



Department of Infrastructure

Northern Central City Corridor Study
Transport Specialist Study
Economic Appraisal of Strategy Scenarios
Addendum Report
March 2003

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1. Introduction

1.1 Report Scope

This report is an addendum to our Economic Evaluation report of September 2002, which presented economic evaluation results for the strategies tested as part of Northern Central City Corridor Study (NCCCS).

The addendum has been prepared for three main reasons:

- £ Changes to the capital costs of tunnel options following the engineering team’s review;
- £ reviews of Zenith model outputs with regard to public transport resources (vehicle-hours, vehicle-km and peak vehicles) used; and
- £ examination of east-west tunnel and DART options as ‘stand-alone’ projects (i.e. without the backdrop of other strategy elements).

1.2 Strategy Scenarios

The strategy scenarios evaluated are listed in Table 1-1, for reference when reading this report.

> **Table 1-1 : ZENITH Model Run Label Descriptions**

Strategies	Model ID	Elements Included
Improved Public Transport	A	A
Traffic on Local Streets	B/C	A + B/C (Bikes & Peds not modelled)
Reduce Car Dependency	D	B/C + D
Eastern Freeway Transit (LRT)	F	D + F
Eastern Freeway Transit (LRT with Toll)	F1	D + F1 (No economic results)
Eastern Freeway Transit (Heavy Rail)	F2	D + F2
G – Tunnel, Eastern Fway – Elliott Ave	G	F + G
G1 – Tunnel as G but no ramps Royal Pde	G1	F + G1
G2 – Tunnel to CBD	G2	F + G2

1.3 Report Structure

Chapter 2 of this report describes the strategy cost estimate changes input to the evaluation, Chapter 3 reports the strategy benefits and Chapter 4 brings these costs and benefits together in a review of the economic evaluation results.

Appendix A summarises the ‘Zenith’ model run outputs used to assess the east-west tunnel as a ‘stand-alone’ project.

2. Changes to Original Assumptions

2.1 Capital Costs

The capital cost estimates documented in the Strategy Costs report by the engineering specialist were allocated to the various strategy elements as shown in Table 2-1.

Table 2-1: Original Strategy Element Costs

Strategy Elements	Cost Item	\$millions	A	B/C	D	F	F1	F2	G	G1	G2
A1 – Upgraded Signalling**	A1	\$ 28.75	1	1	1	1	1	1	1	1	1
A2 – Station Access Improvement	A2	\$ 203.24	1	1	1	1	1	1	1	1	1
A4 – Route 109 Upgrades	A4	\$ 336.80	1	1	1	1	1	1	1	1	1
A9 – Modal Interchanges in Study Area	A9	\$ 50.16	1	1	1	1	1	1	1	1	1
A14 – Hoddle Street Bus Priority	A14	\$ 0.23	1	1	1	1	1	1	1	1	1
B1 – Area Wide Traffic Management	B1	\$ 18.16		1	1	1	1	1	1	1	1
C1 – Pedestrian Network Improvements	C1	\$ 30.01		0	0	0	0	0	0	0	0
C2 – Bicycle Network Improvements	C2	\$ 33.86		0	0	0	0	0	0	0	0
D1 – Changes to Local Parking	D1	\$ 8.94			1	1	1	1	1	1	1
D2 – Behavioural Changes	D3	\$ 39.11			0	0	0	0	0	0	0
F1a – Doncaster Area Rapid Transit****	F1A	\$ 114.65									
F1b – Doncaster Area Rapid Transit****	F1B	\$ 167.06				1	1		1	1	1
F1c – Doncaster Area Rapid Transit****	F1C	\$ 430.12						1			
F2 – Hoddle Street Priority	F2	\$ 0.23				0	0	0	0	0	0
F3 – Bus Lanes on Alexandra/Princess	F3	\$ 0.58				0	0	0	0	0	0
F4 – Shopping Town Modal Interchange	F4	\$ 61.78				0	0	0	0	0	0
F5 – Park and Ride	F5	\$ 9.00				1	1	1	1	1	1
F6 – Melbourne University Modal I/C	F6	\$ 50.16				0	0	0	0	0	0
F8 – Congestion Charge on Eastern Fway	F8	\$ 9.27					1				
G1 – Tunnel, Eastern Fway – Elliott Ave	G1	\$ 722.88							1	0	0
G2 – Supplementary Roadworks	G2	\$ 0.21							1	0	0
G3 – Tunnel to CBD	G3	\$ 369.46									1
G4 – Tunnel, E Fway – Elliott Ave No Ryl Parade Ramps	G4	\$ 591.58								1	
TOTAL COST		(\$millions)	\$ 619	\$ 637	\$ 646	\$ 822	\$ 832	\$ 1,085	\$ 1,545	\$ 1,414	\$ 1,192

