objectives	Major	70	210	13	Very High
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<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
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4.5	Topographical Data	lack of topographical data	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	6	Very High
4.6	Site/Ground Conditions	Risk lower than RT1	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	23	High
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4.10	Buildability	No unique risk										
4.11	Traffic Management - bus replacements	Replacing some existing rail services with buses during construction phase. Limited availability of buses. Road congestion delaying bus leg of journey and adversely affecting connections with rail services.	T	Likely	>50%	5		Medium	40	200	18	Very High
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4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Minor	10	20	31	Low
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	Minor	10
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Opportunity	Negligible	-1
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Extreme
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<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
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3.4	Impact on Public Health	construction activity greater than anticipated	T	Unlikely	10% - 20%	3		Medium	40	120	27	High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Unlikely	10% - 20%	3	change location of road	Major	70	210	13	Very High
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Quite Common	20% - 50%	4	time and cost over base case 5yrs	Major	70	280	6	Very High
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Quite Common	20% - 50%	4	delays to programme and increased costs for land purchase	Major	70	280	6	Very High
3.10	Political	loss of political support (no unity)	T	Unlikely	10% - 20%	3	delays to project & revision of objectives	Major	70	210	13	Very High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	6	Very High
4.2	Design Standards (Definition)	changes to current design standards	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	6	Very High
4.3	Client Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	6	Very High
4.6	Site/Ground Conditions	Risk lower than RT1	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	23	High
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	No unique risk	T	Unusual	1% - 10%	2		Medium	40	80	28	High
4.9	Redesign / Rework (combined with 4.8)	No unique risk										
4.10	Buildability	No unique risk										
4.11	Traffic Management - bus replacements	Replacing some existing rail services with buses during construction phase. Limited availability of buses. Road congestion delaying bus leg of journey and adversely affecting connections with rail services.	T	Likely	>50%	5		Medium	40	200	18	Very High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)	No unique risk										
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Medium	40	80	28	High
4.14	Issues - Pavement/Surfacing Ballast/Rails		T	Unlikely	10% - 20%	3		Major	70	210	13	Very High
4.15	Issues - Structures		T	Unlikely	10% - 20%	3		Substantial	100	300	5	Very High
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Minor	10	20	31	Low
4.17	Services		T	Unusual	1% - 10%	2		Medium	40	80	28	High
4.18	Natural Events	No unique risk	T	Unlikely	10% - 20%	3		Major	70	210	13	Very High
4.19	Other	No unique risk										

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 Contributors:

Threat	Likely	>50%	5
	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unusual	1% - 10%	2	Redo the base modelling investigation	Major	70	140	26	High
1.2	Growth Forecasts	growth forecasts are inadequately low	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport facility	Substantial	100	400	8	Extreme
1.3	Assignment / Mode Choice	under estimation of mode share off rail, modelling parameters	T	Unlikely	10% - 20%	3	don't have sufficient travel capacity so need new transport facility	Substantial	100	300	15	Very High
1.4	Crashes	crash savings aren't realised with implementation of HC4	T	Unusual	1% - 10%	2	high accident rate	Major	70	140	26	High
1.5	Other - Oil Shock	oil prices skyrocket	T	Unlikely	10% - 20%	3	major mode shift	Substantial	100	300	15	Very High
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on local roads than anticipated	T	Likely	>50%	5	health & safety - more accidents, ped accidents?	Major	70	350	11	Extreme
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Quite Common	20% - 50%	4	reputation / image	Medium	40	160	24	Very High
2.3	Funding	funding is unavailable	T	Likely	>50%	5	project doesn't proceed	Substantial	100	500	1	Extreme
2.4	Procurement	procurement problems	T	Unusual	1% - 10%	2	time delay to contract	Medium	40	80	30	High
2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Unusual	1% - 10%	2	project delayed or scope affected	Major	70	140	26	High
2.6	Document Control											
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Substantial	100	500	1	Extreme
2.8	Programming Issues											
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Likely	>50%	5	injury occurs	Medium	40	200	23	Very High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Likely	>50%	5	legal action and political protest	Major	70	350	11	Extreme
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Likely	>50%	5		Major	70	350	11	Extreme
3.4	Impact on Public Health	construction activity greater than anticipated	T	Quite Common	20% - 50%	4		Medium	40	160	24	Very High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Quite Common	20% - 50%	4	change location of road	Substantial	100	400	8	Extreme
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Quite Common	20% - 50%	4	time and cost over base case 5yrs	Major	70	280	18	Very High
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Likely	>50%	5	delays to programme and increased costs for land purchase	Major	70	350	11	Extreme
3.10	Political	loss of political support (no unity)	T	Unlikely	10% - 20%	3	delays to project & revision of objectives	Substantial	100	300	15	Very High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.2	Design Standards (Definition)	changes to current design standards	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.3	Client-Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.6	Site/Ground Conditions	lack of info / data	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	onsite conditions necessitate design changes	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.9	Redesign / Rework (combined with 4.8)											
4.10	Buildability											
4.11	Traffic Management	underestimate TM allowances	T	Quite Common	20% - 50%	4		Major	70	280	18	Very High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)											
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	26	High
4.14	Issues - Pavement/Surfacing		T	Unlikely	10% - 20%	3		Major	70	210	20	Very High
4.15	Issues - Structures		T	Quite Common	20% - 50%	4		Substantial	100	400	8	Extreme
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Medium	40	80	30	High
4.17	Services		T	Unlikely	10% - 20%	3		Major	70	210	20	Very High
4.18	Natural Events	significant natural event (unusual event) during construction	T	Unlikely	10% - 20%	3	delays to project and increased costs	Major	70	210	20	Very High
4.19	Other	causes damage										

