

# **Department of Infrastructure**

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

March 2003

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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.

Tal	ble 1-1	:	ZENITH	Model	Run	Label	Descri	ptions
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Strategies	Model ID	Elements Included
Improved Public Transport	Α	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**

#### **Capital Costs** 2.1

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	Α	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		I	
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								I	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	Α	B/C	D	F	F1	F2	G	G1	G2
A1 – Upgraded Signalling**	A1	\$ 28.75	1	1	11	11	1	1	1	11	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				i			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

		Discounted							
Strategy	Description		Costs		Benefits	NPV	EIRR	BCR	Incr BCR
Α	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

		Disco					
Strategy	Description	Costs	Benefits	NPV	EIRR	BCR	Incr BCR
Α	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	3 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 eastwest 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-1 – Modelled traffic volumes on key roads in the inner north

· Iap	ie A-1	<ul><li>Mode</li></ul>			c volu			ke								
Road	From	To	2001 Calibra AM pk	ited model Daily	AM pk	2021 Base Daily	case Diff from	n 2001	2021 : AM pk	Strategy G - Daily	E-W tunne Diff fron		2021 Stra AM pk	tegy G - E-W Daily	tunnel wrt Ba	se Case 2001
			All veh	All veh	All veh	All veh	All v	/eh	All veh	All veh	All v	eh	All veh	All veh	All v	eh
Abbotsford St	Arden St	Haines St	Total 3,240	Total 8,710	Total 6,370	Total 17,350	AM pk 97%	Daily 99%	Total 270	Total 630	AM pk -92%	Daily -93%	Total 4,720	Total 11,750	AM pk 46%	Daily 35%
Abbotsford St Abbotsford St	Haines St Victoria St	Flemington Rd Arden St	2,260 2,560	5,340 6,760	3,090 4,260	7,890 10,970	37% 66%	48% 62%	320 0	480 10	-86% -100%	-91% -100%	2,900 3,850	6,620 8,760	28% 50%	24% 30%
Alexandra Pde	Brunswick St	Nicholson St	36,920	91,010	41,970	101,160	14%	11%	27,070	54,640	-27%	-40%	38,890	81,480	5%	-10%
Alexandra Pde Alexandra Pde	Gold St Smith St	Smith St Brunswick St	28,640 26,270	70,320 64,940	34,150 31,530	83,660 77,100	19% 20%	19% 19%	11,640 9,590	24,460 25,170	-59% -63%	-65% -61%	22,280 18,560	50,770 47,120	-22% -29%	-28% -27%
Arden St	Citylink	Macaulay Rd	5,700	14,860	8,750	21,890	54%	47%	740	1,600	-87%	-89%	8,120	20,310	42%	37%
Arden St Arden St	Curzon St Macaulay Rd	Courtney St Curzon St	4,550 6,870	11,540 16,720	7,750 9,040	19,490 23,500	70% 32%	69% 41%	450 200	1,010 480	-90% -97%	-91% -97%	8,200 7,970	19,250 19,410	80% 16%	67% 16%
Boundary Rd Brunswick Rd	Macaulay Rd CityLink	Racecourse Rd Grantham St	5,000 10,280	12,030 25,330	6,810 12,810	15,480 32,110	36% 25%	29% 27%	5,490 9,680	14,220 23,610	10% -6%	18% -7%	4,810 12,070	14,050 28,660	-4% 17%	179 139
Brunswick Rd	Grantham St	Sydney Rd	8,650	20,850	10,460	25,110	21%	20%	10,600	25,540	23%	22%	9,130	21,470	6%	3%
Brunswick Rd Brunswick Rd	Lygon St Sydney Rd	Nicholson St Lygon St	9,910 10,770	23,970 27,020	12,330 12,260	31,070 31,060	24% 14%	30% 15%	7,290 9,220	19,170 22,680	-26% -14%	-20% -16%	8,020 9,720	20,850 24,400	-19% -10%	-13% -10%