The review of tunnel and DART capital costs undertaken by the engineering specialist (Estimate Validation Report) resulted in no change to the capital costs for DART, but a 14% increase in the costs of the road tunnel options. The effect on the strategy costs is shown in Table 2-2.

Table 2-2: Revised Strategy Element Costs

Strategy Elements	Cost Item	\$millions	A	B/C	D	F	F1	F2	G	G1	G2
A1 – Upgraded Signalling**	A1	\$ 28.75	1	1	1	1	1	1	1	1	1
A2 – Station Access Improvement	A2	\$ 203.24	1	1	1	1	1	1	1	1	1
A4 – Route 109 Upgrades	A4	\$ 336.80	1	1	1	1	1	1	1	1	1
A9 – Modal Interchanges in Study Area	A9	\$ 50.16	1	1	1	1	1	1	1	1	1
A14 – Hoddle Street Bus Priority	A14	\$ 0.23	1	1	1	1	1	1	1	1	1
B1 – Area Wide Traffic Management	B1	\$ 18.16		1	1	1	1	1	1	1	1
C1 – Pedestrian Network Improvements	C1	\$ 30.01		0	0	0	0	0	0	0	0
C2 – Bicycle Network Improvements	C2	\$ 33.86		0	0	0	0	0	0	0	0
D1 – Changes to Local Parking	D1	\$ 8.94			1	1	1	1	1	1	1
D2 – Behavioural Changes	D3	\$ 39.11			0	0	0	0	0	0	0
F1a – Doncaster Area Rapid Transit Busway	F1A	\$ 114.65									
F1b – Doncaster Area Rapid Transit Light Rail	F1B	\$ 167.06				1	1		1	1	1
F1c – Doncaster Area Rapid Transit Heavt Rail	F1C	\$ 430.12						1			
F2 – Hoddle Street Priority	F2	\$ 0.23				0	0	0	0	0	0
F3 – Bus Lanes on Alexandra/Princess	F3	\$ 0.58				0	0	0	0	0	0
F4 – Shopping Town Modal Interchange	F4	\$ 61.78				0	0	0	0	0	0
F5 – Park and Ride	F5	\$ 9.00				1	1	1	1	1	1
F6 – Melbourne University Modal I/C	F6	\$ 50.16				0	0	0	0	0	0
F8 – Congestion Charge on Eastern Fway	F8	\$ 9.27					1				
G1 – Tunnel, Eastern Fway – Elliott Ave	G1	\$ 809.36							1	0	0
G2 – Supplementary Roadworks	G2	\$ 0.21							1	0	0
G3 – Tunnel to CBD	G3	\$ 408.07									1
G4 – Tunnel, E Fway – Elliott Ave No Ryl Parade Ramps	G4	\$ 664.16								1	
TOTAL COST		(\$millions)	\$ 619	\$ 637	\$ 646	\$ 822	\$ 832	\$ 1,085	\$ 1,632	\$ 1,487	\$ 1,230

2.2 Other changes

In addition to the capital cost changes noted above, some changes were made to the benefit streams in the light of:

- £ an amendment to the calculation of the public transport resource costs because the VLC data was incorrectly interpreted to include 'route distance' when in fact for tram and bus this represented two times the route distance; and
- £ For DART fleet changes were included as follows: 15 additional (large) trams required @ \$4.5M and reduction in bus fleet of 50 buses @ \$350,000 per bus.

