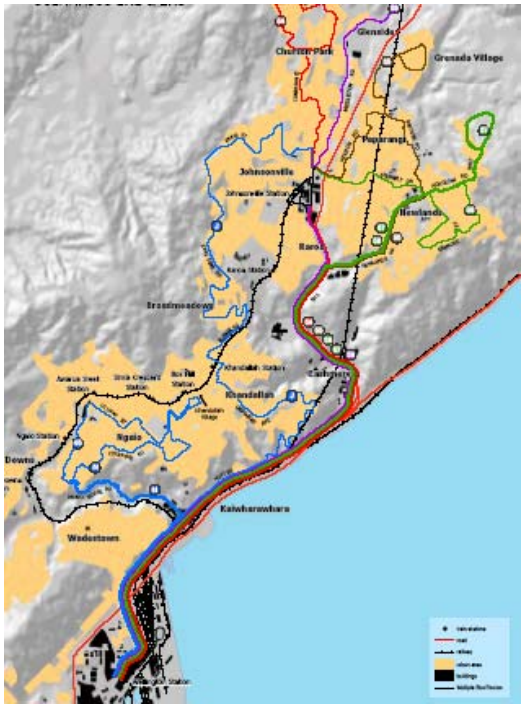
Wellington City Northern Suburbs Passenger Transport Services Study



COMPARATIVE RISK REPORT

- Options Analysis Risk Analysis
- Revision C
- June 2006

Wellington City Northern Suburbs Passenger Transport Services Study

- Revision C
- June 2006

Sinclair Knight Merz
25 Teed Street
PO Box 9806
Newmarket, Auckland New Zealand
Tel: +64 9 913 8900
Fax: +64 9 913 8901
Web: www.skmconsulting.com

Contents

Document history and status

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type
A	3 March 2006	A Bell			
B	28 June 2006				
C	6 Sep 2006	C Beale	G Jerome	6 Sept 2006	

Distribution of copies

Revision	Copy no	Quantity	Issued to
A	1	1	A Bell
B	1	1	
C	1	1	A Bell

Printed:	11 September 2006
Last saved:	11 September 2006
File name:	I:\ANFA\Projects\AN00716\Risk\AN00716W0018 Updated GJ.doc
Author:	Chris Beale
Project manager:	Andrew Bell
Name of organisation:	GWRC / WCC
Name of project:	Wellington City Northern Suburbs Passenger Transport Services Study
Name of document:	Comparative Risk Report
Document version:	Revision C
Project number:	AN00716.0

1. Executive Summary

In August 2005, Sinclair Knight Merz (SKM) was commissioned by Greater Wellington Regional Council (GWRC) and Wellington City Council (WCC) to undertake a study into the Wellington City Northern Suburbs Passenger Transport Services, known as the North Wellington Public Transport Study.

The objective of the North Wellington Public Transport Study is to:

1) identify the current and future passenger transport needs of the Northern Suburbs;

2) to develop a passenger transport strategy to meet these needs; and

3) to develop a passenger transport strategy which supports and informs the strategic, land use and transport planning objectives of the Regional Land Transport Strategy (RLTS), the draft Wellington City Council Transport Strategy (WTS) and the draft Wellington City Council Urban Development Strategy (UDS).

The study has addressed this by developing "a plan to address the needs and issues associated with Wellington City's Northern suburbs passenger transport services, including the Johnsonville Rail Corridor and bus services."

The study focuses on a variety of options including rail, bus, busway and light rail modes, each of which presents a range of risks and opportunities as transport strategies. As part of this study, a facilitated one day risk workshop was held in Wellington on the 1st March 2006 to identify the size and nature of these risks.

Given the early stage of the project, the workshop did not attempt to determine the finite value of the risks, but established a comparative base between the more significant options. Due to time constraints, it was not possible to assess all options during the workshop, however enough detail regarding two of the most extreme, but realistic options were obtained which provided a base for assessing the remaining options. The two options assessed for risk levels were:

- Enhanced timetable - New EMUs; and
- Busway

The remaining options were scored by SKM staff following the workshop, based on the risks identified for the options above and in line with the scoring undertaken for them.

Identification of any potential "show stoppers" using the risk assessment approach is now possible by reviewing the tabulated data presented in the risk tables. These are presented in a range of ways

that allow comparison of the risks as well as presentation of the full data as it was reviewed during the workshop.

The first two of the following three basis's for presenting the results of the risk analysis are provided in this summary.

1) Identifying those risks that differentiate one option from another option;
2) Identifying those risks that are high or extreme for all options; and
3) Recognising the risks that are neither significant nor affect the decision process, but none the less require some level of mitigation and manage control. These risks are retained in the risk register located in the appendices.

1.1 Risk Assessment Methodology

The method used during the risk workshop was based on the Transit New Zealand (Transit) document "Risk Management Process Manual, AC/MAN/1, ISBN 0-478-10560-6. This manual describes both a general and an advanced approach to risk assessment. The general approach was used for the purposes of this workshop.

Eleven strategic level risks where analysed against each of the transport options. These were:

1) Technical risks associated with the design option.
2) Procurement difficulties.
3) Over or under demand for the chosen option.
4) Legislative limitations.
5) Failure to meet stakeholder or community expectations.
6) Constructability difficulties.
7) Project capital cost escalation.
8) Inability to obtain funding.
9) Inability to obtain consents.
10) Operational issues.
11) Interface difficulties with existing infrastructure.

The specific risks under each of these general headings were scored against the likelihood and consequence criteria set out in Table 1 and Table 2. These were then multiplied for the risks to determine their risk score as set out in Table 3 and Table 4.

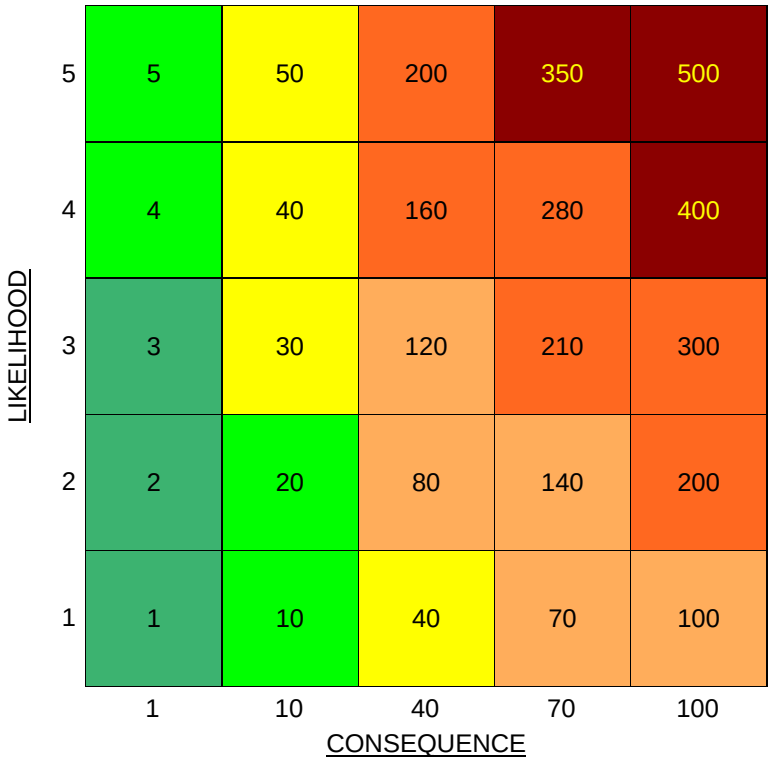
Table 1: Consequence Criteria

Rating	Descriptor	Health & Safety (H&S)	Image / Reputation (Rep)	Environment (Env)	Stakeholder Interest (Stk)	Cost (Fin)	Delay (Del)
100	Substantial	Multiple fatalities	International media cover	Permanent widespread ecological damage	Commission of Inquiry	>$10m	Many years
70	Major	Several fatalities	Substantial national media cover	Heavy ecological damage, costly restoration	Ministerial Inquiry	$1m to $10m	Years
40	Medium	Serious injuries	Regional media cover or short term national cover	Major but recoverable ecological damage	Ministerial questions or 3rd party investigation	$100k to $1m	Months
10	Minor	Minor injuries	Local media cover	Limited but medium-term negative impacts	Official Information Request	$10k to $100k	Weeks
1	Negligible	Slight injuries	Brief local media cover	Short term damage	Minor Complaint	<$10k	Days

Table 2: Likelihood Criteria

Rating	Category	Description	Probability (short term)	Frequency (long term)
5	Likely	The threat can be expected to occur OR a very poor state of knowledge has been established on the threat.	>50%	Greater than once per year.
4	Quite common	The threat will quite commonly occur OR a poor state of knowledge has been established on the threat.	20% - 50%	Once per 1 - 5 years.
3	Unlikely	Threat may occur occasionally OR a moderate state of knowledge has been established on the threat.	10% - 20%	Once per 5 - 10 years.
2	Unusual	The threat could infrequently occur OR a good state of knowledge has been established on the threat.	1% - 10%	Once per 10 - 50 years.
1	Rare	The threat may occur in exceptional circumstances OR a very good state of knowledge has been established on the threat.	<1%	Less than once per 50 years.

- **Table 3: Risk Analysis Matrix**



The colours in the above matrix refer to the following bands of risk:

- **Table 4: Risk Bands**

Risk Rank	Level	Typical Mitigation Action
500 to 350	Extreme threat	Avoid
300 to 200	Very high threat	Avoid
200	Very high threat	Avoid or transfer
160	Very high threat	Avoid
140	High threat	Avoid or transfer
120	High threat	Accept actively or transfer
100	High threat	Avoid or transfer
80	High threat	Accept actively or transfer
70	High threat	Avoid or transfer
50 to 40	Moderate threat	Accept actively
30	Moderate threat	Accept actively
20 to 10	Low threat	Accept actively or transfer
5	Low threat	Accept actively
4	Low threat	Accept actively
3	Negligible threat	Accept passively
2	Negligible threat	Accept passively
1	Negligible threat	Accept passively

1.2 Differentiating Risk Scores

The following table shows only those risk scenarios where there is a difference in the risk scores between the options. Whilst it is not technically correct to simply add these scores together, it does provide a qualitative assessment of the relative risks. Note that the table does not address the relative opportunities for each option. The fill colour is used to highlight which of the options carries the higher risk. The colour used in these cells reflects the band of risk as defined in the risk matrix.