Brunswick St	Alexandra Pde	St Georges Rd	5,600	12,440	7,600	18,210	36%	46%	7,170	14,610	28%	17%	7,750	17,310	38%	39%
Brunswick St Brunswick St	Gertrude St Johnston St	Moor St Alexandra Pde	4,890 6,930	13,030 16,260	6,150 8,830	16,130 20,050	26% 27%	24% 23%	7,390 9,300	18,080 21,850	51% 34%	39% 34%	5,720 8,390	15,120 19,910	17% 21%	16% 22%
Brunswick St	Moor St	Johnston St	4,920	13,450	6,000	16,280	22%	21%	7,000	17,660	42%	31%	5,730	15,720	16%	17%
Brunswick St Cemetery Rd E	Victoria Pde Lygon St	Gertrude St Swanston St	5,680 15,830	15,200 40,950	6,610 18,240	18,160 46,500	16% 15%	19% 14%	8,060 7,910	20,340 21,480	42% -50%	34% -48%	6,610 9,600	17,640 27,370	16% -39%	16% -33%
Cemetery Rd W Citylink	Swanston St Brunswick Rd	Royal Pde Dynon St	12,640 0	31,000 39,500	13,990	33,860 52,780	11%	9% 34%	8,860 0	20,970 50,040	-30% 0%	-32% 27%	8,580 0	20,300 54,630	-32% 0%	-35% 38%
Citylink	Dynon St	Brunswick Rd	0	35,140	0	47,570	0%	35%	0	43,190	0%	23%	0	47,130	0%	34%
Curzon St Dryburgh St	Victoria St Victoria St	Haines St Arden St	6,050 8,330	15,940 20,300	8,610 9,480	21,500 23,580	42% 14%	35% 16%	9,470 10,100	21,320 22,920	57% 21%	34% 13%	9,290 8,820	21,920 20,530	54% 6%	38%
Eastern Fwy	Gold St	Yarra Bend	52,060	68,650	63,390	81,470	22%	19%	62,800	78,700	21%	15%	68,630	88,050	32%	28%
Eastern Fwy Elgin St	Yarra Bend Swanston St	Gold St Nicholson St	10,100	67,040 25,700	11,920	80,130 30,840	0% 18%	20% 20%	6,380	80,040 15,650	-37%	19% -39%	6,170	87,820 17,900	0% -39%	31% -30%
Elizabeth St Elizabeth St	Flemington Rd Grattan St	Victoria St Flemington Rd	16,210 13,970	39,080 33,870	16,810 14,260	40,970 36,070	4% 2%	5% 6%	17,290 19,670	41,800 47,550	7% 41%	7% 40%	16,610 13,910	40,720 35,890	2% 0%	4% 6%
Elliott Ave	Flemington Rd	Macarthur Rd	12,600	31,200	14,570	35,710	16%	14%	2,570	4,690	-80%	-85%	4,140	6,600	-67%	-79%
Errol St Flemington Rd	Arden St Abbotsford St	Victoria St Elliott Ave	1,210 23,000	2,870 55,230	3,020 25,380	8,340 61,640	150% 10%	191% 12%	50 21,270	130 53,540	-96% -8%	-95% -3%	2,890 22,980	7,150 56,380	139% 0%	1499 29
Flemington Rd	Elizabeth St	Grattan St	16,960	40,520	18,460	44,730	9%	10%	19,740	48,610	16%	20%	17,050	42,330	1%	4%
Flemington Rd Flemington Rd	Gatehouse St Grattan St	Abbotsford St Gatehouse St	21,390 18,940	52,260 45,410	22,470 20,080	55,230 48,800	5% 6%	6% 7%	23,930 18,700	55,410 45,620	12% -1%	6% 0%	21,550 18,320	51,610 44,820	1% -3%	-1% -1%
Gatehouse St Gatehouse St	Bayles St Bayles St	Flemington Rd Royal Pde	5,020 5,160	12,420 12,420	6,000 6,030	14,730 14,730	20% 17%	19% 19%	10 10	40 40	-100% -100%	-100% -100%	4,220 4,220	9,970 9,970	-16% -18%	-20% -20%
Gatehouse St	Royal Pde	College Cr	5,700	12,210	6,610	13,180	16%	8%	5,490	8,290	-4%	-32%	5,580	8,260	-2%	-32%
Gertrude St Gertrude St	Brunswick St Nicholson St	Smith St Brunswick St	990 930	2,920 2,380	2,380 3,130	7,360 8,070	140% 237%	152% 239%	1,270 470	3,270 740	28% -49%	12% -69%	1,260 2,060	3,290 4,210	27% 122%	139 779
Grattan St	Elizabeth St	Flemington Rd	6,960	17,810	9,290	23,700	33%	33%	90	300	-99%	-98%	9,250	21,770	33%	22%
Grattan St Grattan St	Rathdowne St Swanston St	Swanston St Royal Pde	4,910 7,700	12,910 19,370	7,520 10,870	20,240 26,560	53% 41%	57% 37%	50 230	190 340	-99% -97%	-99% -98%	5,980 7,740	15,840 18,900	22% 1%	23%
Harker St High St	Haines St Queens Pde	Flemington Rd Westgarth St	7,570 13,480	18,810 31,680	8,820 15,860	20,710 37,090	17% 18%	10% 17%	7,690 14,120	20,700 33,570	2% 5%	10% 6%	7,340 16,450	18,470 38,360	-3% 22%	-2% 21%