These changes had only minor effects on the conclusions of the evaluation (see Section 3).

2.3 'Stand-alone' projects

In order to evaluate the east-west road tunnel and DART as 'stand-alone' projects, the following was undertaken:

- £ A run of the Zenith model was prepared to model the east-west road tunnel (as represented in Scenario G) without the preceding elements, i.e. as an addition to the Base Case alone.
- £ Evaluations of DART undertaken by DOI (ODPT) for Tram Plan were examined.

Results of the Zenith model runs for the east-west tunnel (used as the basis for the economic evaluation) are summarised in Appendix A of this report.

3. Revised Evaluation Results

3.1 Summary of Results

Table 3-1 contains the original summary evaluation results and Table 3-2 gives the revised results following the changes described in the previous Section. The additional item ‘XGB’ in Table 3-2 refers to the east-west tunnel assessed as a ‘stand-alone’ project.

The most important component of the evaluation is the incremental Benefit-Cost Ratio (BCR) reported in the far right-hand column of the tables. This refers to the benefit-cost of each incremental ‘step’ in the strategy scenarios, in the sequence they are introduced.

Table 3-1: Original Evaluation Results

Strategy	Description	Discounted		NPV	EIRR	BCR	Incr BCR
		Costs	Benefits				
A	PT improvements	\$ 3,173	\$ 14,826	\$ 11,653	84%	4.7	4.7
B/C	PT + B Area wide TM	\$ 3,204	\$ 14,172	\$ 10,968	76%	4.4	NA
D	B/C + CBD parking charge	\$ 3,192	\$ 13,446	\$ 10,254	71%	4.2	NA
F	D + LRT DART	\$ 3,300	\$ 13,568	\$ 10,268	61%	4.1	1.1
F2	D + HEAVY RAIL DART	\$ 3,694	\$ 13,788	\$ 10,094	51%	3.7	0.7
G	F + City Link tunnel	\$ 3,888	\$ 14,209	\$ 10,320	44%	3.7	1.1
G1	F + no Royal Pde ramps	\$ 3,790	\$ 14,196	\$ 10,406	47%	3.7	1.3
G2	F + CBD tunnel	\$ 3,606	\$ 13,806	\$ 10,200	50%	3.8	0.8

Table 3-2: Revised Evaluation Results

Strategy	Description	Discounted		NPV	EIRR	BCR	Incr BCR
		Costs	Benefits				
A	PT improvements	\$3,592	\$14,907	\$ 11,315	65%	4.2	NA
B/C	PT + B Area wide TM	\$3,629	\$14,237	\$ 10,608	59%	3.9	NA
D	B/C + CBD parking charge	\$3,604	\$13,496	\$ 9,891	55%	3.7	NA
F	D + LRT DART	\$3,715	\$13,617	\$ 9,902	50%	3.7	1.1
F2	D + HEAVY RAIL DART	\$4,131	\$13,839	\$ 9,708	43%	3.4	0.7
G	F + City Link tunnel	\$4,374	\$14,269	\$ 9,895	37%	3.3	1.0
G1	F + no Royal Pde ramps	\$4,265	\$14,256	\$ 9,991	39%	3.3	1.2
G2	F + CBD tunnel	\$4,057	\$13,859	\$ 9,802	42%	3.4	0.7
XGB	Base + City Link Tunnel	\$660	\$452	-\$ 208	2%	0.7	0.7

The results show:

- £ The incremental BCR for DART ranges from 1.1 (light rail) to 0.7 (heavy rail);
- £ The incremental BCR for the east-west tunnel is 1.0 with intermediate ramps and 1.2 without ramps when assessed incrementally, and 0.7 (with intermediate ramps) when assessed ‘stand-alone’; and
- £ The incremental BCR for the CBD tunnel is 0.7.