- **Table 5: Differentiating Risks Scores**

Scenarios	Risk Type	Most Likely Risk						
		Base Timetable		Enhanced Timetable		Bus way	Bus on street	Light rail
		New EMU	Refurbished EMU	New EMU	Refurbished EMU			
Constructability difficulties.	Del	160	160	160	160	500	20	400
Failure to meet stakeholder or community expectations.	Del	30	30	30	30	120	160	400
Inability to obtain funding.	Del	280	280	280	280	280	160	400
Constructability difficulties.	Fin	160	160	160	160	280	20	400
Constructability difficulties.	Rep					120	20	
Constructability difficulties.	Stk	160	160	160	160	30	20	280
Failure to meet stakeholder or community expectations.	Fin						160	
Failure to meet stakeholder or community expectations.	Rep	20	20	20	20	160	160	160
Failure to meet stakeholder or community expectations.	Stk	20	20	20	20	280	160	120
Inability to obtain consents.	Fin	3	3	3	3	40	40	280
Inability to obtain consents.	Stk	40	40	40	40	40	40	160
Inability to obtain funding.	Fin	40	40	40	40	40	30	160
Inability to obtain funding.	Rep					30	30	
Inability to obtain funding.	Stk	40	40	40	40	30	30	160
Interface difficulties with existing infrastructure.	Del	120	120	120	120	160	160	400
Interface difficulties with existing infrastructure.	Fin	120	120	120	120	160	210	400

Scenarios	Risk Type	Most Likely Risk						
		Base Timetable		Enhanced Timetable		Bus way	Bus on street	Light rail
		New EMU	Refurbished EMU	New EMU	Refurbished EMU			
Interface difficulties with existing infrastructure.	Stk	30	30	30	30	160	160	280
Legislative limitations.	Del					280	350	350
Legislative limitations.	Fin					40	280	280
Legislative limitations.	Fin						280	
Legislative limitations.	Rep					40		280
Operational issues.	Del	30	30	30	30		120	160
Operational issues.	Fin	30	30	30	30	160	120	280
Operational issues.	Rep						30	
Operational issues.	Stk	120	120	120	120	160	120	120
Over or Under demand for the chosen option.	Fin	160	160	160	160	160	160	160
Over or Under demand for the chosen option.	Rep	80	80	80	80	120	120	120
Over or Under demand for the chosen option.	Stk	80	80	80	80	160	160	160
Procurement difficulties.	Del	160	160	160	160	160	160	400
Procurement difficulties.	Fin	40	160	280	160	160	160	280
Procurement difficulties.	Stk	40	40	40	40	160	160	160
Project capital cost escalation.	Fin	280	280	280	280	280	40	280
Project capital cost escalation.	Rep	40	40	40	40	120	40	160
Project capital cost escalation.	Stk	40	40	40	40			160
Technical risks associated with the design option.	Del	160	160	160	160	200	200	350
Technical risks associated with the design option.	Fin	280	280	280	280	200	200	500
Technical risks associated with the design option.	H&S					20		
Technical risks associated with the design option.	Rep						160	

Scenarios	Risk Type	Most Likely Risk						
		Base Timetable		Enhanced Timetable		Bus way	Bus on street	Light rail
		New EMU	Refurbished EMU	New EMU	Refurbished EMU			
Technical risks associated with the design option.	Stk	40	40	40	40	200	200	200

The above analysis has been used to score the performance of the options in terms of risk:

	Base Timetable - New EMU	Base Timetable - Refurbished EMU	Enhanced Timetable – New EMU	Enhanced timetable – Refurbished EMU	Busway	Bus on street	Light rail
No. of Extreme and Very High Risks	9	10	10	10	20	20	30
Risk Total	2803	2923	3043	2923	5050	4640	8400
Score							

1.3 Significant Risks

The following table highlights those risks that were consistently ranked with the same extreme or very high ranks regardless of the study option. These risks are not useful for differentiating between options, but must be mitigated during the project management, design and implementation stages of the project. The issues noted below were identified during the workshop and require action to fully assess the risk of the scenario. Adjustments to the ranking may occur once this is completed.

- **Table 6: Significant Risks**
  - Technical issues associated with the design option
  - Procurement difficulties
  - Under of Over demand for the chosen option
  - Constructability difficulties
  - Project capital cost escalation

1.4 Financial Risks

Only those risks with a financial impact have subsequently been modelled using a Monte Carlo simulation to establish the likely effect, those with a delay, environmental, health and safety, reputational or stakeholder impact have not been assessed in the model. Given the relatively subjective nature of the input, information in terms of the likelihood and range of cost is, however

preliminary at this stage. As an example, an extreme risk of a 500 signifies a likelihood of 50-100% of a cost impact of greater than $10 million [with no upper threshold]. To this end, a preliminary assessment has had to be made to establish the risk parameters. The methodology for this is noted in Section 2 of this report with the outputs of this shown in the graphs below.

There are however, a couple of fundamental risks which have not been assessed in the risk model, due to the nature of the original model.

Two most significant risks, absent from the financial Monte Carlo assessment are the uncertainty around the base cost estimate (given that it is based on very preliminary information), and the risk associated with the use of the rail corridor for non-rail purposes. Whilst the risks associated with the uncertainty of the estimates will apply to a similar level to all of the options, the risks associated with the use of the corridor once it ceases to be a rail route, would only be applicable to the bus on street and bus way options.

	Mean of financial Risk	P95 Value
Base TT - New EMU	13,590,946	19,120,908
Base TT - Refurbished EMU	14,117,799	19,681,226
Enhanced TT - New EMU	19,360,086	27,641,562
Enhanced TT - Refurbished EMU	14,117,799	19,681,226
Busway	38,944,411	51,825,052
Bus on street	20,640,096	26,870,384
Light rail	120,176,692	151,262,624

Note values above are incremental not cumulative

2. Methodology

2.1.1 Comparative risk assessment

The method used during the risk workshop was based on the Transit New Zealand (Transit) document "Risk Management Process Manual, AC/MAN/1, ISBN 0-478-10560-6. This manual describes both a general and an advanced approach to risk assessment. The general approach was used for the purposes of this workshop. Whilst it is not intended to provide a detailed methodology in this report, the risk analysis criteria are essential for interpreting the results contained in this report. The process can be described as a number of steps as outlined below:

Establish the context – this ensures that the correct approach to risk assessment is being used along with the most appropriate risk analysis criteria. This stage also identifies the necessary participants for risk workshops.

Identify Risks – A structured approach is essential to assist the workshop participants to brainstorm effectively and to validate existing information efficiently. For this workshop it was necessary to pre-populate some of this information to ensure the high level issues were targeted.

Eleven strategic level risks were analysed against each of the transport options. These were:

12) Technical risks associated with the design option.
13) Procurement difficulties.
14) Over or under demand for the chosen option.
15) Legislative limitations.
16) Failure to meet stakeholder or community expectations.
17) Constructability difficulties.
18) Project capital cost escalation.
19) Inability to obtain funding.
20) Inability to obtain consents.
21) Operational issues.
22) Interface difficulties with existing infrastructure.

Analyse the Risks – This was undertaken using the established Transit criteria. The software used for the data capture has the capability to record the information for each applicable consequence category. Hence the table shows a number of abbreviations for the risk categories. These are explained in the consequence table over the page.

Treatment Plans – While this was outside the scope of the risk workshop there were a number of action items recorded that will assist the study to make clearer assessments of the risks.

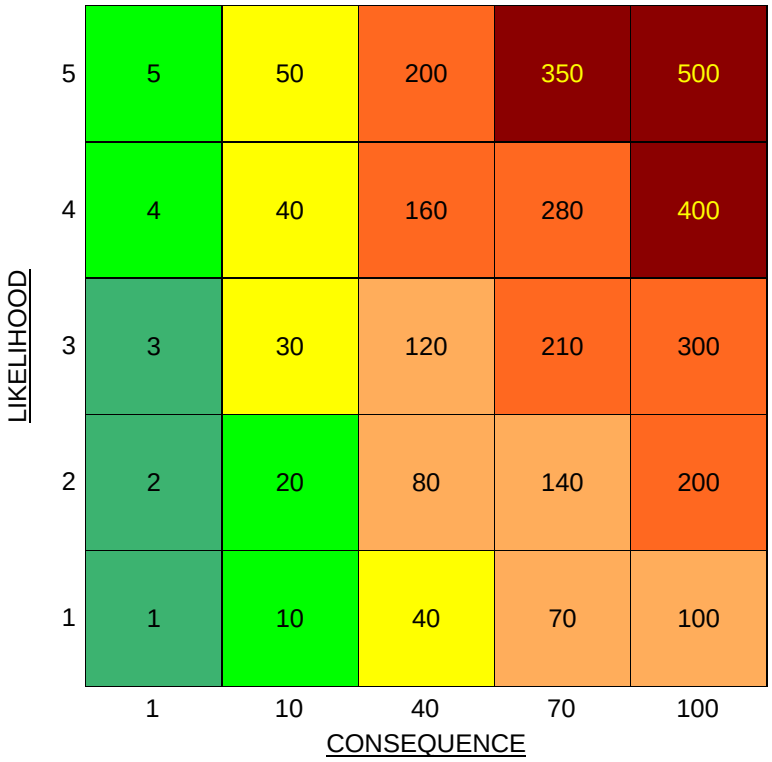
Table 7: Consequence Criteria

Rating	Descriptor	Health & Safety (H&S)	Image / Reputation (Rep)	Environment (Env)	Stakeholder Interest (Stk)	Cost (Fin)	Delay (Del)
100	Substantial	Multiple fatalities	International media cover	Permanent widespread ecological damage	Commission of Inquiry	>$10m	Many years
70	Major	Several fatalities	Substantial national media cover	Heavy ecological damage, costly restoration	Ministerial Inquiry	$1m to $10m	Years
40	Medium	Serious injuries	Regional media cover or short term national cover	Major but recoverable ecological damage	Ministerial questions or 3rd party investigation	$100k to $1m	Months
10	Minor	Minor injuries	Local media cover	Limited but medium-term negative impacts	Official Information Request	$10k to $100k	Weeks
1	Negligible	Slight injuries	Brief local media cover	Short term damage	Minor Complaint	<$10k	Days

Table 8: Likelihood Criteria

Rating	Category	Description	Probability (short term)	Frequency (long term)
5	Likely	The threat can be expected to occur OR a very poor state of knowledge has been established on the threat.	>50%	Greater than once per year.
4	Quite common	The treat will quite commonly occur OR a poor state of knowledge has been established on the threat.	20% - 50%	Once per 1 - 5 years.
3	Unlikely	Threat may occur occasionally OR a moderate state of knowledge has been established on the threat.	10% - 20%	Once per 5 - 10 years.
2	Unusual	The threat could infrequently occur OR a good state of knowledge has been established on the threat.	1% - 10%	Once per 10 - 50 years.
1	Rare	The threat may occur in exceptional circumstances OR a very good state of knowledge has been established on the threat.	<1%	Less than once per 50 years.