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	Quite Common	20% - 50%	4
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	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
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1.3	Assignment / Mode Choice	under estimation of mode share off rail, modelling parameters	T	Unlikely	10% - 20%	3	don't have sufficient travel capacity so need new transport facility	Substantial	100	300	15	Very High
1.4	Crashes	crash savings aren't realised with implementation of HC4	T	Unusual	1% - 10%	2	high accident rate	Major	70	140	25	High
1.5	Other - Oil Shock	oil prices skyrocket	T	Unlikely	10% - 20%	3	major mode shift	Substantial	100	300	15	Very High
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on local roads than anticipated	T	Likely	>50%	5	health & safety - more accidents, ped accidents?	Major	70	350	11	Extreme
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Quite Common	20% - 50%	4	reputation / image	Medium	40	160	24	Very High
2.3	Funding	funding is unavailable	T	Likely	>50%	5	project doesn't proceed	Substantial	100	500	1	Extreme
2.4	Procurement	procurement problems	T	Unusual	1% - 10%	2	time delay to contract	Medium	40	80	30	High
2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Unusual	1% - 10%	2	project delayed or scope affected	Major	70	140	25	High
2.6	Document Control											
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Substantial	100	500	1	Extreme
2.8	Programming Issues											
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Likely	>50%	5	injury occurs	Medium	40	200	23	Very High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Likely	>50%	5	legal action and political protest	Major	70	350	11	Extreme
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Likely	>50%	5		Major	70	350	11	Extreme
3.4	Impact on Public Health	construction activity greater than anticipated	T	Unlikely	10% - 20%	3		Medium	40	120	29	High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Quite Common	20% - 50%	4	change location of road	Substantial	100	400	8	Extreme
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Quite Common	20% - 50%	4	time and cost over base case 5yrs	Major	70	280	18	Very High
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Likely	>50%	5	delays to programme and increased costs for land purchase	Major	70	350	11	Extreme
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<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.2	Design Standards (Definition)	changes to current design standards	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.3	Client-Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.6	Site/Ground Conditions	lack of info / data	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	onsite conditions necessitate design changes	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.9	Redesign / Rework (combined with 4.8)											
4.10	Buildability											
4.11	Traffic Management	underestimate TM allowances	T	Quite Common	20% - 50%	4		Major	70	280	18	Very High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)											
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	25	High
4.14	Issues - Pavement/Surfacing		T	Unlikely	10% - 20%	3		Major	70	210	20	Very High
4.15	Issues - Structures		T	Quite Common	20% - 50%	4		Substantial	100	400	8	Extreme
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Medium	40	80	30	High
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	Expected	75% - 90%	4
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	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
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Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
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2.1	Project Scope	need to do more work on local roads than anticipated	T	Likely	>50%	5	health & safety - more accidents, ped accidents?	Major	70	350	11	Extreme
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2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Likely	>50%	5	injury occurs	Medium	40	200	23	Very High
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2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Likely	>50%	5	legal action and political protest	Major	70	350	11	Extreme
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3.9	Land - Purchase	land purchases delayed	T	Likely	>50%	5	delays to programme and increased costs for land purchase	Major	70	350	11	Extreme
3.10	Political	loss of political support (no unity)	T	Unlikely	10% - 20%	3	delays to project & revision of objectives	Substantial	100	300	15	Very High
3.11	Other											
3.14	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.2	Design Standards (Definition)	changes to current design standards	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.3	Client-Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.6	Site/Ground Conditions	lack of info / data	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	onsite conditions necessitate design changes	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.9	Redesign / Rework (combined with 4.8)											
4.10	Buildability											
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4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	25	High
4.14	Issues - Pavement/Surfacing		T	Unlikely	10% - 20%	3		Major	70	210	20	Very High
4.15	Issues - Structures		T	Quite Common	20% - 50%	4		Substantial	100	400	8	Extreme
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Medium	40	80	30	High
4.17	Services		T	Unlikely	10% - 20%	3		Major	70	210	20	Very High
4.18	Natural Events	significant natural event (unusual event) during construction	T	Unlikely	10% - 20%	3	delays to project and increased costs	Major	70	210	20	Very High
4.19	Other	causes damage										

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	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
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	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

**ELEMENT: RT16 - NEW STABLING NORTH OF WAIKANA**

**Project not required**

## **ELEMENT: RM7 - PASSENGER REAL TIME**

**Funding**

**How the solution will work / robustness**

**Accuracy of info**

**Vandalism of stations**

## **ELEMENT: RM6 - CARRIAGE OF BICYCLES**

**Only an issue in terms of capacity available on trains**

## **ELEMENT: RM2 - MANAGEMENT OF RAIL PRIORITIES**

**Not an issue if RT1 and RT2 are completed**



Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
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1.2	Growth Forecasts	growth forecasts are inadequately low	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport facility	Substantial	100	400	3	Extreme
1.3	Assignment / Mode Choice	under estimation of mode share off road	T	Unlikely	10% - 20%	3	don't have sufficient travel capacity so need new transport	Major	70	210	15	Very High
1.4	Crashes		T	Unusual	1% - 10%	2		Substantial	100	200	18	Very High
1.5	Other - Oil Shock		T	Rare	<1%	1		Negligible	1	1	32	Negligible
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on local roads than anticipated	T	Likely	>50%	5	health & safety - more accidents, ped accidents?	Major	70	350	4	Extreme
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Quite Common	20% - 50%	4	reputation / image	Medium	40	160	22	Very High
2.3	Funding	funding is unavailable	T	Likely	>50%	5	project doesn't proceed	Substantial	100	500	1	Extreme
2.4	Procurement	limited amount of rail design and construction expertise in NZ.	T	Unusual	1% - 10%	2	time delay to contract	Major	70	140	24	High
2.5	Legislative/Regulation Issues	Resources may not be readily available	T	Unusual	1% - 10%	2	project delayed or scope affected	Major	70	140	24	High
2.6	Document Control	unforeseen legislation (new)										
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Substantial	100	500	1	Extreme
2.8	Programming Issues	Programming of construction work around existing rail services. Will be practically impossible to replace all rail services with buses during construction phase.	T	Likely	>50%	5		Medium	40	200	18	Very High
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Likely	>50%	5	injury occurs	Medium	40	200	18	Very High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Likely	>50%	5	legal action and political protest	Major	70	350	4	Extreme
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Likely	>50%	5		Major	70	350	4	Extreme
3.4	Impact on Public Health	construction activity greater than anticipated	T	Quite Common	20% - 50%	4		Medium	40	160	22	Very High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Quite Common	20% - 50%	4	change location of road	Major	70	280	12	Very High
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Likely	>50%	5	time and cost over base case 5yrs	Major	70	350	4	Extreme
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Likely	>50%	5	delays to programme and increased costs for land purchase	Major	70	350	4	Extreme
3.10	Political	loss of political support (no unity)	T	Unlikely	10% - 20%	3	delays to project & revision of objectives	Major	70	210	15	Very High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Likely	>50%	5	delays to project and increased costs	Major	70	350	4	Extreme
4.2	Design Standards (Definition)	changes to current design standards	T	Likely	>50%	5	delays to project and increased costs	Major	70	350	4	Extreme
4.3	Client Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Likely	>50%	5	delays to project and increased costs	Major	70	350	4	Extreme
4.6	Site/Ground Conditions	Risk lower than RT1	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	24	High
4.7	Design Issues (combined with 4.6)	No unique risk										
4.8	Design Changes	No unique risk										
4.9	Redesign / Rework (combined with 4.8)	No unique risk										
4.10	Buildability	No unique risk										
4.11	Traffic Management - bus replacements, TSRs	Replacing some existing rail services with buses during construction phase. Limited availability of buses. Road congestion delaying bus leg of journey and adversely affecting connections with rail services. Temporary speed restrictions will apply to rail services passing the station site during construction phase.	T	Likely	>50%	5		Medium	40	200	18	Very High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)	No unique risk										
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Medium	40	80	30	High
4.14	Issues - Pavement/Surfacing		T	Unlikely	10% - 20%	3		Medium	40	120	28	High
4.15	Issues - Structures		T	Quite Common	20% - 50%	4		Major	70	280	12	Very High
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Minor	10	20	31	Low
4.17	Services		T	Unlikely	10% - 20%	3		Medium	40	120	28	High
4.18	Natural Events	No unique risk	T	Unlikely	10% - 20%	3		Major	70	210	15	Very High
4.19	Other	No unique risk										

Date of Risk Review: 24/02/2005  
 Compiled by: Darren Cash  
 Contributors:

Threat	Likely	>50%	5
	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unusual	1% - 10%	2	Redo the base modelling investigation	Major	70	140	23	High
1.2	Growth Forecasts	growth forecasts are inadequately low	T	Likely	>50%	5	don't have sufficient travel capacity so need new transport facility	Substantial	100	500	1	Extreme
1.3	Assignment / Mode Choice	under estimation of mode share off rail, modelling parameters	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport facility	Substantial	100	400	5	Extreme
1.4	Crashes	crash savings aren't realised with implementation of HC4	T	Unlikely	10% - 20%	3	high accident rate	Major	70	210	18	Very High
1.5	Other - Oil Shock	oil prices skyrocket	T	Unlikely	10% - 20%	3	major mode shift	Medium	40	120	27	High
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on local roads than anticipated & project c	T	Likely	>50%	5	health & safety - more accidents, ped accidents?	Substantial	100	500	1	Extreme
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Quite Common	20% - 50%	4	reputation / image	Medium	40	160	19	Very High
2.3	Funding	funding is unavailable	T	Quite Common	20% - 50%	4	project doesn't proceed	Substantial	100	400	5	Extreme
2.4	Procurement	procurement problems	T	Unusual	1% - 10%	2	time delay to contract	Medium	40	80	30	High
2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Unusual	1% - 10%	2	project delayed or scope affected	Major	70	140	23	High
2.6	Document Control											
2.7	Market Issues	higher construction costs through market forces	T	Quite Common	20% - 50%	4	cost changes significantly	Major	70	280	15	Very High
2.8	Programming Issues											
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Quite Common	20% - 50%	4	injury occurs	Medium	40	160	19	Very High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Likely	>50%	5	legal action and political protest	Major	70	350	9	Extreme
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Quite Common	20% - 50%	4		Major	70	280	15	Very High
3.4	Impact on Public Health	construction activity greater than anticipated	T	Quite Common	20% - 50%	4		Medium	40	160	19	Very High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Quite Common	20% - 50%	4	change location of road	Substantial	100	400	5	Extreme
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Quite Common	20% - 50%	4	time and cost over base case 5yrs	Major	70	280	15	Very High
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Likely	>50%	5	delays to programme and increased costs for land purchase	Major	70	350	9	Extreme
3.10	Political	loss of political support (no unity)	T	Unlikely	10% - 20%	3	delays to project & revision of objectives	Substantial	100	300	14	Very High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.2	Design Standards (Definition)	changes to current design standards	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.3	Client-Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Likely	>50%	5	delays to project and increased costs	Major	70	350	9	Extreme
4.6	Site/Ground Conditions	lack of info / data	T	Likely	>50%	5	delays to project and increased costs	Major	70	350	9	Extreme
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	onsite conditions necessitate design changes	T	Likely	>50%	5	delays to project and increased costs	Major	70	350	9	Extreme
4.9	Redesign / Rework (combined with 4.8)											
4.10	Buildability											
4.11	Traffic Management	underestimate TM allowances	T	Quite Common	20% - 50%	4		Medium	40	160	19	Very High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)											
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	23	High
4.14	Issues - Pavement/Surfacing		T	Unlikely	10% - 20%	3		Medium	40	120	27	High
4.15	Issues - Structures		T	Quite Common	20% - 50%	4		Substantial	100	400	5	Extreme
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Medium	40	80	30	High
4.17	Services		T	Unlikely	10% - 20%	3		Medium	40	120	27	High
4.18	Natural Events	significant natural event (unusual event) during construction causes damage	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	23	High
4.19	Other											

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 Compiled by: Darren Cash  
 Contributors:

Threat	Likely	>50%	5
	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unusual	1% - 10%	2	Redo the base modelling investigation	Major	70	140	17	High
1.2	Growth Forecasts	opportunity to mitigate incorrect growth forecast	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport facility	Substantial	100	400	1	Extreme
1.3	Assignment / Mode Choice	under estimation of mode share off rail, modelling parameters	T	Unlikely	10% - 20%	3	don't have sufficient travel capacity so need new transport facility	Substantial	100	300	5	Very High
1.4	Crashes	crash savings aren't realised with implementation of HC4	T	Unusual	1% - 10%	2	high accident rate	Major	70	140	17	High
1.5	Other - Oil Shock	oil prices skyrocket	T	Unlikely	10% - 20%	3	major mode shift	Substantial	100	300	5	Very High
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on local roads than anticipated	T	Likely	>50%	5	health & safety - more accidents, ped accidents?	Major	70	350	2	Extreme
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Quite Common	20% - 50%	4	reputation / image	Major	70	280	8	Very High
2.3	Funding	funding is unavailable	T	Likely	>50%	5	project doesn't proceed	Major	70	350	2	Extreme
2.4	Procurement	procurement problems	T	Unusual	1% - 10%	2	time delay to contract	Medium	40	80	20	High
2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Unusual	1% - 10%	2	project delayed or scope affected	Major	70	140	17	High
2.6	Document Control											
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Medium	40	200	10	Very High
2.8	Programming Issues											
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Likely	>50%	5	injury occurs	Medium	40	200	10	Very High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Likely	>50%	5	legal action and political protest	Major	70	350	2	Extreme
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Likely	>50%	5		Minor	10	50	21	Moderate
3.4	Impact on Public Health	construction activity greater than anticipated	T	Quite Common	20% - 50%	4		Minor	10	40	24	Moderate
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Quite Common	20% - 50%	4	change location of road	Minor	10	40	24	Moderate
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Quite Common	20% - 50%	4	time and cost over base case 5yrs	Medium	40	160	16	Very High
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Likely	>50%	5	delays to programme and increased costs for land purchase	Medium	40	200	10	Very High
3.10	Political	loss of political support (no unity)	T	Unlikely	10% - 20%	3	delays to project & revision of objectives	Substantial	100	300	5	Very High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Likely	>50%	5	delays to project and increased costs	Medium	40	200	10	Very High
4.2	Design Standards (Definition)	changes to current design standards	T	Likely	>50%	5	delays to project and increased costs	Medium	40	200	10	Very High
4.3	Client-Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Likely	>50%	5	delays to project and increased costs	Minor	10	50	21	Moderate
4.6	Site/Ground Conditions	lack of info / data	T	Likely	>50%	5	delays to project and increased costs	Minor	10	50	21	Moderate
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	onsite conditions necessitate design changes	T	Likely	>50%	5	delays to project and increased costs	Medium	40	200	10	Very High
4.9	Redesign / Rework (combined with 4.8)											
4.10	Buildability											
4.11	Traffic Management	underestimate TM allowances	T	Quite Common	20% - 50%	4		Major	70	280	8	Very High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)											
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Minor	10	20	27	Low
4.14	Issues - Pavement/Surfacing											
4.15	Issues - Structures		T	Unusual	1% - 10%	2		Minor	10	20	27	Low
4.16	Traffic Control and Lighting											
4.17	Services											
4.18	Natural Events	significant natural event (unusual event) during construction	T	Unlikely	10% - 20%	3	delays to project and increased costs	Minor	10	30	26	Moderate
4.19	Other	causes damage										

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 Compiled by: Darren Cash  
 Contributors:

Threat	Likely	>50%	5
	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unlikely	10% - 20%	3	Redo the base modelling investigation	Major	70	210	18	Very High
1.2	Growth Forecasts	growth forecasts are inadequately low	T	Quite Common	20% - 50%	4	additional capacity reduces growth risk	Major	70	280	15	Very High
1.3	Assignment / Mode Choice	under estimate assignment of vehicle using TGM	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport	Substantial	100	400	3	Extreme
1.4	Crashes	crash savings aren't realised with implementation of HC4	T	Quite Common	20% - 50%	4	high accident rate	Major	70	280	15	Very High
1.5	Other - Oil Shock	oil prices skyrocket	T	Quite Common	20% - 50%	4	major mode shift	Substantial	100	400	3	Extreme
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope - relative to a HC4	need to do more work on local roads than anticipated	T	Likely	>50%	5	health & safety - more accidents, ped accidents?	Major	70	350	11	Extreme
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Likely	>50%	5	reputation / image	Medium	40	200	22	Very High
2.3	Funding	funding is unavailable	T	Likely	>50%	5	project doesn't proceed	Substantial	100	500	1	Extreme
2.4	Procurement	procurement problems	T	Unusual	1% - 10%	2	time delay to contract	Major	70	140	24	High
2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Unusual	1% - 10%	2	project delayed or scope affected	Major	70	140	24	High
2.6	Document Control											
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Substantial	100	500	1	Extreme
2.8	Programming Issues											
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Unlikely	10% - 20%	3	injury occurs	Medium	40	120	27	High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, Land and Property)</b>												
3.1	Community	increased costs and time	T	Likely	>50%	5	legal action and political protest	Major	70	350	11	Extreme
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Quite Common	20% - 50%	4		Major	70	280	15	Very High
3.4	Impact on Public Health	construction activity greater than anticipated	T	Unusual	1% - 10%	2		Medium	40	80	28	High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Unusual	1% - 10%	2	change location of road	Major	70	140	24	High
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Unlikely	10% - 20%	3	time and cost over base case 5yrs	Major	70	210	18	Very High
3.7	Building Consent											
3.8	Land - Designation											
3.9	Land - Purchase	land purchases delayed	T	Unlikely	10% - 20%	3	delays to programme and increased costs for land purchase	Major	70	210	18	Very High
3.10	Political	loss of political support (no unity)	T	Unusual	1% - 10%	2	delays to project & revision of objectives	Substantial	100	200	22	Very High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	increased likelihood of scope change on HT4	T	Quite Common	20% - 50%	4	delays to project and increased costs	Substantial	100	400	3	Extreme
4.2	Design Standards (Definition)	changes to current design standards	T	Quite Common	20% - 50%	4	delays to project and increased costs	Substantial	100	400	3	Extreme
4.3	Client Initiated Changes		T	Quite Common	20% - 50%	4		Substantial	100	400	3	Extreme
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Unlikely	10% - 20%	3	delays to project and increased costs	Substantial	100	300	13	Very High
4.6	Site/Ground Conditions	lack of info / data	T	Quite Common	20% - 50%	4	delays to project and increased costs	Substantial	100	400	3	Extreme
4.7	Design Issues		T	Quite Common	20% - 50%	4		Substantial	100	400	3	Extreme
4.8	Design Changes											
4.9	Redesign / Rework (combined with 4.8)											
4.10	Buildability											
4.11	Traffic Management		T	Unusual	1% - 10%	2		Medium	40	80	28	High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)											
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Medium	40	80	28	High
4.14	Issues - Pavement/Surfacing		T	Unlikely	10% - 20%	3		Major	70	210	18	Very High
4.15	Issues - Structures		T	Quite Common	20% - 50%	4		Substantial	100	400	3	Extreme
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Medium	40	80	28	High
4.17	Services		T	Unusual	1% - 10%	2		Medium	40	80	28	High
4.18	Natural Events	significant natural event (unusual event) during construction	T	Unlikely	10% - 20%	3	delays to project and increased costs	Substantial	100	300	13	Very High
4.19	Other	causes damage										

Date of Risk Review: 24/02/2005  
 Compiled by: Darren Cash  
 Contributors:

Threat	Descriptor	Probability	Rating
Threat	Likely	>50%	5
	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Descriptor	Rating
Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unlikely	10% - 20%	3	Redo the base modelling investigation	Major	70	210	16	Very High
1.2	Growth Forecasts	growth forecasts are inadequately low	T	Unlikely	10% - 20%	3	additional capacity reduces growth risk	Major	70	210	16	Very High
1.3	Assignment / Mode Choice	under estimate assignment of vehicle using TGM	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport	Substantial	100	400	3	Extreme
1.4	Crashes	uncertainty of crash rates	T	Unusual	1% - 10%	2	high accident rate	Major	70	140	23	High
1.5	Other - Oil Shock	oil prices skyrocket	T	Unlikely	10% - 20%	3	major mode shift	Substantial	100	300	9	Very High
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope - relative to a HC4	need to do more work on local roads than anticipated	T	Quite Common	20% - 50%	4	health & safety - more accidents, ped accidents?	Major	70	280	12	Very High
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Quite Common	20% - 50%	4	reputation / image	Medium	40	160	22	Very High
2.3	Funding	funding is unavailable	T	Likely	>50%	5	project doesn't proceed	Substantial	100	500	1	Extreme
2.4	Procurement	procurement problems	T	Unusual	1% - 10%	2	time delay to contract	Major	70	140	23	High
2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Unusual	1% - 10%	2	project delayed or scope affected	Major	70	140	23	High
2.6	Document Control											
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Substantial	100	500	1	Extreme
2.8	Programming Issues											
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Unlikely	10% - 20%	3	injury occurs	Medium	40	120	27	High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, Land and Property)</b>												
3.1	Community	increased costs and time	T	Quite Common	20% - 50%	4	legal action and political protest	Major	70	280	12	Very High
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Quite Common	20% - 50%	4		Major	70	280	12	Very High
3.4	Impact on Public Health	construction activity greater than anticipated	T	Unusual	1% - 10%	2		Medium	40	80	28	High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Unusual	1% - 10%	2	change location of road	Medium	40	80	28	High
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Unlikely	10% - 20%	3	time and cost over base case 5yrs	Major	70	210	16	Very High
3.7	Building Consent											
3.8	Land - Designation - designation in place											
3.9	Land - Purchase	land purchases delayed	T	Unlikely	10% - 20%	3	delays to programme and increased costs for land purchase	Major	70	210	16	Very High
3.10	Political	loss of political support (no unity)	T	Unusual	1% - 10%	2	delays to project & revision of objectives	Substantial	100	200	21	Very High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	increased likelihood of scope change on HT4	T	Quite Common	20% - 50%	4	delays to project and increased costs	Substantial	100	400	3	Extreme
4.2	Design Standards (Definition)	changes to current design standards	T	Quite Common	20% - 50%	4	delays to project and increased costs	Substantial	100	400	3	Extreme
4.3	Client Initiated Changes		T	Quite Common	20% - 50%	4		Substantial	100	400	3	Extreme
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Unlikely	10% - 20%	3	delays to project and increased costs	Substantial	100	300	9	Very High
4.6	Site/Ground Conditions	lack of info / data	T	Quite Common	20% - 50%	4	delays to project and increased costs	Substantial	100	400	3	Extreme
4.7	Design Issues		T	Quite Common	20% - 50%	4		Major	70	280	12	Very High
4.8	Design Changes											
4.9	Redesign / Rework (combined with 4.8)											
4.10	Buildability											
4.11	Traffic Management		T	Unusual	1% - 10%	2		Medium	40	80	28	High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)											
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	23	High
4.14	Issues - Pavement/Surfacing		T	Unlikely	10% - 20%	3		Major	70	210	16	Very High
4.15	Issues - Structures	large long bridges	T	Quite Common	20% - 50%	4		Substantial	100	400	3	Extreme
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Medium	40	80	28	High
4.17	Services		T	Unusual	1% - 10%	2		Medium	40	80	28	High
4.18	Natural Events	earthquake and high batters	T	Unlikely	10% - 20%	3	delays to project and increased costs	Substantial	100	300	9	Very High
4.19	Other											