The overall effect of the changes to the evaluation has been to reduce the incremental benefit-cost ratios of the roads tunnel options (consistent with the increased costs resulting from the engineering review), whilst the DART options have remained more or less the same as in the original evaluation.

3.2 Commentary

DART LRT

The DART LRT has a BCR of 1.1 based on the marginal analysis (including the range of improvements in the Base and runs 'A' through 'D' in the Do Something (run 'F') and Do Minimum (run 'D')). This compares with a BCR of 0.8 estimated in the Tram Plan evaluation report; this was a stand-alone assessment and was made without the use of a wider area transportation model.

There were several differences between these assessments; comparison shows that the Tram Plan analysis used a capital cost of \$222M (compared to the NCCCS cost of \$170M including Doncaster Hill works), while the user benefits from the VLC model were higher than the Tram Plan estimates.

It is likely that the DART LRT BCR is around 1.0. Greater certainty on the magnitude of the economic returns requires a further level of analytical refinement (for example, running the Zenith model specifically for DART as a stand-alone project and raising the level of detail of its representation in the model). Such work could be undertaken if the concept is studied further as a follow-up to the NCCCS.

East-West Tunnel

The BCR estimates for the east-west tunnel in scenario 'G' (added to measures 'A' to 'F') and scenario 'XGB' (stand-alone against the Base Case) range from 0.7 to 1.0. These returns are low compared with other major road building projects such as the Scoresby Freeway. Reasons for this in terms of costs and benefits are as follows:

- £ Capital cost: the east-west tunnel is nearly four times the cost per kilometre of a surface freeway (the tunnel costs \$162M/km (\$810/5km), and the Mitcham-Frankston Freeway costs \$43M/km (\$1.65B/39km) – source: media release 23 Sept average of the capital cost range \$1.5B–\$1.8B);
- £ Benefits: The east-west tunnel creates a link for a movement currently made by a relatively small proportion of traffic going through the study area. It also attracts some north-south traffic because of the intermediate ramps at Nicholson Street and Royal Parade, but this traffic only uses short sections of the tunnel for a marginal time saving.

It is noteworthy that the east-west tunnel results in lower road user benefits when assessed as a stand-alone project compared to adding it to the preceding scenarios. The tunnel attracts less traffic in this situation, because the surface street capacity is not reduced by the public transport improvements (Scenario A), local street management (Scenario B) and DART LRT (Scenario F) that are included in the incremental evaluation.

Appendix A Zenith results: east-west tunnel

The east-west tunnel has been modelled in Zenith as a ‘stand-alone’ project (i.e. compared to the Base Case instead of with the other NCCCS strategy elements in place). This Appendix summarises the Zenith run results of this scenario, and compares them with the results of modelling the tunnel with the other strategy elements in place.

The two relevant Zenith modelled scenarios are referred to as the ‘incremental’ tunnel (tunnel added to other NCCCS strategy elements) and the ‘stand-alone’ tunnel (tunnel added to the 2021 Base Case, without other NCCCS strategy elements).

Traffic volumes

Table A-1 shows Zenith modelled traffic volumes on selected roads in the inner north with the relevant scenarios. Some key indications are:

- £ Traffic volumes in the ‘stand-alone’ tunnel (max. 98,000 vpd) are slightly less than in the ‘incremental’ tunnel (max 102,000 vpd). This is because the surface road network in the inner north has less capacity in the ‘incremental’ scenario, because of the public transport improvements (including DART on Alexandra Parade) and local area traffic management measures.
- £ The ‘stand-alone’ tunnel attracts significantly less traffic from Alexandra Parade (about 33,000 vpd) than the ‘incremental’ tunnel (about 59,000 vpd). As a result, the ‘stand-alone’ tunnel attracts more traffic from other competing routes further afield (e.g. Brunswick Road traffic relief increases from 10,000 to 15,000 vpd; Victoria Parade traffic relief increases from 6,500 to 7,000vpd).

Network performance indicators

Table A-2 lists the Zenith model summary outputs (network performance indicators) for the relevant scenarios, and compares the two E-W tunnel scenarios.