Hoddle St	Johnston St	Langridge St	35,490	85,250	38,500	93,580	8%	10%	39,860	93,480	12%	10%	36,990	89,200	4%	5%
Hoddle St Hoddle St	Langridge St Queens Pde	Victoria St Alexandra Pde	32,660 19,810	81,290 48,820	37,590 23,710	88,950 57,630	15% 20%	9% 18%	38,190 19,860	93,540 48,460	17% 0%	15% -1%	33,850 21,660	84,200 54,470	4% 9%	4% 12%
Holden St	Nicholson St	St Georges Rd	5,010	13,180	6,460	16,970	29%	29%	7,440	17,920	49%	36%	4,850	13,150	-3%	0%
Johnston St Johnston St	Brunswick St Hoddle St	Smith St Masons Lane	7,670 9,750	21,330 22,370	9,560 10,840	26,230 25,410	25% 11%	23% 14%	6,840 11,010	17,540 24,070	-11% 13%	-18% 8%	7,010 10,590	19,900 25,220	-9% 9%	- <b>7</b> %
Johnston St	Nicholson St	Brunswick St	8,590	23,980	9,990	28,010	16%	17%	7,510	20,430	-13%	-15%	7,930	22,110	-8%	-8%
Johnston St Johnston St	Smith St Wellington St	Wellington St Hoddle St	7,840 6,770	21,840 20,920	8,770 7,880	25,050 24,670	12% 16%	15% 18%	6,260 7,050	16,420 19,240	-20% 4%	-25% -8%	6,670 6,590	20,510 22,290	-15% -3%	-6% <b>7</b> %
Lygon St Lygon St	Elgin St Elgin St	Grattan St Princes St	7,130 10,190	16,080 24,300	9,590 12,700	22,130 30,250	35% 25%	38% 24%	7,960 9,360	18,620 22,440	12% -8%	16% -8%	9,340 11,300	21,270 26,330	31% 11%	32% 8%
Lygon St	Grattan St	Queensberry St	4,480	12,200	5,320	15,210	19%	25%	8,000	19,260	79%	58%	6,060	15,130	35%	24%
Lygon St Lygon St	Princes St Queensberry St	Brunswick Rd Victoria St	11,480 9,410	30,170 21,490	13,040 10,610	35,180 25,040	14% 13%	17% 17%	14,280 10,800	35,120 25,710	24% 15%	16% 20%	13,410 10,750	35,050 25,670	17% 14%	16% 19%
Macarthur Rd	Elliot Ave	Royal Pde	12,140	29,470	14,040	34,000	16%	15%	440	2,260	-96%	-92%	680	5,010	-94%	-83%
Macaulay Rd Macaulay Rd	Boundary Rd Haines St	City Link Arden St	8,020 11,790	18,790 26,870	10,050 13,230	23,230 30,830	25% 12%	24% 15%	6,880 10,390	15,690 22,950	-14% -12%	-16% -15%	9,900 12,370	23,220 27,250	23% 5%	24% 19
Macaulay Rd Nicholson St	Haines St Alexandra Pde	Boundary Rd Johnston St	13,040 13,930	30,480 32,870	16,040 17,140	37,910 38,620	23% 23%	24% 17%	12,840 15,620	28,210 37,640	-2% 12%	-7% 15%	15,340 15,500	33,100 36,770	18% 11%	9% 12%
Nicholson St	Alexandra Pde	Newry St	12,510	31,560	14,790	36,020	18%	14%	13,230	33,670	6%	7%	13,420	34,350	7%	9%
Nicholson St Nicholson St	Johnston St Newry St	Victoria St Brunswick Rd	12,190 11,730	30,950 30,050	14,250 14,480	35,260 35,780	17% 23%	14% 19%	14,180 12,730	34,160 32,480	16% 9%	10% 8%	14,350 13,110	35,980 33,180	18% 12%	16% 10%
Peel St	Flemington Rd	Victoria St	12,380	30,620	13,810	33,860	12%	11%	15,390	37,870	24%	24%	14,470	34,600	17%	13%
Princes St Princes St	Nicholson St Rathdowne St	Rathdowne St Lygon St	26,640 18,940	64,780 45,860	27,870 21,880	63,720 51,200	5% 16%	-2% 12%	13,940 11,190	36,120 28,630	-48% -41%	-44% -38%	19,040 16,490	47,840 40,490	-29% -13%	-26% -12%
Queens Pde Queens Pde	Alexandra Pde Heidelberg Rd	Heidelberg Rd High St	15,990 13,180	43,660 33,450	19,850 15,630	52,180 39,410	24% 19%	20% 18%	16,240 14,370	41,980 35,500	2% 9%	-4% 6%	19,090 15,810	52,080 40,590	19% 20%	19%
Queensberry St	Lygon St	Rathdowne St	4,320	11,180	5,460	13,330	26%	19%	20	70		-99%	2,940	7,760	-32%	-31%
Queensberry St Queensberry St	Lygon St Swanston St	Swanston St Peel St	4,800 5,830	12,020 13,570	7,920 9,740	19,720 23,300	65% 67%	64% 72%	140 10	260 30	-97% -100%	-98% -100%	5,720 7,840	13,920 17,830	19% 34%	16% 31%