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 Contributors:

Threat	Likely	>50%	5
	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unusual	1% - 10%	2	Redo the base modelling investigation	Minor	10	20	30	Low
1.2	Growth Forecasts	growth forecasts are inadequately low	T	Unlikely	10% - 20%	3	don't have sufficient travel capacity so need new transport facility	Medium	40	120	17	High
1.3	Assignment / Mode Choice	under estimation of mode share off rail, modelling parameters	T	Unlikely	10% - 20%	3	don't have sufficient travel capacity so need new transport facility	Major	70	210	7	Very High
1.4	Crashes	crash savings aren't realised with implementation of HC4	T	Unusual	1% - 10%	2	high accident rate	Medium	40	80	20	High
1.5	Other - Oil Shock	oil prices skyrocket	T	Unlikely	10% - 20%	3	major mode shift	Substantial	100	300	4	Very High
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on interface than anticipated	T	Unusual	1% - 10%	2		Medium	40	80	20	High
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Rare	<1%	1	reputation / image	Medium	40	40	28	Moderate
2.3	Funding	funding is unavailable	T	Unlikely	10% - 20%	3	project doesn't proceed	Substantial	100	300	4	Very High
2.4	Procurement	procurement problems	T	Unusual	1% - 10%	2	time delay to contract	Medium	40	80	20	High
2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Unusual	1% - 10%	2	project delayed or scope affected	Major	70	140	14	High
2.6	Document Control											
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Medium	40	200	10	Very High
2.8	Programming Issues											
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Unusual	1% - 10%	2	injury occurs	Minor	10	20	30	Low
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Likely	>50%	5	legal action and political protest	Major	70	350	2	Extreme
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Unlikely	10% - 20%	3		Medium	40	120	17	High
3.4	Impact on Public Health	construction activity greater than anticipated	T	Quite Common	20% - 50%	4		Medium	40	160	13	Very High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Likely	>50%	5	change location of road	Substantial	100	500	1	Extreme
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Likely	>50%	5	time and cost over base case 5yrs	Major	70	350	2	Extreme
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Unusual	1% - 10%	2	delays to programme and increased costs for land purchase	Major	70	140	14	High
3.10	Political	loss of political support (no unity)	T	Unusual	1% - 10%	2	delays to project & revision of objectives	Substantial	100	200	10	Very High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	14	High
4.2	Design Standards (Definition)	changes to current design standards	T	Likely	>50%	5	delays to project and increased costs	Medium	40	200	10	Very High
4.3	Client-Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Rare	<1%	1	delays to project and increased costs	Medium	40	40	28	Moderate
4.6	Site/Ground Conditions	lack of info / data	T	Unlikely	10% - 20%	3	delays to project and increased costs	Medium	40	120	17	High
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	onsite conditions necessitate design changes	T	Unusual	1% - 10%	2	delays to project and increased costs	Medium	40	80	20	High
4.9	Redesign / Rework (combined with 4.8)											
4.10	Buildability											
4.11	Traffic Management	underestimate TM allowances	T	Unusual	1% - 10%	2		Medium	40	80	20	High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)											
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Medium	40	80	20	High
4.14	Issues - Pavement/Surfacing		T	Unlikely	10% - 20%	3		Major	70	210	7	Very High
4.15	Issues - Structures		T	Unlikely	10% - 20%	3		Substantial	100	300	4	Very High
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Medium	40	80	20	High
4.17	Services		T	Rare	<1%	1		Major	70	70	27	High
4.18	Natural Events	significant natural event (unusual event) during construction causes damage	T	Unlikely	10% - 20%	3	delays to project and increased costs	Major	70	210	7	Very High
4.19	Other											

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Threat	Likely	>50%	5
	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unusual	1% - 10%	2	Redo the base modelling investigation	Major	70	140	14	High
1.2	Growth Forecasts	growth forecasts are inadequately low	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport facility	Negligible	1	4	30	Low
1.3	Assignment / Mode Choice	under estimation of mode share off rail, modelling parameters	T	Unlikely	10% - 20%	3	don't have sufficient travel capacity so need new transport facility	Major	70	210	10	Very High
1.4	Crashes	crash savings aren't realised with implementation of HC4	T	Rare	<1%	1	high accident rate	Minor	10	10	28	Low
1.5	Other - Oil Shock	oil prices skyrocket	T	Unlikely	10% - 20%	3	major mode shift	Substantial	100	300	6	Very High
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on interface than anticipated	T	Unlikely	10% - 20%	3	health & safety - more accidents, ped accidents?	Minor	10	30	25	Moderate
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Unlikely	10% - 20%	3	reputation / image	Medium	40	120	16	High
2.3	Funding	funding is unavailable	T	Unlikely	10% - 20%	3	project doesn't proceed	Substantial	100	300	6	Very High
2.4	Procurement	procurement problems	T	Unusual	1% - 10%	2	time delay to contract	Medium	40	80	20	High
2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Unusual	1% - 10%	2	project delayed or scope affected	Major	70	140	14	High
2.6	Document Control											
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Major	70	350	4	Extreme
2.8	Programming Issues											
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Rare	<1%	1	injury occurs	Minor	10	10	28	Low
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	community resistance	T	Unlikely	10% - 20%	3	legal action and political protest	Minor	10	30	25	Moderate
3.2	Industrial Action by Others											
3.3	Ecological Issues	unexpected costs with mitigating environ impacts	T	Quite Common	20% - 50%	4		Medium	40	160	13	Very High
3.4	Impact on Public Health	construction activity greater than anticipated	T	Unusual	1% - 10%	2		Minor	10	20	27	Low
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Unusual	1% - 10%	2	change location of road	Medium	40	80	20	High
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Quite Common	20% - 50%	4	time and cost over base case 5yrs	Major	70	280	9	Very High
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Unlikely	10% - 20%	3	delays to programme and increased costs for land purchase	Major	70	210	10	Very High
3.10	Political	loss of political support (no unity)	T	Rare	<1%	1	delays to project & revision of objectives	Substantial	100	100	19	High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Unlikely	10% - 20%	3	delays to project and increased costs	Substantial	100	300	6	Very High
4.2	Design Standards (Definition)	changes to current design standards	T	Likely	>50%	5	delays to project and increased costs	Major	70	350	4	Extreme
4.3	Client Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.6	Site/Ground Conditions	lack of info / data	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	onsite conditions necessitate design changes	T	Rare	<1%	1	delays to project and increased costs	Negligible	1	1	31	Negligible
4.9	Redesign / Rework (combined with 4.8)											
4.10	Buildability											
4.11	Traffic Management	underestimate TM allowances	T	Unusual	1% - 10%	2		Medium	40	80	20	High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)											
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unlikely	10% - 20%	3	delays to project and increased costs	Medium	40	120	16	High
4.14	Issues - Pavement/Surfacing		T	Unlikely	10% - 20%	3		Major	70	210	10	Very High
4.15	Issues - Structures		T	Quite Common	20% - 50%	4		Substantial	100	400	3	Extreme
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Medium	40	80	20	High
4.17	Services		T	Rare	<1%	1		Major	70	70	24	High
4.18	Natural Events	significant natural event (unusual event) during construction causes damage	T	Unlikely	10% - 20%	3	delays to project and increased costs	Medium	40	120	16	High
4.19	Other											