- **Table 9: Risk Analysis Matrix**



The colours in the above matrix refer to the following bands of risk:

- **Table 10: Risk Bands**

Risk Rank	Level	Typical Mitigation Action
500 to 350	Extreme threat	Avoid
300 to 200	Very high threat	Avoid
200	Very high threat	Avoid or transfer
160	Very high threat	Avoid
140	High threat	Avoid or transfer
120	High threat	Accept actively or transfer
100	High threat	Avoid or transfer
80	High threat	Accept actively or transfer
70	High threat	Avoid or transfer
50 to 40	Moderate threat	Accept actively
30	Moderate threat	Accept actively
20 to 10	Low threat	Accept actively or transfer
5	Low threat	Accept actively
4	Low threat	Accept actively
3	Negligible threat	Accept passively
2	Negligible threat	Accept passively
1	Negligible threat	Accept passively

2.1.2 Modelling the financial risk

The level of available information is insufficient to develop a detailed quantitative assessment of the risk profiles for the options, however a preliminary assessment based on the comparitative risk analysis can be utilised for a more robust and calculated risk assessment than notional percentages of overall cost. In order to ascertain a financial value for the risks identified and scored above, a very preliminary assessment model was constructed and a Monte Carlo simulation performed to establish the mean and 95th percentile values. The mean value should be used in the economic analysis of the options.

To undertake the assessment a number of broad assumptions had to be made. These relate to both the probability and likelihood of the individual risks.

The probability was as noted in the qualitative assessment of likelihood, and the financial effect driven by the consequence as noted in the table below e.g.

- **Table 11 : Monte Carlo Assumptions**

Probability	
Table 4 value	Likelihood
5	75%
4	50%
3	35%
2	15%
1	5%

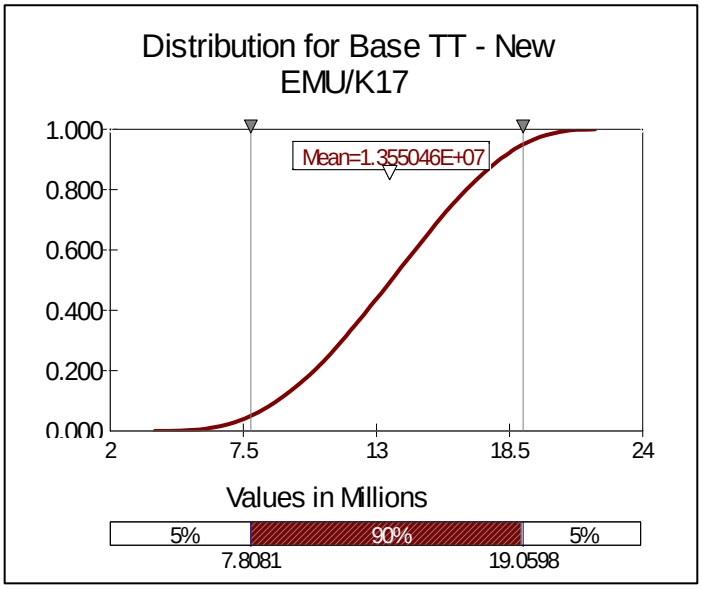
Consequence	
Table 3 value	Financial effect
100	$10,000,000 to $30,000,000 with $20,000,000 the most likely value and a “pert” distribution.
70	$1,000,000 to $10,000,000 with $600,000 the most likely value and a “pert” distribution.
40	$100,000 to $1,000,000 with $600,000 the most likely value and a “pert” distribution.
10	$10,000 to $100,000 with $60,000 the most likely value and a “pert” distribution.
1	$0 to $10,000 with $5,000 the most likely value and a “pert” distribution.

Through assigning the values noted above to each of the risks, a very preliminary assessment can be made of the financial risk that should be allocated to each of the options. This approach is not meant to provide a deterministic value for the risk allocated to each option, but to provide a mechanism for evaluating the relative risk profiles of each of the options.

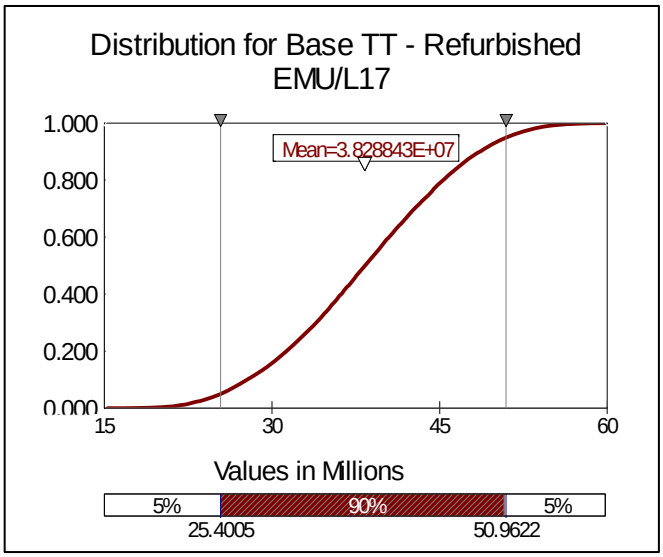
Risk values, both mean and 95th percentile, have been calculated using the above approach and consequently the band of risk profile is much narrower than one would expect under the Transit detailed approach with the Mean value being fairly central in the range of risk values. The consistent nature of the distribution of the risk values noted above is the main driver for this result.

The following graphs illustrate the financial risk profiles of the options under consideration.