Racecourse Rd	Flemington Rd	Stubbs St	12,650	29,210	16,960	41,170	34%	41%	17,990	44,660	42%	53%	17,290	43,440	37%	49%
Rathdowne St Rathdowne St	Princes St Princes St	Newry St Victoria St	5,230 14,480	13,710 33,990	6,800 13,540	18,630 32,310	30% -6%	36% -5%	5,130 15,210	12,070 35,370	-2% 5%	-12% 4%	6,450 14,800	17,110 34,670	23% 2%	25% 2%
Royal Pde Royal Pde	Gatehouse St Gatehouse St	Brunswick Rd Grattan St	17,120 14,540	39,560 34,800	19,440 17,320	44,500 40,710	14% 19%	12% 17%	18,220 18,780	43,000 44,080	6% 29%	9% 27%	19,230 17,790	44,180 42,240	12% 22%	12% 21%
Smith St	Alexandra Pde	Queens Pde	1,710	6,280	3,200	10,840	87%	73%	970	4,010	-43%	-36%	2,750	8,900	61%	42%
Smith St Smith St	Johnston St Keele St	Keele St Alexandra Pde	5,050 6,950	15,570 15,370	7,000 8,880	20,640 20,150	39% 28%	33% 31%	1,310 1,430	3,030 3,450	-74% -79%	-81% -78%	6,970 7,850	19,140 19,160	38% 13%	23% 25%
Smith St	Victoria Pde	Johnston St	5,640	12,340	8,020	17,310	42%	40%	840	2,280	-85%	-82%	6,390	14,400	13%	17%
St Georges Rd Swanston St	Brunswick St Cemetery Rd W	Holden St Elgin St	5,850 4,220	17,580 12,780	7,030 5,240	20,570 14,550	20% 24%	17% 14%	3,710 7,730	13,440 19,570	-37% 83%	-24% 53%	6,270 7,730	19,240 21,660	7% 83%	9% 69%
Swanston St Swanston St	Grattan St	Elgin St	5,790	15,300	7,250	18,910	25%	24% 29%	6,460	16,080	12% 37%	5% 41%	7,740	19,900	34%	30% 27%
Victoria Pde	Victoria St Brunswick St	Grattan St Nicholson St	5,740 20,940	13,310 52,300	7,630 24,620	17,130 62,030	33% 18%	19%	7,870 21,430	18,800 51,080	2%	-2%	7,250 21,480	16,910 55,010	26% 3%	5%
Victoria Pde Victoria Pde	Hoddle St Rokeby St	Rokeby St Cambridge St	22,200 21,860	54,860 53,600	25,580 25,050	62,060 60,510	15% 15%	13% 13%	21,670 21,340	54,260 52,750	-2% -2%	-1% -2%	21,760 21,440	55,440 54,010	-2% -2%	19 19
Victoria St	Chetwynd St	Elizabeth St	9,430	23,510	10,150	26,340	8%	12%	10,150	25,600	8%	9%	8,920	23,580	-5%	0%
Victoria St Victoria St	Curzon St Elizabeth St	Dryburgh St Rathdowne St	8,300 20,670	18,840 50,800	9,520 22,820	23,450 55,750	15% 10%	24% 10%	10,960 21,660	25,150 52,070	32% 5%	33% 2%	10,030 22,190	22,500 54,000	21% 7%	19% 6%
Victoria St	Hawke St	Chetwynd St	8,750	20,790	10,540	26,710	20%	28%	9,770	23,780	12%	14%	10,330	24,930	18%	20%
Victoria St Victoria St	Hoddle St Nicholson St	Lithgow St Rathdowne St	7,600 19,780	19,350 48,560	8,950 23,970	23,790 60,090	18% 21%	23% 24%	9,790 20,030	24,710 45,630	29% 1%	28% -6%	8,370 22,020	22,060 54,130	10% 11%	149 119
Wellington St Wellington St	Johnston St Victoria Pde	Alexandra Pde Johnston St	7,220 5,540	18,630 16,480	8,420 6,910	20,640 19,340	17% 25%	11% 17%	430 130	970 410	-94% -98%	-95% -98%	8,090 6,310	20,190 18,380	12% 14%	89 129
Wreckyn St	Courtney St	Flemington Rd	5,180	13,200	8,060	20,550	25% 56%	56%	1,140	3,000	-78%	-77%	8,520	20,260	64%	53%
E-W Tunnel E-W Tunnel	Eastern Fwy Nicholson St	Nicholson St Eastern Fwy	0	0	0	0			39,360 0	47,070 47,660			36,300 0	43,770 44,350	0% 0%	0%
E-W Tunnel	Nicholson St	Royal Pde	0	0	0	0			42,760	51,330			41,090	49,830	0%	0%
E-W Tunnel E-W Tunnel	Royal Pde Royal Pde	Nicholson St Flemington Rd	0	0	0	0			33,980	50,600 41,290			32,730	48,530 40,200	0% 0%	09
E-W Tunnel CBD Tunnel	Flemington Rd	Royal Pde Albert St	0	0	0	0			0 0	39,590			0	37,870	0%	09
CBD Tunnel	Eastern Fwy Albert St	Eastern Fwy	0	0	0	0			0	0			0	0	0% 0%	09