Economic indicators and appraisal

Table A-3 shows the key economic indicators from Zenith (the outputs used in the economic analysis presented in this report), again comparing the effects of the two tunnel scenarios. Table A-4 gives the results of the economic appraisal of the east-west tunnel as a ‘stand-alone’ project.

Summary observations

The primary reason for the relatively poor economic performance of the E-W tunnel is its high capital cost.

When evaluated against the preceding strategy elements, the tunnel’s traffic relieving effect is more significant than as a stand-alone project, mainly because of the greater capacity constraints in the road network through the public transport improvements (introduced in Scenario A) and local street traffic management measures (introduced in Scenario B). The tunnel attracts more traffic as a result, and relieves surface streets to a greater extent, compared to its performance as a stand-alone project.

Table A-3 – Summary Zenith economic performance indicators

Economic Analysis	Year 2021 StratA (PT imps) Base	Year 2021 StratBC (Local Sts) Base	Year 2021 StratD (CBD Park) Base	Year 2021 StratF (DART LRT) Base	Year 2021 StratG (E-W Tunnel) Base	Year 2021 StratG3 (E-W Tunnel) Base
User Benefits (wrt 2021 Base)						
PT User Benefits (\$ per Day)	\$3,785,233	\$3,787,021	\$3,865,885	\$3,913,960	\$3,911,550	\$4,751
Car VOC Benefits (\$ per Day)	\$74,751	\$49,378	\$61,809	\$60,870	\$80,314	\$12,244
CV VOC Benefits (\$ per Day)	\$42,882	\$22,679	\$28,443	\$27,065	\$43,286	\$3,325
Car Other User Benefits (\$ per Day)	\$713,709	\$555,839	\$173,928	\$159,980	\$299,225	\$92,623
CV Other User Benefits (\$ per Day)	\$150,749	\$87,887	\$3,536	-\$1,965	\$44,672	\$33,827

Differences - Tunnel scenarios	Strategy G wrt Strategy F (effect of E-W Tunnel)	Strategy G3 wrt 2021 Base (stand-alone E-W Tunnel)
	-\$2,409	\$4,751
	\$19,444	\$12,244
	\$16,220	\$3,325
	\$139,244	\$92,623
	\$46,638	\$33,827