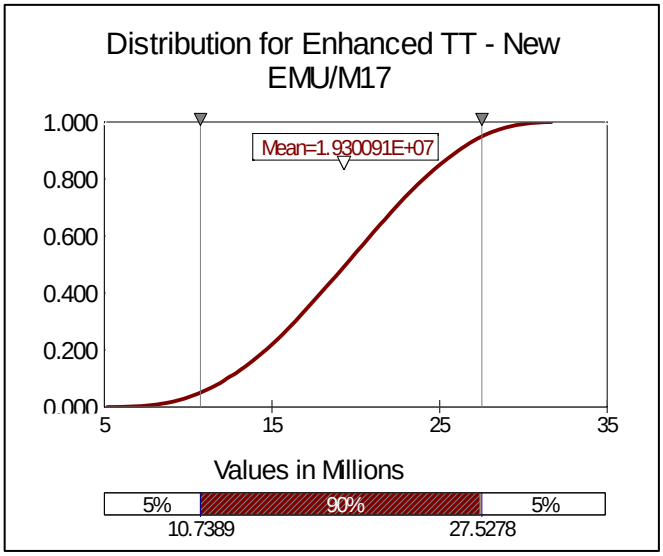
Base Timetable – New EMU



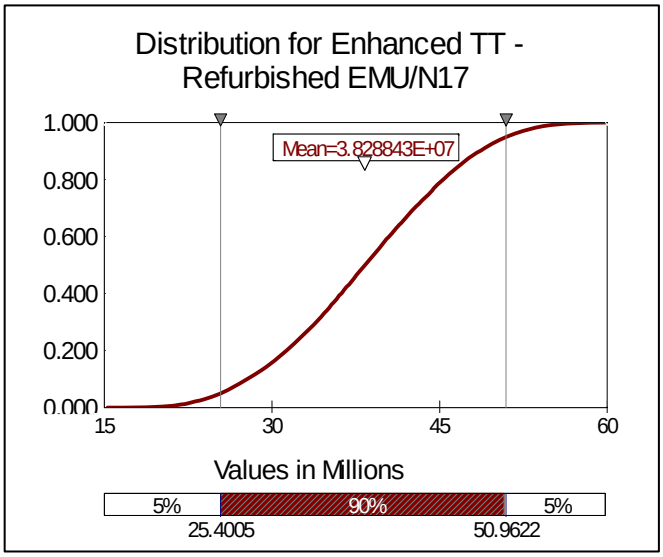
Base Timetable – Refurbished EMU



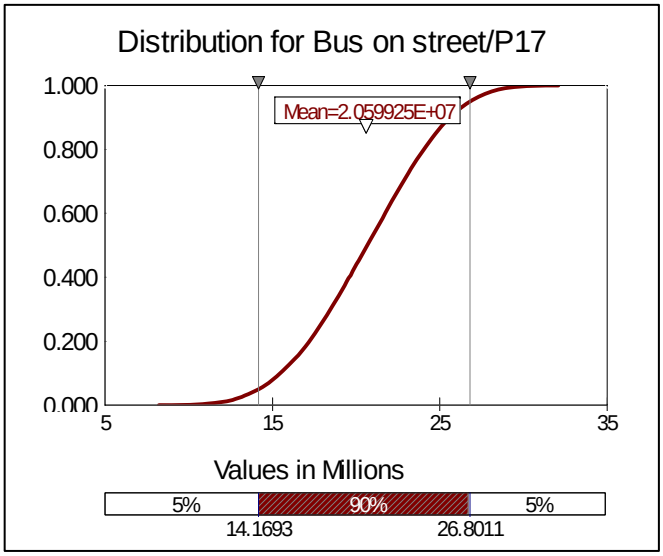
Enhanced Timetable – New EMU



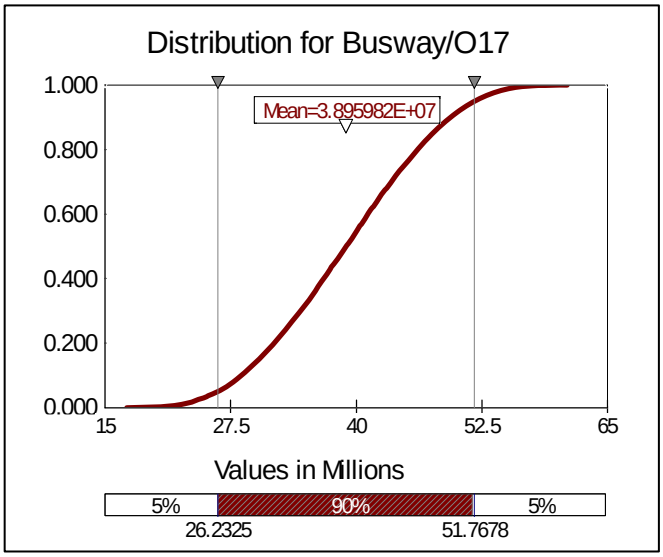
Enhanced Timetable – Refurbished EMU



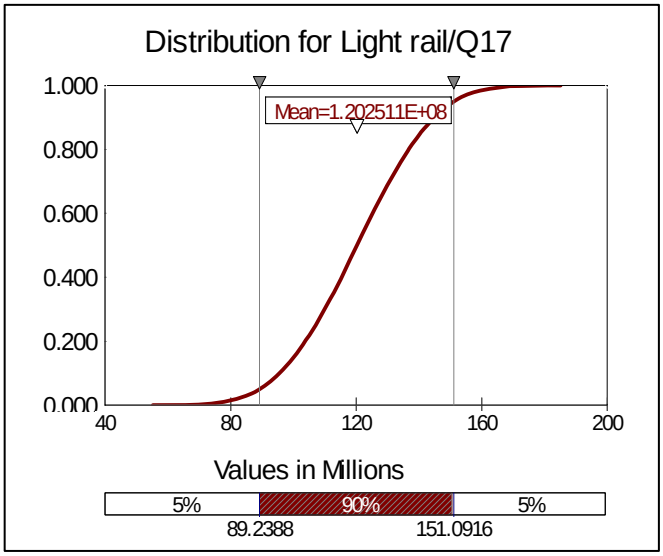
Bus on Street



Guided busway



Light Rail


Distribution for Light rail/Q17
Mean=1.202511E+08
1.000
0.800
0.600
0.400
0.200
0.000
40
80
120
160
200
Values in Millions
5%
90%
5%
89.2388
151.0916

Appendix A Workshop Attendees

The following persons representing their respective organisations participated in the workshop held on 1 March 2006.

Table 12: Participants

Full Name	Company	Title	1/03/2006
Adam Lawrance	Wellington City Council	Strategic Advisor	Present
Alan Burford	SKM	Rail Development Manager	Present
Alex Campbell	Greater Wellington Regional Council	Transport Service Design	Present
Andrew Bell	SKM	Senior Traffic and Transport Engineer	Present
Anthony Cross	Greater Wellington Regional Council	Manager, Transport Service Design	Present
Chris Beale	SKM	Project Risk Manager	Present
Eric Whitfield	Transit NZ	Regional Transportation Manager	Absent
Gary Jerome	SKM	Cost Manager	Present
Greg Campbell	Wellington City Council	Principal Strategic Adviser Transport	Present
Joe Hewitt	Greater Wellington Regional Council	Divisional Manager, Transport Strategy and Policy	Present
Ken Hind	SKM	Senior Exec Transport Planner	Present
Mark Gullery	ONTRACK	Regional Manager	Present
Rhona Nicol	Greater Wellington Regional Council	Manager Transport Procurement	Present
Robert Schofield	Boffa Miskell	Principal Planner	Present
Steve Harte	Wellington City Council	Traffic Engineer	Present
Steve Spence	Wellington City Council	Chief Transportation Engineer	Invited
Tony Brennand	Greater Wellington Regional Council	Manager, Transport Strategic Direction	Present

Appendix B Risk Register

1. Busway

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
1.1. Technical risks associated with the design option.	1. Design envelope through tunnels is tight.	1. Delays in developing specialised technical designs.	1. Guidance system for buses require throughout route, inc tunnels.	Del	40	5	200	8. Recovery vehicle required in base estimate
	2. Susceptibility to seismic event.	2. Increased cost associated with both procurement and maintenance for specialised buses.	2. Ability to retrofit buses with guidance equipment.	Fin	40	5	200	
	3. Specified equipment does not meet accessibility requirements	3. Johnsonville line cannot accept current network wide buses.		Stk	40	5	200	
	4. Large increase in cost due to small order	4. Inability to evacuate vehicle in tunnel		H&S	10	2	20	
	5. Increased specification of bus increases capital costs above plans							
	6. Existing railway infrastructure may have interoperability issues eg access points to infrastructure.							
	7. Unknown design parameters eg safety.							
1.2. Procurement difficulties.	1. Inability to purchase and install specialised guidance equipment at a reasonable price.	1. Existing rolling stock fails prior to delivery of new stock.		Del	40	4	160	

1. Busway

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	2. Lack of availability of buses.	2. Loss of patronage to other transport modes.		Fin	40	4	160	
	3. Complexity of Procurement procedures with LTNZ (eg new technology)	3. Increased traffic congestion		Stk	40	4	160	
	4. Extended procurement schedule.	4. Cost and delay associated with compliance with LTNZ requirements						
	5. Complexities and difficulties associated with procurement and contracting strategy.							
1.3. Over or Under demand for the chosen option.	1. Increased population growth.	1. Revenue shortfalls / over recovery		Stk	40	4	160	9. Confirm financial returns from bus and rail operations
	2. Increased demand on new infrastructure.	2. Inflexibility to meet changing demands		Fin	40	4	160	
	3. Changes in land use demands.	3. Lack of capacity in supporting infrastructure eg park and ride		Rep	40	3	120	
	4. Capacity limitations of chosen option.	4. Bus resources to serve increased rail service not available.						
	5. Illegibility of bus route deters passengers							
1.4. Legislative limitations.	1. Legislative provisions have restrictions	1. Current law does not allow for change. Representations would need to be made to seek Crown Approval to use the corridor other than for rail.		Del	70	4	280	10. Need to establish legislative protocols.
	2. Changes in legislation			Fin	10	4	40	
				Stk	10	4	40	
1.5. Failure to meet stakeholder or	1. Public interest or objection.	1. Loss of patronage to other transport modes.		Stk	70	4	280	

1. Busway

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
community expectations.	2. Stakeholder interest or objections.	2. Reputational damage.		Rep	40	4	160	
	3. Objection to loss of railway.	3. Loss of confidence in public decision making		Del	40	3	120	
		4. Loss of revenue through rates						
		5. Motions to the Auditor General						
		6. Increased traffic congestion						
		7. Political interference by policy or involvement						
1.6. Constructability difficulties.	1. Limited construction and industry capacity market to deliver multiple, concurrent projects	1. Delay in implementation, operation and owners and project cost increases	1. Introduction of replacement bus services during construction	Rep	40	3	120	
	2. Latent impacts - unknowns in refurbishment, geotech or construction.	2. Prolonged community disruption		Fin	100	5	500	
	3. Disruption during construction.	3. Loss of patronage to other transport modes.		Del	40	4	160	
	4. Existing utilities.			Stk	10	3	30	
	5. Lack of construction space.							
1.7. Project capital cost escalation.	1. Escalation greater than anticipated.	1. Cost over runs during implementation.		Fin	70	4	280	
	2. Scope creep. (Additional buses/routes/stops)	2. Community objection to funding levels.		Rep	40	3	120	
	3. Design growth.	3. Need to reduce scope to						

1. Busway

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	4. Exchange rate exposure	suit available funds						
1.8. Inability to obtain funding.	1. Fare box revenue assumptions not realised.	1. Reduction in strategy or scope to meet available funding	1. Manage through service procurement strategy.	Del	70	4	280	
	2. Greater Wellington funding insufficient	2. Reduction in funding during project lifecycle		Fin	10	4	40	
	3. LTNZ funding insufficient or does not meet funding criteria	3. Project does not proceed.		Rep	10	3	30	
	4. Wellington City Council may not be available.	4. WCC funding required		Stk	10	3	30	
	5. Capital cost too high.							
	6. Change in Government or Council policy. eg inability to hold future parties accountable for debt funding contracts							
	7. Rate of draw down on funds too rapid.							
	8. Funding structure unacceptable (grant, debt funding, debt and toll recovery)							
1.9. Inability to obtain consents.	1. Requirements to obtain Resource Consent.	1. Cost of completing the consent process	1. Technical Expert involved and developing a (Resource) consenting plan. Limited to	Del	70	4	280	
	2. Requirement to change Designation.	2. Cost of mitigation required by Consenting Authority - RMA		Fin	10	4	40	

1. Busway

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	3. Difficulties in obtaining Building Consents.	3. Uncertainty in obtaining desired outcome	Consents around earthworks.	Stk	10	4	40	
	4. Loss of Johnsonville Rail corridor as a rail corridor rather than a transport corridor.	4. Time delays through the Notification and Appeal process						
	5. Difficulties in siting new bus stops.	5. Additional works required beyond those assumed in the base option required by Building Consenting Authority e.g. accessibility						
		6. Requirement to manage change in designation for corridor						
		7. Agreements required to cover change in maintainer						
1.10. Operational issues.	1. Difficulty in influencing bus routes and frequency for commercial services.	1. Increasing contract (operational) costs	1. Current procedures in place for PT services.	Fin	40	4	160	
	2. Labour & skill shortages.	2. Timetable delays and reduced reliability	2. Modelled timetable to demonstrate it can be achieved.	Stk	40	4	160	
	3. Loss of amenity							
1.11. Interface difficulties with existing infrastructure.	1. CBD bus corridors near capacity.	1. Increased costs and program delays.	1. Interface difficulties with existing infrastructure.	Fin	40	4	160	
	2. Lack of corridor for introduction - not applicable for rail options.	2. Raised public expectation of wider infrastructure improvements for access	2. Ngauranga to Airport strategic study commissioned.	Del	40	4	160	