Source: Summarised from Veitch Lister Consulting model outputs

Table A-2 – Summary Zenith network performance indicators

				Zenith Mode	l Run Result	s			Differences - T	unnel scenarios
Network Performance	Year 2001	Year 2021	Year 2021	Year 2021	Year 2021	Year 2021	Year 2021	Year 2021	Strategy G	Strategy G3
Indicators	Road Network	Base	Strategy A (PT imps)	Strategy B (A + Local	Strategy D (B + City	Strategy F (D + DART	Strategy G (F + E-W	Strategy G3 (Base + E-W	wrt Strategy F (effect of	wrt 2021 Base (stand-alone
	Calibrated		(F1 mips)	Streets)	Parking)	LRT)	Tunnel)	Tunnel)	E-W Tunnel)	E-W Tunnel)
Public Transport										
Public Transport System Patronage (per day)										
M> Tram	248,621	318,351	648,551	655,971	676,262	708,845	705,983	315,984	-2,862	-2,367
Yarra Tram	183,034	265,983	546,622	549,503	572,674	562,824	562,250	265,550	-574	-433
M> Train	215,042	333,499	419,815	424,239	434,345	435,387	434,908	332,404	-479	-1,095
Connex Metro Bus	165,813 325,029	236,680 371,536	270,095 466,821	275,443 472,192	280,550 478,098	278,255 460,211	275,730 460,019	234,524 370,924	-2,525 -192	-2,156 -612
Other (includes some V/Line services)	6,872	13,123	14,162	14,312	14,287	14,344	14,266	13,137	-78	14
Total	1,144,411	1,539,172	2,366,066	2,391,660	2,456,216	2,459,866	2,453,156	1,552,523	-6,710	13,351
Passenger Kilometres (per day)	1									
M> Tram	866,349	1,066,953	1,846,637	1,864,505	1,914,638	2,385,137	2,362,176	1,054,313	-22,961	-12,641
Yarra Tram M> Train	680,152 3,309,759	992,450 5,299,029	1,867,038 6,230,764	1,864,645 6,303,892	1,931,454 6,440,343	1,893,133 6,454,871	1,890,438 6,440,458	993,918 5,276,465	-2,695 -14,413	1,468 -22,564
Connex	2,190,061	3,299,029	3,427,242	3,502,829	3,572,501	3,576,282	3,534,889	3,071,141	-41,392	-29,495
Metro Bus	2,146,138	2,411,725	2,961,363	2,996,866	3,057,503	2,712,910	2,715,355	2,406,681	2,446	-5,044
Other (includes some V/Line services)	200,053	394,867	417,072	422,108	421,670	424,007	421,413	395,073	-2,594	206
Total	9,392,512	13,265,660	16,750,115	16,954,844	17,338,109	17,446,340	17,364,730	13,197,589	-81,609	-68,070
Passenger Hours (per day)										
' M> Tram ' Yarra Tram	51,253 40,190	66,433 58,720	103,234 98,846	104,774 100,476	107,206 103,961	116,865 101,742	116,123 101,191	65,836 58,526	-742 -550	-598 -194
Yarra 17am 'M>Train	79,503	126,446	148,462	150,257	153,587	153,959	153,606	125,926	-352	-194 -520
Connex	52,603	75,417	82,131	84,020	85,667	85,732	84,709	74,667	-1,024	-750
' Metro Bus	76,289	87,761	99,121	100,361	101,962	94,201	94,167	87,444	-34	-317
Other (includes some V/Line services)	3,832	7,589	8,113	8,207	8,197	8,241	8,193	7,592	-48	3
Total	303,669	422,366	539,907	548,095	560,579	560,739	557,989	419,990	-2,750	-2,376
No. of Passenger Interchanges (per day)	359,901	510,245	1,009,659	1,024,181	1,055,138	1,051,175	1,047,293	527,096	-3,882	16,851
No. of Passenger Trips (per day)	784,510	1,028,927	1,356,407	1,367,479	1,404,078	1,408,691	1,405,863	1,025,427	-2,828	-3,500
Revenue (per day)										
M> Tram	\$162,910	\$206,711	\$394,219	\$397,686	\$410,604	\$447,034	\$445,988	\$205,471	-\$1,046	-\$1,240
Yarra Tram	\$133,278	\$193,849	\$381,210	\$383,379	\$398,028	\$393,536	\$393,014	\$161,626	-\$522	-\$32,223
' M> Train ' Connex	\$343,528 \$258,992	\$513,441 \$355,711	\$478,905 \$324,094	\$482,744 \$329,676	\$493,844 \$335,382	\$493,844 \$333,752	\$493,315 \$330,884	\$512,425 \$352,977	-\$529 -\$2,868	-\$1,016 -\$2,734
Metro Bus	\$154,196	\$169,932	\$201,682	\$203,258	\$206,340	\$190,329	\$190,187	\$169,789	-\$142	-\$143
Other (includes some V/Line services)	\$11,850	\$23,165	\$23,280	\$23,619	\$23,593	\$23,631	\$23,544	\$23,234	-\$87	\$69