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Threat	Likely	>50%	5
	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unusual	1% - 10%	2	Redo the base modelling investigation	Minor	10	20	25	Low
1.2	Growth Forecasts	growth forecasts are inadequately low	T	Quite Common	20% - 50%	4	No consequence	Negligible	1	4	28	Low
1.3	Assignment / Mode Choice	under estimation of mode share off rail, modelling parameters	T	Unlikely	10% - 20%	3	No consequence	Negligible	1	3	29	Negligible
1.4	Crashes	crash savings aren't realised with implementation of HC4	T	Unusual	1% - 10%	2	high accident rate	Minor	10	20	25	Low
1.5	Other - Oil Shock	oil prices skyrocket	T	Unlikely	10% - 20%	3	No consequence	Negligible	1	3	29	Negligible
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on local roads than anticipated	T	Unlikely	10% - 20%	3	health & safety - more accidents, ped accidents?	Medium	40	120	16	High
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Unusual	1% - 10%	2	reputation / image	Major	70	140	13	High
2.3	Funding	funding is unavailable	T	Likely	>50%	5	project doesn't proceed	Substantial	100	500	1	Extreme
2.4	Procurement	procurement problems	T	Unusual	1% - 10%	2	time delay to contract	Medium	40	80	20	High
2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Likely	>50%	5	project delayed or scope affected	Major	70	350	3	Extreme
2.6	Document Control											
2.7	Market Issues	higher construction costs through market forces	T	Unlikely	10% - 20%	3	cost changes significantly	Major	70	210	8	Very High
2.8	Programming Issues											
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Unusual	1% - 10%	2	injury occurs	Minor	10	20	25	Low
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Unlikely	10% - 20%	3	legal action and political protest	Minor	10	30	24	Moderate
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Unlikely	10% - 20%	3		Medium	40	120	16	High
3.4	Impact on Public Health	construction activity greater than anticipated onerous conditions imposed. Additional costs to obtain HPT approval	T	Unusual	1% - 10%	2	No consequence	Negligible	1	2	31	Negligible
3.5	Heritage Issues (Historic Places Trust)		T	Quite Common	20% - 50%	4	change location of road	Medium	40	160	12	Very High
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Unlikely	10% - 20%	3	time and cost over base case 5yrs	Major	70	210	8	Very High
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Quite Common	20% - 50%	4	delays to programme and increased costs for land purchase	Major	70	280	4	Very High
3.10	Political	loss of political support (no unity)	T	Unusual	1% - 10%	2	delays to project & revision of objectives	Major	70	140	13	High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Unlikely	10% - 20%	3	delays to project and increased costs	Medium	40	120	16	High
4.2	Design Standards (Definition)	changes to current design standards	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	4	Very High
4.3	Client-Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	4	Very High
4.6	Site/Ground Conditions	lack of info / data	T	Unlikely	10% - 20%	3	delays to project and increased costs	Major	70	210	8	Very High
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	onsite conditions necessitate design changes	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	4	Very High
4.9	Redesign / Rework (combined with 4.8)											
4.10	Buildability											
4.11	Traffic Management	underestimate TM allowances	T	Unusual	1% - 10%	2		Medium	40	80	20	High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)											
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	13	High
4.14	Issues - Pavement/Surfacing		T	Unlikely	10% - 20%	3		Major	70	210	8	Very High
4.15	Issues - Structures		T	Quite Common	20% - 50%	4		Substantial	100	400	2	Extreme
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Medium	40	80	20	High
4.17	Services		T	Rare	<1%	1		Major	70	70	23	High
4.18	Natural Events	significant natural event (unusual event) during construction causes damage	T	Unlikely	10% - 20%	3	delays to project and increased costs	Medium	40	120	16	High
4.19	Other											

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Threat	Likely	>50%	5
	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible



Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unusual	1% - 10%	2	Redo the base modelling investigation	Minor	10	20	29	Low
1.2	Growth Forecasts	growth forecasts are inadequately low	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport facility	Minor	10	40	26	Moderate
1.3	Assignment / Mode Choice	change from 58	T	Unlikely	10% - 20%	3	don't have sufficient travel capacity so need new transport	Minor	10	30	27	Moderate
1.4	Crashes	crash savings aren't realised with implementation of HC4	T	Unusual	1% - 10%	2	high accident rate	Medium	40	80	23	High
1.5	Other - Oil Shock	oil prices skyrocket	T	Unlikely	10% - 20%	3	no consequences	Negligible	1	3	31	Negligible
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	length creep	T	Quite Common	20% - 50%	4	health & safety - more accidents, ped accidents?	Major	70	280	8	Very High
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Quite Common	20% - 50%	4	reputation / image	Major	70	280	8	Very High
2.3	Funding	funding is unavailable	T	Likely	>50%	5	project doesn't proceed	Substantial	100	500	1	Extreme
2.4	Procurement	procurement problems	T	Unusual	1% - 10%	2	time delay to contract	Medium	40	80	23	High
2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Likely	>50%	5	project delayed or scope affected	Major	70	350	3	Extreme
2.6	Document Control											
2.7	Market Issues	higher construction costs through market forces	T	Unlikely	10% - 20%	3	cost changes significantly	Medium	40	120	18	High
2.8	Programming Issues											
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Unlikely	10% - 20%	3	injury occurs	Medium	40	120	18	High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, Land and Property)</b>												
3.1	Community	increased costs and time	T	Quite Common	20% - 50%	4	legal action and political protest	Medium	40	160	13	Very High
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Likely	>50%	5		Major	70	350	3	Extreme
3.4	Impact on Public Health	construction activity greater than anticipated	T	Unlikely	10% - 20%	3		Minor	10	30	27	Moderate
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Quite Common	20% - 50%	4	change location of road	Medium	40	160	13	Very High
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Likely	>50%	5	time and cost over base case 5yrs	Major	70	350	3	Extreme
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Likely	>50%	5	delays to programme and increased costs for land purchase	Major	70	350	3	Extreme
3.10	Political	loss of political support (no unity)	T	Likely	>50%	5	delays to project & revision of objectives	Major	70	350	3	Extreme
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Quite Common	20% - 50%	4	delays to project and increased costs	Medium	40	160	13	Very High
4.2	Design Standards (Definition)	changes to current design standards	T	Quite Common	20% - 50%	4	delays to project and increased costs	Major	70	280	8	Very High
4.3	Client-Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Quite Common	20% - 50%	4	delays to project and increased costs	Medium	40	160	13	Very High
4.6	Site/Ground Conditions	lack of info / data	T	Unlikely	10% - 20%	3	delays to project and increased costs	Medium	40	120	18	High
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	onsite conditions necessitate design changes	T	Quite Common	20% - 50%	4	delays to project and increased costs	Medium	40	160	13	Very High
4.9	Redesign / Rework (combined with 4.8)											
4.10	Buildability											
4.11	Traffic Management	underestimate TM allowances	T	Unlikely	10% - 20%	3		Medium	40	120	18	High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)											
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Minor	10	20	29	Low
4.14	Issues - Pavement/Surfacing		T	Unlikely	10% - 20%	3		Major	70	210	11	Very High
4.15	Issues - Structures		T	Quite Common	20% - 50%	4		Substantial	100	400	2	Extreme
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Medium	40	80	23	High
4.17	Services		T	Unlikely	10% - 20%	3		Major	70	210	11	Very High
4.18	Natural Events	significant natural event (unusual event) during construction	T	Unlikely	10% - 20%	3	delays to project and increased costs	Medium	40	120	18	High
4.19	Other	causes damage										