1. Busway

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	3. Existing infrastructure does not interface with new equipment for accessibility.	3. Availability of suitable land for depot facility		Stk	40	4	160	
	4. Interchange facilities at Johnsonville centre.							
	5. Implementation of change over of direction.							
	6. Additional buses on route							

2. Enhanced timetable - New EMUs

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
2.1. Technical risks associated with the design option.	1. Susceptibility to seismic event.	1. Inability to procure in larger quantities due to technical differences.	1. ONTRACK study into track lowering on going.	Del	40	4	160	
	2. Specified equipment does not meet accessibility requirements	2. Delays in developing specialised technical designs.	2. Known seismic risk.	Fin	70	4	280	
	3. Increased specification of rolling stock increases capital costs above plans	3. Increased cost associated with both procurement and maintenance for specialised rolling stock.	3. Adherence to assumed standards for accessibility - based on HRC review.	Stk	10	4	40	
	4. Existing railway infrastructure may have interoperability issues	4. Johnsonville line cannot accept current network wide trains	4. Part of overall procurement plans and ongoing co-ordination with infrastructure owner, operator and LTNZ.					
		5. OHLE and signalling asset condition and renewal dependant on others						
2.2. Procurement difficulties.	1. Inability to purchase specialised rolling stock at a reasonable price.	1. Existing rolling stock fails prior to delivery of new stock.	1. Existing procurement function and strategy. Procurement process well understood.	Del	40	4	160	
	2. Lack of availability of rolling stock.	2. Loss of patronage to other transport modes.		Fin	70	4	280	
	3. Complexity of Procurement procedures with LTNZ	3. Increased traffic congestion		Stk	10	4	40	
	4. Extended procurement schedule.	4. Cost and delay associated with compliance with LTNZ requirements						
	5. Equipment to meet technical specification is not available.							

2. Enhanced timetable - New EMUs

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	6. Complexities and difficulties associated with procurement and contracting strategy.							
	7. Large increase in cost due to small order							
2.3. Over or Under demand for the chosen option.	1. Increased population growth.	1. Revenue shortfalls / over recovery	1. Patronage forecast in place	Stk	40	2	80	9. Confirm financial returns from bus and rail operations
	2. Increased demand on new infrastructure.	2. Inflexibility to meet changing demands	2. Alignment with strategic growth and transport plan	Rep	40	2	80	
	3. Changes in land use demands.	3. Lack of capacity in supporting infrastructure eg park and ride	3. New station added at Raroa	Fin	40	4	160	
	4. Capacity limitations of chosen option	4. Bus resources to serve increased rail service not available.						
	5. Loss of two stations.							
	6. Inconvenient location of new station (to replace Raroa)							
2.4. Legislative limitations.	1. Legislative provisions have restrictions	1. Law does not allow for change -not applicable for this option						
	2. Changes in legislation							
2.5. Failure to meet stakeholder or community expectations.	1. Public interest or objection.	1. Loss of patronage to other transport modes.	1. Consultation and Communications Strategy and plans in place to manage.	Rep	10	2	20	2. New station at Raroa is an opportunity for transit orientated

2. Enhanced timetable - New EMUs

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	2. Stakeholder interest or objections.	2. Reputational damage.	2. Reference group in place to advise.	Stk	10	2	20	development (TOD) and/or Park and Ride
	3. Loss of two stations.	3. Loss of confidence in public decision making	3. New station added at Raroa					
	4. Inconvenient location of new station (to replace Raroa)	4. Loss of revenue through rates						
		5. Motions to the Auditor General						
		6. Increased traffic congestion						
		7. Political interference by policy or involvement						
2.6. Constructability difficulties.	1. Limited construction and industry capacity market to deliver multiple, concurrent projects	1. Delay in implementation, operation and owners and project cost increases	1. Feasibility studies feed into detailed design requirements.	Del	40	4	160	
	2. Latent impacts - unknowns in refurbishment, geotech or construction.	2. Prolonged community disruption	2. Relocated stations would be constructed within the designation.	Fin	40	4	160	
	3. Disruption during construction.	3. Loss of patronage to other transport modes.		Stk	40	4	160	
	4. Existing utilities.	4. Additional upgrade required to Fraser Avenue.						
	5. Lack of construction space.							
	6. Accessibility to Box Hill station for construction works.							
2.7. Project capital cost escalation.	1. Escalation greater than anticipated.	1. Cost over runs during implementation.	1. Existing estimate plans allows for single	Fin	70	4	280	

2. Enhanced timetable - New EMUs

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	2. Scope creep. (Additional rail infrastructure asset renewals may be required to be brought forward)	2. Community objection to funding levels.	line escalation factor	Stk	10	4	40	
	3. Design growth.	3. Need to reduce scope to suit available funds		Rep	10	4	40	
	4. Exchange rate exposure							
2.8. Inability to obtain funding.	1. Fare box revenue assumptions not realised.	1. Reduction in strategy or scope to meet available funding	1. Early involvement and engagement of LTNZ.	Del	70	4	280	1. Confirm funding arrangements for rolling stock.
	2. Greater Wellington funding insufficient	2. Reduction in funding during project lifecycle	2. Some funding is included in Greater Wellington Long Term Council Community Plan (GW LTCCP).	Fin	10	4	40	
	3. LTNZ funding insufficient or does not meet funding criteria	3. Project does not proceed.		Stk	10	4	40	
	4. Capital cost too high.							
	5. Change in Government or Council policy. eg inability to hold future parties accountable for debt funding contracts							
	6. Rate of draw down on funds too rapid.							
	7. Funding structure unacceptable (grant, debt funding, debt and toll recovery)							

2. Enhanced timetable - New EMUs

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
2.9. Inability to obtain consents.	1. Requirements to obtain Resource Consent.	1. Cost of completing the consent process	1. Technical Expert involved and developing a (Resource) consenting plan. Limited to Consents around earthworks.	Del	10	3	30	
	2. Requirement to change Designation.	2. Cost of mitigation required by Consenting Authority - RMA	2. No new designations required under this option.	Fin	1	3	3	
	3. Difficulties in obtaining Building Consents.	3. Uncertainty in obtaining desired outcome	3. Designation needs confirmation.	Stk	10	4	40	
		4. Time delays through the Notification and Appeal process						
		5. Additional works required beyond those assumed in the base option required by Building Consenting Authority e.g. accessibility						
2.10. Operational issues.	1. Commitment of operator to chosen solution.	1. Increasing contract (operational) costs	1. Current procedures in place for PT services.	Stk	40	3	120	
	2. Monopoly service provider.	2. Timetable delays and reduced reliability	2. Modelled timetable to demonstrate it can be achieved.	Del	10	3	30	
	3. Labour & skill shortages.			Fin	10	3	30	
2.11. Interface difficulties with existing infrastructure.	1. CBD bus corridors near capacity.	1. Increased costs and program delays.	1. Ngauranga to Airport strategic study commissioned.	Del	40	3	120	
	2. Lack of corridor for introduction - not applicable for rail options.	2. Raised public expectation of wider infrastructure improvements for access		Fin	40	3	120	

2. Enhanced timetable - New EMUs

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	3. Existing infrastructure does not interface with new equipment for accessibility.			Stk	10	3	30	
	4. Interchange facilities at Johnsonville centre							

3. Enhanced timetable - Refurbished Rolling stock

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
3.1. Technical risks associated with the design option.	1. Track lowering in tunnels takes longer than planned.	1. Inability to procure in larger quantities due to technical differences.	1. ONTRACK study into track lowering on going.	Del	40	4	160	11. Risk to refurbished rolling stock is reduced from that to new rolling stock but not to a level commnsurate witha reduction in the risk scores
	2. Susceptibility to seismic event.	2. Delays in developing specialised technical designs.	2. Known seismic risk.	Fin	100	4	400	
	3. Specified equipment does not meet accessibility requirements	3. Increased cost associated with both procurement and maintenance for specialised rolling stock.	3. Adherence to assumed standards for accessibility - based on HRC review.	Stk	10	4	40	
	4. Increased specification of rolling stock increases capital costs above plans	4. Johnsonville line cannot accept current network wide trains	4. Part of overall procurement plans and ongoing co-ordination with infrastructure owner, operator and LTNZ.					
	5. Existing railway infrastructure may have interoperability issues	5. OHLE and signalling asset condition and renewal dependant on others	5. Toll study underway to review abilities of GM units					
	6. Inability of Ganz Mavag units to operate on the Johnsonville line.							
3.2. Procurement difficulties.	1. Inability identify the extent of the refurbishment required	1. Existing rolling stock fails prior to delivery of new stock.	1. Existing procurement function and strategy. Procurement process well understood.	Del	40	4	160	11. Risk to refurbished rolling stock is reduced from that to new rolling stock but not to a level commnsurate witha reduction in the risk scores
	2. Lack of availability of buses.	2. Loss of patronage to other transport modes.		Fin	40	4	160	
	3. Complexity of Procurement procedures with LTNZ	3. Increased traffic congestion		Stk	10	4	40	
	4. Extended procurement schedule.	4. Cost and delay associated with compliance with LTNZ						

3. Enhanced timetable - Refurbished Rolling stock

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	5. Equipment to meet technical specification is not available.	requirements						
	6. Complexities and difficulties associated with procurement and contracting strategy.							
3.3. Over or Under demand for the chosen option.	1. Increased population growth.	1. Revenue shortfalls / over recovery	1. Patronage forecast in place	Stk	40	2	80	
	2. Increased demand on new infrastructure.	2. Inflexibility to meet changing demands	2. Alignment with strategic growth and transport plan	Rep	40	2	80	
	3. Changes in land use demands.	3. Lack of capacity in supporting infrastructure eg park and ride		Fin	40	4	160	
	4. Capacity limitations of chosen option	4. Bus resources to serve increased rail service not available.						
3.4. Legislative limitations.	1. Legislative provisions have restrictions	1. Law does not allow for change -not applicable for this option						
	2. Changes in legislation							
3.5. Failure to meet stakeholder or community expectations.	1. Public interest or objection.	1. Loss of patronage to other transport modes.	1. Consultation and Communications Strategy and plans in place to manage.	Rep	10	2	20	
	2. Stakeholder interest or objections.	2. Reputational damage.	2. Reference group in place to advise.	Stk	10	2	20	
		3. Loss of confidence in public decision making						