Total	\$1,064,754	\$1,462,809	\$1,803,390	\$1,820,363	\$1,867,791	\$1,882,126	\$1,876,933	\$1,425,521	-\$5,193	-\$37,288
Private/Commercial Vehicles										
Person Trips (per day)										
Private Vehicle **	9,325,357	11,745,137	11,499,980	11,486,030	11,426,408	11,421,690	11,424,042	11,749,748	2,352	4,611
Commercial Vehicle **	425,542	549,778	549,778	549,778	549,778	549,778	549,778	549,778	0	0
Vehicle Trips (per day)										
Private Vehicle **	6,704,419	8,570,670	8,377,864	8,366,569	8,319,795	8,316,031	8,318,651	8,574,411	2,620	3,741
Commercial Vehicle **	425,542	549,778	549,778	549,778	549,778	549,778	549,778	549,778	0	0
Person Kilometres (000's per day)										
Private Vehicle ^	93,029.2	124,662.9	120,942.6	120,877.5	120,307.0	120,235.8	120,292.1	124,720.8	56.3	57.9
Commercial Vehicle	5,585.9	7,515.8	7,493.7	7,508.5	7,505.8	7,505.7	7,498.7	7,512.5	-7.0	-3.3
Vehicle Kilometres (000's per day)										
Private Vehicle	66,932.9	91,063.5	88,198.9	88,110.1	87,661.1	87,609.1	87,650.2	91,118.6	41.1	55.1
· Commercial Vehicle ^	5,585.9	7,515.8	7,493.7	7,508.5	7,505.8	7,505.7	7,498.7	7,512.5	-7.0	-3.3
Person Hours (per day)										
Private Vehicle	1,901,159	2,820,443	2,621,192	2,636,489	2,609,131	2,609,287	2,591,859	2,808,412	-17,428	-12,031
· Commercial Vehicle ^	116,104	173,516	166,816	169,490	168,669	168,923	166,772	172,139	-2,151	-1,377
Vehicle Hours (per day)	1 200 017	2.062.744	1.012.157	1 022 200	1 002 461	1.002.550	1 880 004	2.054.205	12.655	0.420
Private Vehicle Commercial Vehicle	1,369,017 116,104	2,062,744 173,516	1,913,157 166,816	1,923,390 169,490	1,902,461 168,669	1,902,559 168,923	1,889,904 166,772	2,054,305 172,139	-12,655 -2,151	-8,439 -1,377
	110,101	175,510	100,010	10,,,,,	100,007	100,723	100,772	1,2,13,	2,131	1,577
Operating Costs (\$000's per day) Private Vehicle		\$22,659.7	\$21,876.7	\$21,868.2	\$21,747.0	\$21,736.7	\$21,715.3	\$22,648.1	-\$21.4	-\$11.6
Commercial Vehicle ^		\$5,462.7	\$5,415.5	\$5,440.1	\$5,433.9	\$5,436.6	\$5,405.9	\$5,443.2	-\$30.7	-\$19.5
	1							<del>                                     </del>		
Person Trip Statistics										
PT Passenger Trips (per day)										
AM Peak **	197,461	262,762	324,026	326,948	343,739	344,456	344,500	261,566	44	-1,196
Off-Peak ** PM Peak **	434,206 152,843	553,325 212,840	750,893 281,488	755,860 284,671	755,860 304,479	758,926 305,309	755,312 306,051	551,966 211,895	-3,614 742	-1,359 -945
Total Vehicle Trips (per day) **	7,129,961	9,120,448	8,927,642	8,916,347	8,869,573	8,865,809	8,868,429	9,124,189	2,620	3,741
Passenger Trips Categorised (per day)	0.225.255	11.745.05	11 400 000	11 40 5 00 5	11.405.405	11.401.505	11.404.045	11.740.710	2.252	4.611
Total Persons in Cars  Total Persons in Comm. Vehicles	9,325,357 425,542	11,745,137	11,499,980	11,486,030	11,426,408 549,778	11,421,690	11,424,042	11,749,748 549,778	2,352 0	4,611 0
Total Persons in Comm. Vehicles  Total Persons on PT	425,542 784,510	549,778 1,028,927	549,778 1,356,407	549,778 1,367,479	1,404,078	549,778 1,408,691	549,778 1,405,863	1,025,427	-2,828	-3,500
Total Persons on PT  Total Persons Walking/Cycling **	1,918,956	2,332,541	2,250,218	2,253,096	2,276,119	2,276,224	2,276,700	2,331,430	-2,828 476	-3,500 -1,111
Total	12,454,365	15,656,383	15,656,383	15,656,383	15,656,383	15,656,383	15,656,383	15,656,383	0	0
Mode Splits (per day)	,,	.,,	.,,	.,,	. ,	.,,	.,,	.,	<u> </u>	
Total Persons in Cars	77.5%	77.7%	76.1%	76.0%	75.6%	75.6%	75.6%	77.8%		
Total Persons in Comm. Vehicles **	-	-	-	-	-	-	-	-		
Total Persons on PT **	6.5%	6.8%	9.0%	9.1%	9.3%	9.3%	9.3%	6.8%		
Total reisons on r 1					15.10/	15.10/	15.10	15.404		1
Total Persons Walking/Cycling **  Total	16.0% 100.0%	15.4% 100.0%	14.9% 100.0%	14.9% 100.0%	15.1% 100.0%	15.1% 100.0%	15.1% 100.0%	15.4% 100.0%		