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	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unusual	1% - 10%	2	Redo the base modelling investigation	Major	70	140	22	High
1.2	Growth Forecasts	growth forecasts are inadequately low	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport facility	Substantial	100	400	3	Extreme
1.3	Assignment / Mode Choice	under estimation of mode share off rail, modelling parameters	T	Unlikely	10% - 20%	3	don't have sufficient travel capacity so need new transport facility	Substantial	100	300	9	Very High
1.4	Crashes - opportunity to reduce crashes	crash savings aren't realised with implementation of HC4	T	Unlikely	10% - 20%	3	high accident rate	Major	70	210	12	Very High
1.5	Other - Oil Shock	oil prices skyrocket	T	Unlikely	10% - 20%	3	major mode shift	Substantial	100	300	9	Very High
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on local roads than anticipated	T	Unlikely	10% - 20%	3	highway well understood	Major	70	210	12	Very High
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Unlikely	10% - 20%	3	only WCC TLA	Medium	40	120	26	High
2.3	Funding	funding is unavailable	T	Quite Common	20% - 50%	4	project doesn't proceed	Substantial	100	400	3	Extreme
2.4	Procurement	procurement problems	T	Unusual	1% - 10%	2	time delay to contract	Medium	40	80	29	High
2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Rare	<1%	1	?? Cant read what's written	Major	70	70	31	High
2.6	Document Control											
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Substantial	100	500	1	Extreme
2.8	Programming Issues											
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Likely	>50%	5	injury occurs	Medium	40	200	19	Very High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Unlikely	10% - 20%	3	less community severance / ?? Of property	Major	70	210	12	Very High
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Unlikely	10% - 20%	3	less ratepayers risk	Major	70	210	12	Very High
3.4	Impact on Public Health	construction activity greater than anticipated	T	Unlikely	10% - 20%	3	less risk than coast	Medium	40	120	26	High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Unusual	1% - 10%	2	low risk, few values	Substantial	100	200	19	Very High
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Unlikely	10% - 20%	3	simpler consent process	Major	70	210	12	Very High
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Likely	>50%	5	delays to programme and increased costs for land purchase	Major	70	350	8	Extreme
3.10	Political	loss of political support (no unity)	T	Unusual	1% - 10%	2	delays to project & revision of objectives	Substantial	100	200	19	Very High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Quite Common	20% - 50%	4	delays to project and increased costs	Substantial	100	400	3	Extreme
4.2	Design Standards (Definition)	changes to current design standards	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.3	Client-Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Quite Common	20% - 50%	4	delays to project and increased costs	Substantial	100	400	3	Extreme
4.6	Site/Ground Conditions	lack of info / data	T	Unlikely	10% - 20%	3	delays to project and increased costs	Medium	40	120	26	High
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	onsite conditions necessitate design changes	T	Quite Common	20% - 50%	4	delays to project and increased costs	Substantial	100	400	3	Extreme
4.9	Redesign / Rework (combined with 4.8)											
4.10	Buildability											
4.11	Traffic Management	underestimate TM allowances	T	Unlikely	10% - 20%	3		Major	70	210	12	Very High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)											
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	22	High
4.14	Issues - Pavement/Surfacing		T	Unusual	1% - 10%	2		Major	70	140	22	High
4.15	Issues - Structures		T	Unlikely	10% - 20%	3		Substantial	100	300	9	Very High
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Medium	40	80	29	High
4.17	Services	assume services not adequately mapped	T	Unlikely	10% - 20%	3		Major	70	210	12	Very High
4.18	Natural Events	significant natural event (unusual event) during construction	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	22	High
4.19	Other	causes damage										

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	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Notes:  
 1.2 Very subject to downstream constraints plus Petone / Grenada flow / volumes  
 1.5 Opportunities exist to optimise use of extra lane - HOV / HOT  
 2.4 Have some potential for PPP