3. Enhanced timetable - Refurbished Rolling stock

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
		4. Loss of revenue through rates						
		5. Motions to the Auditor General						
		6. Increased traffic congestion						
		7. Political interference by policy or involvement						
		8. Public expectation for new units not met						
3.6. Constructability difficulties.	1. Limited construction and industry capacity market to deliver multiple, concurrent projects	1. Delay in implementation, operation and owners and project cost increases	1. Feasibility studies feed into detailed design requirements	Del	40	4	160	
	2. Latent impacts - unknowns in refurbishment, geotech or construction.	2. Prolonged community disruption		Fin	40	4	160	
	3. Disruption during construction.	3. Loss of patronage to other transport modes.		Stk	40	4	160	
	4. Existing utilities.							
	5. Lack of construction space.							
3.7. Project capital cost escalation.	1. Escalation greater than anticipated.	1. Cost over runs during implementation.	1. Existing estimate plans allows for single line escalation factor	Fin	70	4	280	
	2. Scope creep. (Additional rail infrastructure asset renewals may be required to be brought forward)	2. Community objection to funding levels.		Rep	10	4	40	
	3. Design growth.	3. Need to reduce scope to		Stk	10	4	40	

3. Enhanced timetable - Refurbished Rolling stock

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	4. Limited exchange rate exposure	suit available funds						
3.8. Inability to obtain funding.	1. Fare box revenue assumptions not realised.	1. Reduction in strategy or scope to meet available funding	1. Early involvement and engagement of LTNZ.	Del	70	4	280	1. Confirm funding arrangements for rolling stock.
	2. Greater Wellington funding insufficient	2. Reduction in funding during project lifecycle	2. Some funding is included in Greater Wellington Long Term Council Community Plan (GW LTCCP).	Fin	10	4	40	11. Risk to refurbished rolling stock is reduced from that to new rolling stock but not to a level commnsurate witha reduction in the risk scores
	3. LTNZ funding insufficient or does not meet funding criteria	3. Project does not proceed.						
	4. Capital cost too high.							
	5. Change in Government or Council policy. eg inability to hold future parties accountable for debt funding contracts			Stk	10	4	40	
	6. Rate of draw down on funds too rapid.							
	7. Funding structure unacceptable (grant, debt funding, debt and toll recovery)							
3.9. Inability to obtain consents.	1. Requirements to obtain Resource Consent.	1. Cost of completing the consent process	1. Technical Expert involved and developing a (Resource) consenting plan. Limited to Consents around earthworks.	Del	10	3	30	

3. Enhanced timetable - Refurbished Rolling stock

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	2. Requirement to change Designation.	2. Cost of mitigation required by Consenting Authority - RMA	2. No new designations required under this option.	Fin	1	3	3	
	3. Difficulties in obtaining Building Consents.	3. Uncertainty in obtaining desired outcome		Stk	10	4	40	
		4. Time delays through the Notification and Appeal process						
		5. Additional works required beyond those assumed in the base option required by Building Consenting Authority e.g. accessibility						
3.10. Operational issues.	1. Commitment of operator to chosen solution.	1. Increasing contract (operational) costs	1. Current procedures in place for PT services.	Stk	40	3	120	
	2. Monopoly service provider.	2. Timetable delays and reduced reliability	2. Modelled timetable to demonstrate it can be achieved.	Del	10	3	30	
	3. Labour & skill shortages.			Fin	10	3	30	
3.11. Interface difficulties with existing infrastructure.	1. CBD bus corridors near capacity.	1. Increased costs and program delays.	1. Ngauranga to Airport strategic study commissioned.	Del	40	3	120	
	2. Lack of corridor for introduction - not applicable for rail options.	2. Raised public expectation of wider infrastructure improvements for access		Fin	40	3	120	
	3. Existing infrastructure does not interface with new equipment for accessibility.			Stk	10	3	30	

4. Base timetable - New EMUs

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
4.1. Technical risks associated with the design option.	1. Track lowering in tunnels takes longer than planned.	1. Inability to procure in larger quantities due to technical differences.	1. ONTRACK study into track lowering on going.	Del	40	4	160	
	2. Susceptibility to seismic event.	2. Delays in developing specialised technical designs.	2. Known seismic risk.	Fin	70	4	280	
	3. Specified equipment does not meet accessibility requirements	3. Increased cost associated with both procurement and maintenance for specialised rolling stock.	3. Adherence to assumed standards for accessibility - based on HRC review.	Stk	10	4	40	
	4. Increased specification of rolling stock increases capital costs above plans	4. Johnsonville line cannot accept current network wide trains	4. Part of overall procurement plans and ongoing co-ordination with infrastructure owner, operator and LTNZ.					
	5. Existing railway infrastructure may have interoperability issues	5. OHLE and signalling asset condition and renewal dependant on others						
4.2. Procurement difficulties.	1. Inability to purchase specialised rolling stock at a reasonable price.	1. Existing rolling stock fails prior to delivery of new stock.	1. Existing procurement function and strategy. Procurement process well understood.	Del	40	4	160	
	2. Lack of availability of buses.	2. Loss of patronage to other transport modes.		Fin	10	4	40	
	3. Complexity of Procurement procedures with LTNZ	3. Increased traffic congestion		Stk	10	4	40	
	4. Extended procurement schedule.	4. Cost and delay associated with compliance with LTNZ requirements						
	5. Equipment to meet technical specification is not available.							

4. Base timetable - New EMUs

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	6. Complexities and difficulties associated with procurement and contracting strategy.							
	7. Large increase in cost due to small order							
4.3. Over or Under demand for the chosen option.	1. Increased population growth.	1. Revenue shortfalls / over recovery	1. Patronage forecast in place	Stk	40	2	80	
	2. Increased demand on new infrastructure.	2. Inflexibility to meet changing demands	2. Alignment with strategic growth and transport plan	Rep	40	2	80	
	3. Changes in land use demands.	3. Lack of capacity in supporting infrastructure eg park and ride		Fin	40	4	160	
	4. Capacity limitations of chosen option	4. Bus resources to serve increased rail service not available.						
4.4. Legislative limitations.	1. Legislative provisions have restrictions	1. Law does not allow for change -not applicable for this option						
	2. Changes in legislation							
4.5. Failure to meet stakeholder or community expectations.	1. Public interest or objection.	1. Loss of patronage to other transport modes.	1. Consultation and Communications Strategy and plans in place to manage.	Rep	10	2	20	
	2. Stakeholder interest or objections.	2. Reputational damage.	2. Reference group in place to advise.	Stk	10	2	20	
		3. Loss of confidence in public decision making						
		4. Loss of revenue through rates						

4. Base timetable - New EMUs

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
		5. Motions to the Auditor General						
		6. Increased traffic congestion						
		7. Political interference by policy or involvement						
4.6. Constructability difficulties.	1. Limited construction and industry capacity market to deliver multiple, concurrent projects	1. Delay in implementation, operation and owners and project cost increases	1. Feasibility studies feed into detailed design requirements	Del	40	4	160	
	2. Latent impacts - unknowns in refurbishment, geotech or construction.	2. Prolonged community disruption		Fin	40	4	160	
	3. Disruption during construction.	3. Loss of patronage to other transport modes.		Stk	40	4	160	
	4. Existing utilities.							
	5. Lack of construction space.							
4.7. Project capital cost escalation.	1. Escalation greater than anticipated.	1. Cost over runs during implementation.	1. Existing estimate plans allows for single line escalation factor	Fin	70	4	280	
	2. Scope creep. (Additional rail infrastructure asset renewals may be required to be brought forward)	2. Community objection to funding levels.		Stk	10	4	40	
	3. Design growth.	3. Need to reduce scope to suit available funds		Rep	10	4	40	
	4. Exchange rate exposure							
4.8. Inability to obtain funding.	1. Fare box revenue assumptions not realised.	1. Reduction in strategy or scope to meet available funding	1. Early involvement and engagement of LTNZ.	Del	70	4	280	1. Confirm funding arrangements for rolling stock.

4. Base timetable - New EMUs

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	2. Greater Wellington funding insufficient	2. Reduction in funding during project lifecycle	2. Some funding is included in Greater Wellington Long Term Council Community Plan (GW LTCCP).	Fin	10	4	40	
	3. LTNZ funding insufficient or does not meet funding criteria	3. Project does not proceed.		Stk	10	4	40	
	4. Capital cost too high.							
	5. Change in Government or Council policy. eg inability to hold future parties accountable for debt funding contracts							
	6. Rate of draw down on funds too rapid.							
	7. Funding structure unacceptable (grant, debt funding, debt and toll recovery)							
4.9. Inability to obtain consents.	1. Requirements to obtain Resource Consent.	1. Cost of completing the consent process	1. Technical Expert involved and developing a (Resource) consenting plan. Limited to Consents around earthworks.	Del	10	3	30	
	2. Requirement to change Designation.	2. Cost of mitigation required by Consenting Authority - RMA	2. No new designations required under this option.	Fin	1	3	3	
	3. Difficulties in obtaining Building Consents.	3. Uncertainty in obtaining desired outcome		Stk	10	4	40	

4. Base timetable - New EMUs

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
		4. Time delays through the Notification and Appeal process						
		5. Additional works required beyond those assumed in the base option required by Building Consenting Authority e.g. accessibility						
4.10. Operational issues.	1. Commitment of operator to chosen solution.	1. Increasing contract (operational) costs	1. Current procedures in place for PT services.	Stk	40	3	120	
	2. Monopoly service provider.	2. Timetable delays and reduced reliability	2. Modelled timetable to demonstrate it can be achieved.	Del	10	3	30	
	3. Labour & skill shortages.			Fin	10	3	30	
	4. Failure to achieve the 13/13/13 timetable							
4.11. Interface difficulties with existing infrastructure.	1. CBD bus corridors near capacity.	1. Increased costs and program delays.	1. Ngauranga to Airport strategic study commissioned.	Del	40	3	120	
	2. Lack of corridor for introduction - not applicable for rail options.	2. Raised public expectation of wider infrastructure improvements for access		Fin	40	3	120	
	3. Existing infrastructure does not interface with new equipment for accessibility.			Stk	10	3	30	
	4. Interchange facilities at Johnsonville centre							