Economic Analysis - Indicators	Year 2021 Base	Year 2021 StratA	Year 2021 StratBC	Year 2021 StratD	Year 2021 StratF	Year 2021 StratG	Year 2021 Tunnel
Accidents							
Number of Accidents (Total per Day)	36.7	35.5	35.4	35.2	35.2	35.0	36.5
Accidents Costs (\$ per Day)	\$5,614,026	\$5,438,599	\$5,434,663	\$5,407,108	\$5,405,231	\$5,382,030	\$5,595,690
Emissions							
PT VKTs (kms per Day)							
Tram	88,491	112,515	112,574	112,574	123,354	123,354	88,491
Train	78,449	100,016	100,016	100,016	100,016	100,016	78,449
Bus	266,918	313,961	314,014	314,014	285,855	285,855	266,918
Sub-Total	433,858	526,492	526,605	526,605	509,225	509,225	433,858
Fuel Consumption (Litres per Day)							
Private Vehicle	10,067,480	9,663,833	9,676,033	9,615,998	9,614,436	9,596,204	10,059,314
Commercial Vehicle	2,032,908	2,003,211	2,020,460	2,016,703	2,019,006	2,005,148	2,024,897
Sub-Total	12,100,388	11,667,044	11,696,493	11,632,701	11,633,442	11,601,352	12,084,211
NO _x (tonnes per Day)							
Private Vehicle	107.82	103.50	103.63	102.99	102.97	102.78	107.74
Commercial Vehicle	30.92	30.47	30.73	30.67	30.71	30.50	30.80
Sub-Total	138.74	133.97	134.36	133.66	133.68	133.27	138.53
NMVOc (tonnes per Day)							
Private Vehicle	50.44	48.42	48.48	48.18	48.17	48.08	50.40
Commercial Vehicle	19.17	18.89	19.05	19.02	19.04	18.91	19.09
Sub-Total	69.61	67.31	67.53	67.19	67.21	66.99	69.49
SO ₂ (tonnes per Day)							
Private Vehicle	3.222	3.092	3.096	3.077	3.077	3.071	3.219
Commercial Vehicle	3.436	3.385	3.415	3.408	3.412	3.389	3.422
Sub-Total	6.657	6.478	6.511	6.485	6.489	6.459	6.641
CO ₂ (tonnes per Day)							
Private Vehicle	21,815.9	20,941.2	20,967.7	20,837.6	20,834.2	20,794.7	21,798.2
Commercial Vehicle	4,751.9	4,682.4	4,722.8	4,714.0	4,719.4	4,687.0	4,733.1
Sub-Total	26,567.8	25,623.7	25,690.4	25,551.6	25,553.6	25,481.7	26,531.4
CH ₄ (tonnes per Day)							
Private Vehicle	8.054	7.731	7.741	7.693	7.692	7.677	8.047
Commercial Vehicle	1.037	1.022	1.030	1.029	1.030	1.023	1.033
Sub-Total	9.091	8.753	8.771	8.721	8.721	8.700	9.080
N ₂ O (tonnes per Day)							
Private Vehicle	2.013	1.933	1.935	1.923	1.923	1.919	2.012
Commercial Vehicle	0.183	0.180	0.182	0.182	0.182	0.180	0.182
Sub-Total	2.196	2.113	2.117	2.105	2.105	2.100	2.194
CO (tonnes per Day)							
Private Vehicle	733.62	704.20	705.09	700.72	700.60	699.28	733.02
Commercial Vehicle	183.39	180.71	182.27	181.93	182.13	180.88	182.67
Sub-Total	917.01	884.91	887.36	882.64	882.74	880.16	915.69
Particulate Emissions (tonnes per Day)							
Private Vehicle	4.553	4.410	4.406	4.383	4.380	4.383	4.556
Commercial Vehicle	1.203	1.199	1.201	1.201	1.201	1.200	1.202
Sub-Total	5.756	5.609	5.607	5.584	5.581	5.582	5.758

	-0.2	-0.2
	-\$23,201	-\$18,336
	0	0
	0	0
	0	0
	0	0
	-18,232	-8,166
	-13,858	-8,011
	-32,090	-16,177
	-0.20	-0.09
	-0.21	-0.12
	-0.41	-0.21
	-0.09	-0.04
	-0.13	-0.08
	-0.22	-0.12
	-0.006	-0.003
	-0.023	-0.014
	-0.029	-0.016
	-39.5	-17.7
	-32.4	-18.7
	-71.9	-36.4
	0.00	0.00
	-0.015	-0.007
	-0.007	-0.004
	-0.022	-0.011
	-0.004	-0.002
	-0.001	-0.001
	-0.005	-0.002
	-1.33	-0.60
	-1.25	-0.72
	-2.58	-1.32
	0.002	0.003
	-0.001	-0.001
	0.001	0.002