Ref.	Event		Threat / Opportunity	Likelihood			Consequences	Consequence		Risk		
	Description	What? How? (What can happen and how can it happen)		Descriptor (Table 1a or 1b)	Probability	Rating		Descriptor (Table 2)	Rating	Score (Rating * Rating)	Ranking	Category
<b>1.0 Benefit Risks (Base Travel Demand, Growth Forecasts, Assignment, Crashes)</b>												
1.1	Base Travel Demand	Inaccuracy in base info data, found pre construction	T	Unusual	1% - 10%	2	Redo the base modelling investigation	Major	70	140	23	High
1.2	Growth Forecasts	growth forecasts are inadequately low	T	Quite Common	20% - 50%	4	don't have sufficient travel capacity so need new transport facility	Substantial	100	400	8	Extreme
1.3	Assignment / Mode Choice	under estimation of mode share off rail, modelling parameters	T	Unlikely	10% - 20%	3	don't have sufficient travel capacity so need new transport facility	Substantial	100	300	11	Very High
1.4	Crashes	crash savings aren't realised with implementation of HC4	T	Unlikely	10% - 20%	3	high accident rate	Major	70	210	16	Very High
1.5	Other - Oil Shock	oil prices skyrocket	T	Unlikely	10% - 20%	3	major mode shift	Substantial	100	300	11	Very High
<b>2.0 Cost Risks (Commercial, Legal, Economic, Managerial)</b>												
2.1	Project Scope	need to do more work on local roads than anticipated	T	Likely	>50%	5	health & safety - more accidents, ped accidents?	Substantial	100	500	1	Extreme
2.2	Team Relationships (Performance, Communications etc)	break down in stakeholder relationships (within team)	T	Quite Common	20% - 50%	4	reputation / image	Medium	40	160	21	Very High
2.3	Funding	funding is unavailable	T	Likely	>50%	5	project doesn't proceed	Substantial	100	500	1	Extreme
2.4	Procurement	procurement problems	T	Unusual	1% - 10%	2	time delay to contract	Medium	40	80	29	High
2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Unusual	1% - 10%	2	project delayed or scope affected	Major	70	140	23	High
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2.8	Programming Issues											
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Likely	>50%	5	injury occurs	Medium	40	200	20	Very High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
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<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
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3.2	Industrial Action by Others											
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3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Unlikely	10% - 20%	3	change location of road	Medium	40	120	26	High
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Quite Common	20% - 50%	4	time and cost over base case 5yrs	Major	70	280	13	Very High
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<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
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4.5	Topographical Data	lack of topographical data	T	Unlikely	10% - 20%	3	delays to project and increased costs	Major	70	210	16	Very High
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Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
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2.5	Legislative/Regulation Issues	unforeseen legislation (new)	T	Rare	<1%	1	?? Cant read what's written	Major	70	70	31	High
2.6	Document Control											
2.7	Market Issues	higher construction costs through market forces	T	Likely	>50%	5	cost changes significantly	Major	70	350	7	Extreme
2.8	Programming Issues											
2.9	Insolvency (Contractor)											
2.10	Contractual Claim/Dispute											
2.11	Health and Safety	increased risk due to proximity of live traffic lanes (to workers and public)	T	Likely	>50%	5	injury occurs	Medium	40	200	17	Very High
2.12	Inadequate QC/QA											
2.13	Post-Construction Liability											
2.14	Other											
<b>3.0 Cost Risks (Community, Political, Environmental, land and Property)</b>												
3.1	Community	increased costs and time	T	Unlikely	10% - 20%	3	less community severance / ?? Of property	Major	70	210	11	Very High
3.2	Industrial Action by Others											
3.3	Ecological Issues	increased costs with mitigating environ impacts	T	Unlikely	10% - 20%	3	less ratepayers risk	Major	70	210	11	Very High
3.4	Impact on Public Health	construction activity greater than anticipated	T	Unlikely	10% - 20%	3	less risk than coast	Medium	40	120	23	High
3.5	Heritage Issues (Historic Places Trust)	onerous conditions imposed. Additional costs to obtain HPT approval	T	Unusual	1% - 10%	2	low risk, few values	Substantial	100	200	17	Very High
3.6	Resource Management Act Consents	substantial delays in obtaining consents & associated costs	T	Unlikely	10% - 20%	3	simpler consent process	Major	70	210	11	Very High
3.7	Building Consent											
3.8	Land - Designation (combined with 3.6)											
3.9	Land - Purchase	land purchases delayed	T	Likely	>50%	5	delays to programme and increased costs for land purchase	Major	70	350	7	Extreme
3.10	Political	loss of political support (no unity)	T	Unusual	1% - 10%	2	delays to project & revision of objectives	Substantial	100	200	17	Very High
3.11	Other											
<b>4.0 Cost Risks (Site Conditions, Engineering, Services, Natural Events)</b>												
4.1	Project Scope Definition (Unscheduled Items)	substantial scope changes	T	Quite Common	20% - 50%	4	delays to project and increased costs	Substantial	100	400	2	Extreme
4.2	Design Standards (Definition)	changes to current design standards	T	Likely	>50%	5	delays to project and increased costs	Substantial	100	500	1	Extreme
4.3	Client-Initiated Changes											
4.4	New/Change in Technology											
4.5	Topographical Data	lack of topographical data	T	Quite Common	20% - 50%	4	delays to project and increased costs	Substantial	100	400	2	Extreme
4.6	Site/Ground Conditions	lack of info / data	T	Unlikely	10% - 20%	3	delays to project and increased costs	Medium	40	120	23	High
4.7	Design Issues (combined with 4.6)											
4.8	Design Changes	onsite conditions necessitate design changes	T	Quite Common	20% - 50%	4	delays to project and increased costs	Substantial	100	400	2	Extreme
4.9	Redesign / Rework (combined with 4.8)											
4.10	Buildability											
4.11	Traffic Management	underestimate TM allowances	T	Unlikely	10% - 20%	3		Major	70	210	11	Very High
4.12	Impact of Value Engineering (Risk/Opportunity Assessment)											
4.13	Changes Arising from Safety Audits	safety audit affects scope more than allowed for	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	20	High
4.14	Issues - Pavement/Surfacing		T	Unusual	1% - 10%	2		Major	70	140	20	High
4.15	Issues - Structures		T	Unlikely	10% - 20%	3		Major	70	210	11	Very High
4.16	Traffic Control and Lighting		T	Unusual	1% - 10%	2		Medium	40	80	28	High
4.17	Services	assume services not adequately mapped	T	Unlikely	10% - 20%	3		Major	70	210	11	Very High
4.18	Natural Events	significant natural event (unusual event) during construction	T	Unusual	1% - 10%	2	delays to project and increased costs	Major	70	140	20	High
4.19	Other	causes damage										

Date of Risk Review: 24/02/2005  
 Compiled by: Darren Cash  
 Contributors:

Threat	Likely	>50%	5
	Quite Common	20% - 50%	4
	Unlikely	10% - 20%	3
	Unusual	1% - 10%	2
	Rare	<1%	1
Opportunity	Almost Certain	>90%	5
	Expected	75% - 90%	4
	Likely	50% - 75%	3
	Unlikely	25% - 50%	2
	Very Unlikely	<25%	1

Threat	Substantial	100
	Major	70
	Medium	40
	Minor	10
	Negligible	1
Opportunity	Negligible	-1
	Minor	-10
	Medium	-40
	Major	-70
	Substantial	-100

Extreme
Very High
High
Medium
Low
Negligible

Notes:  
 2.1 Very subject to downstream constraints plus Petone / Grenada flow / volumes (HOV)  
 3.4 opportunity - reduced emissions

## Appendix 5

### Opportunity Risks

#### OPPORTUNITIES 'BRAIN STORMING'

	COMMUNITY	ECOLOGY	POLITICS	ENGINEERING
MEDIA, IMAGE	consult after flood	sea protection coastal		truckway 24hr work
	educate on how they save (Consumer report)	interpret - destroy? / protect		innovation
	CO2 savings	media campaign		fast, timely, info (spend more but more efficient)
				iconic
				invisible coast smart highway
ENVIRONMENT	viewing - sign post	eco slope stability		gateway
	cycle track	forest link (bird corridor) (P Bay)		electric hybrid priority
	general sign post	wetland enhancement		
FUNDING (LESS COST)	tourist advertise		team united voice to govt	big initial budget tolls
				developers do work - BOOT
				services
				lane rental
				HOT lane tidal 1 way peak direction
HEALTH & SAFETY	reduce severence emergency route security			rest lay by / walk eng / client spec H&S stds
	access to hospital			access to walking tracks (secure parking)
STAKEHOLDERS	discover history			
	better access to regional parks			
	enhance heritage through corridor			