Source: Veitch Lister Consulting

Table A-3 – Summary Zenith economic performance indicators

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

Differences - T	unnel scenarios
Strategy G	Strategy G3
wrt Strategy F	wrt 2021 Base
(effect of	(stand-alone
E-W Tunnel)	E-W Tunnel)
£2.400	Φ4.751
-\$2,409	\$4,751
\$19,444	\$12,244
\$16,220 \$139,244	\$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) Accidents Costs (\$ per Day)	36.7 \$5,614,026	35.5 \$5,438,599	35.4 \$5,434,663	35.2 \$5,407,108	35.2 \$5,405,231	35.0 \$5,382,030	36.5 \$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 Sub-Total	266,918 433,858	313,961 526,492	314,014 526,605	314,014 526,605	285,855 509,225	285,855 509,225	266,918 433,858
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 <sub>x</sub> (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 Commercial Vehicle	50.44 19.17	48.42 18.89	48.48 19.05	48.18 19.02	48.17 19.04	48.08	50.40 19.09
Sub-Total	69.61	67.31	67.53	67.19	67.21	18.91 66.99	69.49
50 (t) P )							
SO <sub>x</sub> (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 <sub>2</sub> (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 <sub>4</sub> (tonnes per Day)							
Private Vehicle	8.054 1.037	7.731 1.022	7.741 1.030	7.693 1.029	7.692 1.030	7.677 1.023	8.047 1.033
Commercial Vehicle Sub-Total	9.091	8.753	8.771	8.721	8.721	8.700	9.080
N <sub>2</sub> 0 (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
,	7.0,000
0	0
0	0
0	0
0	0
0	0
-18,232	-8,166
-13,858	-8,011
-32,090	-16,177
0.20	0.00
-0.20	-0.09
-0.21	-0.12
-0.41	-0.21
0.00	0.04
-0.09	-0.04
-0.13	-0.08
-0.22	-0.12
-0.006	-0.003
-0.023	-0.014
-0.029	-0.016
20.5	
-39.5	-17.7
-32.4	-18.7
-71.9	-36.4
0.00	0.00
0.00	0.00
-0.015	-0.007
-0.007	-0.004
-0.022	-0.011
0.004	0.002
-0.004	-0.002
-0.001	-0.001
-0.005	-0.002
1 22	0.60
-1.33	-0.60
-1.25 -2.58	-0.72 -1.32
-2.58	-1.52
0.002	0.002
0.002	0.003
-0.001 0.001	-0.001 0.002
0.001	0.002