5. Base timetable - Refurbished Rolling Stock

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
5.1. Technical risks associated with the design option.	1. Track lowering in tunnels takes longer than planned.	1. Inability to procure in larger quantities due to technical differences.	1. ONTRACK study into track lowering on going.	Del	40	4	160	11. Risk to refurbished rolling stock is reduced from that to new rolling stock but not to a level commnsurate witha reduction in the risk scores
	2. Susceptibility to seismic event.	2. Delays in developing specialised technical designs.	2. Known seismic risk.	Fin	100	4	400	
	3. Specified equipment does not meet accessibility requirements	3. Increased cost associated with both procurement and maintenance for specialised rolling stock.	3. Adherence to assumed standards for accessibility - based on HRC review.	Stk	10	4	40	
	4. Increased specification of rolling stock increases capital costs above plans	4. Johnsonville line cannot accept current network wide trains	4. Part of overall procurement plans and ongoing co-ordination with infrastructure owner, operator and LTNZ.					
	5. Existing railway infrastructure may have interoperability issues	5. OHLE and signalling asset condition and renewal dependant on others	5. Toll study underway to review abilities of GM units					
	6. Inability of Ganz Mavag units to operate on the Johnsonville line.							
5.2. Procurement difficulties.	1. Inability identify the extent of the refurbishment required	1. Existing rolling stock fails prior to delivery of new stock.	1. Existing procurement function and strategy. Procurement process well understood.	Del	40	4	160	11. Risk to refurbished rolling stock is reduced from that to new rolling stock but not to a level commnsurate witha reduction in the risk scores
	2. Lack of availability of buses.	2. Loss of patronage to other transport modes.		Fin	40	4	160	
	3. Complexity of Procurement procedures with LTNZ	3. Increased traffic congestion		Stk	10	4	40	
	4. Extended procurement schedule.	4. Cost and delay associated with compliance with LTNZ						

5. Base timetable - Refurbished Rolling Stock

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	5. Equipment to meet technical specification is not available.	requirements						
	6. Complexities and difficulties associated with procurement and contracting strategy.							
5.3. Over or Under demand for the chosen option.	1. Increased population growth.	1. Revenue shortfalls / over recovery	1. Patronage forecast in place	Stk	40	2	80	
	2. Increased demand on new infrastructure.	2. Inflexibility to meet changing demands	2. Alignment with strategic growth and transport plan	Rep	40	2	80	
	3. Changes in land use demands.	3. Lack of capacity in supporting infrastructure eg park and ride		Fin	40	4	160	
	4. Capacity limitations of chosen option	4. Bus resources to serve increased rail service not available.						
5.4. Legislative limitations.	1. Legislative provisions have restrictions	1. Law does not allow for change -not applicable for this option						
	2. Changes in legislation							
5.5. Failure to meet stakeholder or community expectations.	1. Public interest or objection.	1. Loss of patronage to other transport modes.	1. Consultation and Communications Strategy and plans in place to manage.	Rep	10	2	20	
	2. Stakeholder interest or objections.	2. Reputational damage.	2. Reference group in place to advise.	Stk	10	2	20	
		3. Loss of confidence in public decision making						

5. Base timetable - Refurbished Rolling Stock

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
		4. Loss of revenue through rates						
		5. Motions to the Auditor General						
		6. Increased traffic congestion						
		7. Political interference by policy or involvement						
		8. Public expectation for new units not met						
5.6. Constructability difficulties.	1. Limited construction and industry capacity market to deliver multiple, concurrent projects	1. Delay in implementation, operation and owners and project cost increases	1. Feasibility studies feed into detailed design requirements	Del	40	4	160	
	2. Latent impacts - unknowns in refurbishment, geotech or construction.	2. Prolonged community disruption		Fin	40	4	160	
	3. Disruption during construction.	3. Loss of patronage to other transport modes.		Stk	40	4	160	
	4. Existing utilities.							
	5. Lack of construction space.							
5.7. Project capital cost escalation.	1. Escalation greater than anticipated.	1. Cost over runs during implementation.	1. Existing estimate plans allows for single line escalation factor	Fin	70	4	280	
	2. Scope creep. (Additional rail infrastructure asset renewals may be required to be brought forward)	2. Community objection to funding levels.		Stk	10	4	40	
	3. Design growth.	3. Need to reduce scope to		Rep	10	4	40	

5. Base timetable - Refurbished Rolling Stock

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	4. Limited exchange rate exposure	suit available funds						
5.8. Inability to obtain funding.	1. Fare box revenue assumptions not realised.	1. Reduction in strategy or scope to meet available funding	1. Early involvement and engagement of LTNZ.	Del	70	4	280	1. Confirm funding arrangements for rolling stock.
	2. Greater Wellington funding insufficient	2. Reduction in funding during project lifecycle	2. Some funding is included in Greater Wellington Long Term Council Community Plan (GW LTCCP).	Fin	10	4	40	11. Risk to refurbished rolling stock is reduced from that to new rolling stock but not to a level commnsurate witha reduction in the risk scores
	3. LTNZ funding insufficient or does not meet funding criteria	3. Project does not proceed.						
	4. Capital cost too high.							
	5. Change in Government or Council policy. eg inability to hold future parties accountable for debt funding contracts			Stk	10	4	40	
	6. Rate of draw down on funds too rapid.							
	7. Funding structure unacceptable (grant, debt funding, debt and toll recovery)							
5.9. Inability to obtain consents.	1. Requirements to obtain Resource Consent.	1. Cost of completing the consent process	1. Technical Expert involved and developing a (Resource) consenting plan. Limited to Consents around earthworks.	Del	10	3	30	

5. Base timetable - Refurbished Rolling Stock

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	2. Requirement to change Designation.	2. Cost of mitigation required by Consenting Authority - RMA	2. No new designations required under this option.	Fin	1	3	3	
	3. Difficulties in obtaining Building Consents.	3. Uncertainty in obtaining desired outcome		Stk	10	4	40	
		4. Time delays through the Notification and Appeal process						
		5. Additional works required beyond those assumed in the base option required by Building Consenting Authority e.g. accessibility						
5.10. Operational issues.	1. Commitment of operator to chosen solution.	1. Increasing contract (operational) costs	1. Current procedures in place for PT services.	Stk	40	3	120	
	2. Monopoly service provider.	2. Timetable delays and reduced reliability	2. Modelled timetable to demonstrate it can be achieved.	Del	10	3	30	
	3. Labour & skill shortages.			Fin	10	3	30	
	4. Failure to achieve the 13/13/13 timetable							
5.11. Interface difficulties with existing infrastructure.	1. CBD bus corridors near capacity.	1. Increased costs and program delays.	1. Ngauranga to Airport strategic study commissioned.	Del	40	3	120	
	2. Lack of corridor for introduction - not applicable for rail options.	2. Raised public expectation of wider infrastructure improvements for access		Fin	40	3	120	
	3. Existing infrastructure does not interface with new equipment for accessibility.			Stk	10	3	30	
	4. Interchange facilities at Johnsonville centre							

6. Bus on-street

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
6.1. Technical risks associated with the design option.	1. Susceptibility to seismic event.	1. Loss of roadside parking capacity.		Del	40	5	200	
	2. Specified equipment does not meet accessibility requirements	2. Business or residents complain of impact of bus stops, route changes and lane.		Fin	40	5	200	
	3. Inability to implement dedicated bus lanes	3. Increased traffic congestion		Rep	40	4	160	
				Stk	40	5	200	
6.2. Procurement difficulties.	1. Lack of availability of buses.	1. Existing rolling stock fails prior to delivery of new buses.		Del	40	4	160	6. Current review of procurement with LTNZ.
	2. Complexities and difficulties associated with procurement and contracting strategy.	2. Loss of patronage to other transport modes.		Fin	40	4	160	
		3. Increased traffic congestion		Stk	40	4	160	
		4. Cost and delay associated with compliance with LTNZ requirements						
6.3. Over or Under demand for the chosen option.	1. Increased population growth.	1. Revenue shortfalls / over recovery		Stk	40	4	160	5. Confirm patronage from trains can be accommodated with buses
	2. Increased demand on new infrastructure.	2. Lack of capacity in supporting infrastructure eg park and ride		Fin	40	4	160	
	3. Changes in land use demands.	3. Bus resources to serve increased frequency of service not available.		Rep	40	3	120	
	4. Capacity limitations of chosen option.	4. Reputational damage.						
	5. Rejection of buses as an alternative to rail	5. Increased traffic congestion						

6. Bus on-street

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
6.4. Legislative limitations.	1. Legislative provisions have restrictions	1. Law does not allow for change. Representations would need to be made to seek Crown Approval to use the corridor other than for rail.		Del	70	5	350	4. Examine the political impact of stopping trains with or without the introduction of the cycle way.
	2. Changes in legislation			Fin	70	4	280	
				Rep	70	4	280	
6.5. Failure to meet stakeholder or community expectations.	1. Public interest or objection.	1. Loss of patronage to other transport modes.	1. Potential for introduction of new recreational amenity in terms of a walking / cycle track	Fin	40	4	160	
	2. Stakeholder interest or objections.	2. Reputational damage.		Rep	40	4	160	
	3. Objection to loss of railway.	3. Loss of confidence in public decision making		Stk	40	4	160	
		4. Loss of revenue through rates		Del	40	4	160	
		5. Motions to the Auditor General						
		6. Increased traffic congestion						
		7. Political interference by policy or involvement.						
6.6. Constructability difficulties.	1. Limited construction and industry capacity market to deliver multiple, concurrent projects	1. Delay in implementation, operation and owners and project cost increases		Del	10	2	20	3. Tunnel security, fencing and surfacing track to be included in base estimate.
	2. Latent impacts - unknowns in refurbishment, geotech or construction.	2. Prolonged community disruption		Fin	10	2	20	
	3. Disruption during construction.	3. Loss of patronage to other transport modes.		Rep	10	2	20	

6. Bus on-street

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	4. Existing utilities.			Stk	10	2	20	
	5. Lack of construction space.							
6.7. Project capital cost escalation.	1. Escalation greater than anticipated.	1. Cost over runs during implementation.		Fin	10	4	40	
	2. Scope creep.	2. Community objection to funding levels.		Rep	10	4	40	
	3. Design growth.	3. Need to reduce scope to suit available funds						
	4. Exchange rate exposure							
6.8. Inability to obtain funding.	1. Fare box revenue assumptions not realised.	1. Reduction in strategy or scope to meet available funding	1. Manage through service procurement strategy.	Del	40	4	160	
	2. Greater Wellington funding insufficient	2. Reduction in funding during project lifecycle		Fin	10	3	30	
	3. Wellington City Council may not be available.	3. Project does not proceed.		Rep	10	3	30	
	4. LTNZ funding insufficient or does not meet funding criteria	4. WCC funding required		Stk	10	3	30	
	5. Change in Government or Council policy. eg inability to hold future parties accountable for debt funding contracts							
	6. Rate of draw down on funds too rapid.							