Source: Veitch Lister Consulting

Table A-4 – Economic Appraisal Results Sheet

ECONOMIC APPRAISAL OF STRATEGY								XGB	(\$'000s at 201 Prices)					NET BENEFIT FLOW
Key Dates	Year	Rate	ECONOMIC COSTS					ECONOMIC BENEFITS						
			Capital Costs	Vehicle Purchase	PT Ops & Maint	Other Road Costs	TOTAL COSTS	PT User Benefits	CV Benefits	Private Car Benefits	Greenhouse + Accidents	PT, Parking, Toll Revenues	TOTAL BENEFITS	
	2002	1.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	2003	0.94	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	2004	0.89	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Eval Start	2005	0.84	\$ 81	\$ -	\$ -	\$ -	\$ 81	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	2006	0.79	\$ 243	\$ -	\$ -	\$ 1	\$ 243	\$ 0	\$ 1	\$ 2	\$ 0	\$ -	\$ 4	\$ 239
	2007	0.75	\$ 243	\$ -	\$ -	\$ 2	\$ 245	\$ 0	\$ 4	\$ 10	\$ 2	\$ -	\$ 16	\$ 229
Open Year	2008	0.70	\$ 162	\$ -	\$ -	\$ 4	\$ 165	\$ 1	\$ 7	\$ 17	\$ 3	\$ -	\$ 28	\$ 137
	2009	0.67	\$ 81	\$ -	\$ -	\$ 5	\$ 85	\$ 1	\$ 9	\$ 23	\$ 5	\$ -	\$ 37	\$ 49
	2010	0.63	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 10	\$ 25	\$ 5	\$ -	\$ 41	\$ 36
	2011	0.59	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 10	\$ 26	\$ 5	\$ -	\$ 42	\$ 37
	2012	0.56	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 10	\$ 26	\$ 5	\$ -	\$ 43	\$ 38
	2013	0.53	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 10	\$ 27	\$ 5	\$ -	\$ 43	\$ 38
	2014	0.50	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 10	\$ 27	\$ 5	\$ -	\$ 44	\$ 39
	2015	0.47	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 10	\$ 27	\$ 5	\$ -	\$ 44	\$ 39
	2016	0.44	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 10	\$ 28	\$ 6	\$ -	\$ 45	\$ 40
	2017	0.42	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 11	\$ 28	\$ 6	\$ -	\$ 46	\$ 41
	2018	0.39	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 11	\$ 28	\$ 6	\$ -	\$ 46	\$ 41
	2019	0.37	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 11	\$ 29	\$ 6	\$ -	\$ 47	\$ 42
	2020	0.35	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 11	\$ 29	\$ 6	\$ -	\$ 47	\$ 42
	2021	0.33	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 11	\$ 29	\$ 6	\$ -	\$ 47	\$ 42
	2022	0.31	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 11	\$ 30	\$ 6	\$ -	\$ 48	\$ 43
	2023	0.29	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 11	\$ 30	\$ 6	\$ -	\$ 49	\$ 44
	2024	0.28	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 12	\$ 30	\$ 6	\$ -	\$ 50	\$ 45
	2025	0.26	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 12	\$ 31	\$ 6	\$ -	\$ 50	\$ 45
	2026	0.25	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 12	\$ 31	\$ 6	\$ -	\$ 50	\$ 45
	2027	0.23	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 12	\$ 31	\$ 6	\$ -	\$ 50	\$ 45
	2028	0.22	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 12	\$ 31	\$ 6	\$ -	\$ 50	\$ 45
	2029	0.21	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 12	\$ 31	\$ 6	\$ -	\$ 50	\$ 45
	2030	0.20	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 12	\$ 31	\$ 6	\$ -	\$ 50	\$ 45
	2031	0.18	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 12	\$ 31	\$ 6	\$ -	\$ 50	\$ 45
	2032	0.17	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 12	\$ 31	\$ 6	\$ -	\$ 50	\$ 45
	2033	0.16	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 12	\$ 31	\$ 6	\$ -	\$ 50	\$ 45
Eval End	2034	0.15	\$ -	\$ -	\$ -	\$ 5	\$ 5	\$ 1	\$ 12	\$ 31	\$ 6	\$ -	\$ 50	\$ 45
	2035	0.15	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	2036	0.14	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	2037	0.13	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	TOTAL		\$ 810	\$ -	\$ -	\$ 136	\$ 945	\$ 38	\$ 296	\$ 779	\$ 157	\$ -	\$ 1,270	\$ 324
	PV		\$ 610	\$ -	\$ -	\$ 50	\$ 660	\$ 13	\$ 105	\$ 277	\$ 56	\$ -	\$ 452	\$ 208
Economic Internal Rate of Return %													2%	
Net Present Value @ 6%													-\$ 208	
Benefit - Cost Ratio													0.7	
Benefit - Capital Ratio														