Source: Veitch Lister Consulting

Table A-4 – Economic Appraisal Results Sheet

							EG				XGB (\$'000s at 2001 Prices)											
Kay Datas	Voor	Boto	ECONOMIC COSTS  Capital Costs   Vehicle   PT Ops & Other Road   TOTAL									ECONOMIC BENEFITS  PT User   CV Benefits   Private Car   Greenhouse + PT, Parking, TOTAL BENEFITS								TOTAL DENEELTS		
Key Dates	Year	Rate	Capital Cost		urchase	Mai		Costs		COSTS		Benefits	ľ	ov Benefits	Benefits		Accidents	Toll Revenu		TOTAL BENEFITS		FLOW
	2002	1.00	\$ -	\$	_	\$	-	\$ -	-	s -	_	\$ -	\$	-	\$ -	\$	_	\$	_	\$ -	\$	
	2003	0.94	\$ -	\$		\$		\$ -				\$ -	\$		\$ -	\$		\$		\$ -	\$	
	2004	0.89	\$ -	\$		\$		\$ -	- 1-5			\$ -	\$		\$ -	\$		\$		\$ -	\$	
Eval Start	2005	0.84	\$ 81	\$		\$	-	\$ -	- 5	\$	81	\$ -	\$	-	\$ -	\$		\$	-	\$ -	-\$	
	2006	0.79	\$ 243			\$		\$ 1			43	\$ 0	\$	1	\$ 2	\$	0	\$		\$ 4	-\$	2
	2007	0.75	\$ 243			\$			2 3		45	\$ 0	\$		\$ 10		2	\$	-	\$ 16		2:
Open Year	2008	0.70	\$ 162	\$		\$	-	\$ 4	1 5		65	\$ 1					3	\$		\$ 28		1:
	2009	0.67	\$ 81	\$	-	\$		\$ 5	5 5 5		85	\$ 1			\$ 23		5	\$		\$ 37		
	2010	0.63	\$ -	\$		\$		\$ 5	5 5		5	\$ 1	+-	+			5	\$		\$ 41		
	2011	0.59	\$ -	\$		\$		\$ 5	5 5		5	\$ 1	\$		\$ 26		5	\$		\$ 42		
	2012	0.56	\$ -	\$		\$					5	\$ 1	+-		\$ 26		5	\$		\$ 43		
	2013	0.53	\$ -	\$		\$		\$ 5	5 5			\$ 1	\$				5	\$		\$ 43		
	2014	0.50	\$ -	\$		\$ \$		\$ 5	5 5			\$ 1			\$ 27		5	\$		\$ 44		
	2015	0.47	\$ -	\$					5 5		5	\$ 1	\$				5	\$		\$ 44		
	2016	0.44	\$ -	\$		\$		\$ 5	5 5		5	\$ 1	\$				6	\$		\$ 45		
	2017 2018	0.42 0.39	<u>\$</u> -	\$		\$		\$ 5	5 5		5	<u>\$ 1</u>	\$				6	\$		\$ 46 \$ 46		
		0.39	\$ -	\$							5	\$ 1 \$ 1	9				6	\$		<del></del>		
	2019 2020	0.37	<u>\$</u>	\$		\$		\$ 5	5 5		5	\$ 1 \$ 1	99				6	3		\$ 47 \$ 47		
	2020	0.33	ф -	\$		\$			5 5		5	φ I	9		\$ 29	- P	6	<del>o</del>		\$ 48		
	2021	0.33	φ -	\$		\$					5	\$ 1			\$ 30	\$	6	<u>\$</u>		\$ 48		
	2022	0.29	ф -	\$		\$			5 5		5	\$ 1	9		\$ 30		6	<u>~</u>		\$ 49		
	2024	0.28	\$ -	\$	<del>:</del>	\$			5 5			\$ 1					6	\$		\$ 50		
	2025	0.26	\$ -	\$		\$			5			\$ 1					6	\$		\$ 50		
	2026	0.25	\$ -	\$		\$			5			\$ 1	-				6	\$		\$ 50		
	2027	0.23	\$ -	\$		\$			5 5			\$ 1	+-				6	\$		\$ 50		
	2028	0.22	\$ -	\$		\$		\$ 5	5			\$ 1	-				6	Š		\$ 50		
	2029	0.21	\$ -	\$	-	\$		\$ 5	5 5			\$ 1		12	\$ 31		6	Š	-	\$ 50		
	2030	0.20	\$ -	\$		\$			5 5	\$	5	\$ 1	9	12	\$ 31		6	\$		\$ 50		
	2031	0.18	\$ -	\$		\$		\$ 5	5 \$	5	5	\$ 1	\$		\$ 31		6	\$		\$ 50	\$	
	2032	0.17	\$ -	\$	-	\$	-	\$ 5	5 5	5	5	\$ 1	\$	12	\$ 31	\$	6	\$	-	\$ 50	\$	
	2033	0.16	\$ -	\$	-	\$		\$ 5		\$	5	\$ 1	\$		\$ 31	\$	6	\$	-	\$ 50	\$	
Eval End	2034	0.15	\$ -	\$		\$		\$ 5		\$	5	\$ 1	\$		\$ 31	\$	6	\$		\$ 50	\$	
	2035	0.15	\$ -	\$		\$	-	\$ -	3	\$ -		\$ -	\$		\$ -	\$		\$	-	\$ -	\$	
	2036	0.14	\$ -	\$		\$	-	\$ - \$ -		\$ -		\$ -	\$	-	\$ -	\$		\$	-	\$ -	\$	
	2037	0.13	\$ -	\$		\$		\$ -		-	==F	\$ -	93		\$ -	\$		\$		\$ -	\$	
	TOTAL			\$	-	\$	-	\$ 136				\$ 38			\$ 779			\$		\$ 1,270		3
	PV		\$ 610	\$	-	\$	-	\$ 50	) \$	5 6		\$ 13			\$ 277	\$		\$	-	\$ 452	-\$	2
											Economic Internal Rate of Return % Net Present Value @ 6%											
												–			O						-\$	20

Benefit - Cost Ratio Benefit - Capital Ratio 0.7