6. Bus on-street

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	7. Funding structure unacceptable (grant, debt funding, debt and toll recovery)							
6.9. Inability to obtain consents.	1. Requirements to obtain Resource Consent.	1. Cost of completing the consent process	1. Technical Expert involved and developing a (Resource) consenting plan. Limited to Consents around earthworks.	Del	40	4	160	
	2. Requirement to change Designation.	2. Cost of mitigation required by Consenting Authority - RMA		Fin	10	4	40	
	3. Difficulties in obtaining Building Consents.	3. Uncertainty in obtaining desired outcome						
	4. Loss of Johnsonville Rail corridor as a rail corridor rather than a transport corridor.	4. Time delays through the Notification and Appeal process						
	5. Difficulties in siting new bus stops.	5. Additional works required beyond those assumed in the base option required by Building Consenting Authority e.g. accessibility		Stk	10	4	40	
		6. Requirement to manage change in designation for corridor						
		7. Agreements required to cover change in maintainer						
6.10. Operational issues.	1. Difficulty in influencing bus routes and frequency for commercial services.	1. Increasing contract (operational) costs	1. Current procedures in place for PT services.	Del	40	3	120	7. Base bus improvements assumes some roads are constructed that do not presently exist.
	2. Labour & skill shortages.	2. Timetable delays and reduced reliability	2. Modelled timetable to demonstrate it can be	Rep	10	3	30	
	3. Loss of amenity			Stk	40	3	120	

6. Bus on-street

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
			achieved.	Fin	40	3	120	Common to all options
6.11. Interface difficulties with existing infrastructure.	1. CBD bus corridors near capacity.	1. Increased costs and program delays.	1. Interface difficulties with existing infrastructure.	Stk	40	4	160	
	2. Lack of corridor for introduction - not applicable for rail options.	2. Raised public expectation of wider infrastructure improvements for access	2. Ngauranga to Airport strategic study commissioned.	Fin	70	3	210	
	3. Existing infrastructure does not interface with new equipment for accessibility.	3. Availability of suitable land for location of new depot facility		Del	40	4	160	
	4. Interchange facilities at Johnsonville centre							
	5. Additional buses on route							

7. Light Rail

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
7.1. Technical risks associated with the design option.	1. Susceptibility to seismic event.	1. Inability to procure in larger quantities due to technical differences.	1. Known seismic risk.	Del	70	5	350	
	2. Specified equipment does not meet accessibility requirements	2. Delays in developing specialised technical designs.	2. Adherence to assumed standards for accessibility - based on HRC review.	Fin	100	5	500	
	3. Increased specification of rolling stock increases capital costs above plans	3. Increased cost associated with both procurement and maintenance for specialised rolling stock.	3. Part of overall procurement plans and ongoing co-ordination with infrastructure owner, operator and LTNZ.	Stk	40	5	200	
	4. Existing railway infrastructure may have interoperability issues	4. Johnsonville line cannot accept new light rail units						
	5. LRV's cannot go through tunnels	5. OHLE and signalling asset condition and renewal dependant on others						
	6. Low floor LRV's may not be able to operate on existing alignment due to track geometry issues	6. Light rail units are not compatible with existing infrastructure - signalling etc						
	7. Street running sections is a new environment							
7.2. Procurement difficulties.	1. Inability to purchase specialised rolling stock at a reasonable price [small order issue].	1. Existing rolling stock fails prior to delivery of new stock.		Del	100	4	400	
	2. Complexity of Procurement procedures with LTNZ	2. Loss of patronage to other transport modes.		Fin	70	4	280	

7. Light Rail

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	3. LTNZ certification of LRV units	3. Increased traffic congestion						
	4. Extended procurement schedule.	4. Cost and delay associated with compliance with LTNZ requirements						
	5. No existing strategy for procurement or accreditation							
	6. Equipment to meet technical specification is not available.			Stk	40	4	160	
	7. Complexities and difficulties associated with procurement and contracting strategy.							
	8. Large increase in cost due to small order							
7.3. Over or Under demand for the chosen option.	1. Increased population growth.	1. Revenue shortfalls / over recovery	1. Patronage forecast in place	Stk	40	4	160	9. Confirm financial returns from bus and rail operations
	2. Increased demand on new infrastructure.	2. Inflexibility to meet changing demands	2. Alignment with strategic growth and transport plan	Rep	40	3	120	
	3. Changes in land use demands.	3. Lack of capacity in supporting infrastructure eg park and ride	3. New station added at Raroa	Fin	40	4	160	
	4. Capacity limitations of chosen option	4. Bus resources to serve increased rail service not available.						
	5. Loss of two stations.							

7. Light Rail

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	6. Inconvenient location of new station (to replace Raroa)							
7.4. Legislative limitations.	1. Legislative provisions have restrictions	1. Crown Approval required to change use to LRV route		Del	70	5	350	
	2. Changes in legislation			Fin	70	4	280	
				Stk	70	4	280	
7.5. Failure to meet stakeholder or community expectations.	1. Public interest or objection.	1. Loss of patronage to other transport modes.	1. Consultation and Communications Strategy and plans in place to manage.	Rep	40	4	160	2. New station at Raroa is an opportunity for transit orientated development (TOD) and/or Park and Ride
	2. Stakeholder interest or objections.	2. Reputational damage.	2. Reference group in place to advise.	Stk	40	3	120	
	3. Loss of two stations.	3. Loss of confidence in public decision making	3. New station added at Raroa					
	4. Inconvenient location of new station (to replace Raroa)	4. Loss of revenue through rates						
		5. Motions to the Auditor General						
		6. Increased traffic congestion						
		7. Political interference by policy or involvement						
7.6. Constructability difficulties.	1. Limited construction and industry capacity market to deliver multiple, concurrent projects	1. Delay in implementation, operation and owners and project cost increases	1. Feasibility studies feed into detailed design requirements.	Del	100	4	400	

7. Light Rail

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	2. Latent impacts - unknowns in refurbishment, geotech or construction.	2. Prolonged community disruption	2. Relocated stations would be constructed within the designation.	Fin	100	4	400	
	3. Disruption during construction.	3. Loss of patronage to other transport modes.		Stk	70	4	280	
	4. Existing utilities.	4. Additional upgrade required to Fraser Avenue.						
	5. Lack of construction space.							
	6. Accessibility to Box Hill station for construction works.							
7.7. Project capital cost escalation.	1. Escalation greater than anticipated.	1. Cost over runs during implementation.	1. Existing estimate plans allows for single line escalation factor	Fin	70	4	280	
	2. Scope creep. (Additional rail infrastructure asset renewals may be required to be brought forward)	2. Community objection to funding levels.		Stk	40	4	160	
	3. Design growth.	3. Need to reduce scope to suit available funds		Rep	40	4	160	
	4. Exchange rate exposure							
7.8. Inability to obtain funding.	1. Fare box revenue assumptions not realised.	1. Reduction in strategy or scope to meet available funding	1. Early involvement and engagement of LTNZ.	Del	100	4	400	1. Confirm funding arrangements for rolling stock.
	2. Greater Wellington funding insufficient	2. Reduction in funding during project lifecycle		Fin	40	4	160	
	3. LTNZ funding insufficient or does not meet funding criteria	3. Project does not proceed.		Stk	40	4	160	
	4. Capital cost too high.							

7. Light Rail

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	5. Change in Government or Council policy. eg inability to hold future parties accountable for debt funding contracts							
	6. Rate of draw down on funds too rapid.							
	7. Funding structure unacceptable (grant, debt funding, debt and toll recovery)							
7.9. Inability to obtain consents.	1. Requirements to obtain Resource Consent.	1. Cost of completing the consent process	1. Technical Expert involved and developing a (Resource) consenting plan.	Del	100	4	400	
	2. Requirement to change Designation.	2. Cost of mitigation required by Consenting Authority - RMA	2. Designation needs confirmation.	Fin	70	4	280	
	3. Difficulties in obtaining Building Consents.	3. Uncertainty in obtaining desired outcome		Stk	40	4	160	
	4. Issues with CBD retailers and parking for city centre route	4. Time delays through the Notification and Appeal process						
	5. Difficulties in obtaining building owner approval for infrastructure [ohle]	5. Additional works required beyond those assumed in the base option required by Building Consenting Authority e.g. accessibility						
7.10. Operational issues.	1. Problems identifying a new operator	1. Increasing contract (operational) costs	1. Current procedures in place for PT services.	Stk	40	3	120	

7. Light Rail

Scenarios	Causes	Consequences	Current Controls / Plans	Risk Analysis				Issues List
				CAT	Most Likely Risk			
					C	L	Risk	
	2. Labour & skill shortages.	2. Timetable delays and reduced reliability	2. Modelled timetable to demonstrate it can be achieved.	Del	40	4	160	
	3. Need for new control infrastructure and driver training etc	3. Delay in bringing service on line		Fin	70	4	280	
	4. Interfaces with traffic signal operations							
7.11. Interface difficulties with existing infrastructure.	1. CBD corridors near capacity.	1. Increased costs and programme delays.	1. Ngauranga to Airport strategic study commissioned.	Del	100	4	400	
	2. Lack of corridor for introduction - current vehicular traffic near capacity	2. Raised public expectation of wider infrastructure improvements for access to CBD and beyond		Fin	100	4	400	
	3. Existing infrastructure does not interface with new equipment for accessibility.eg platform heights, overhead equipment			Stk	70	4	280	
	4. Interchange facilities at Johnsonville centre							
	5. New terminus required at Courtenay Place							