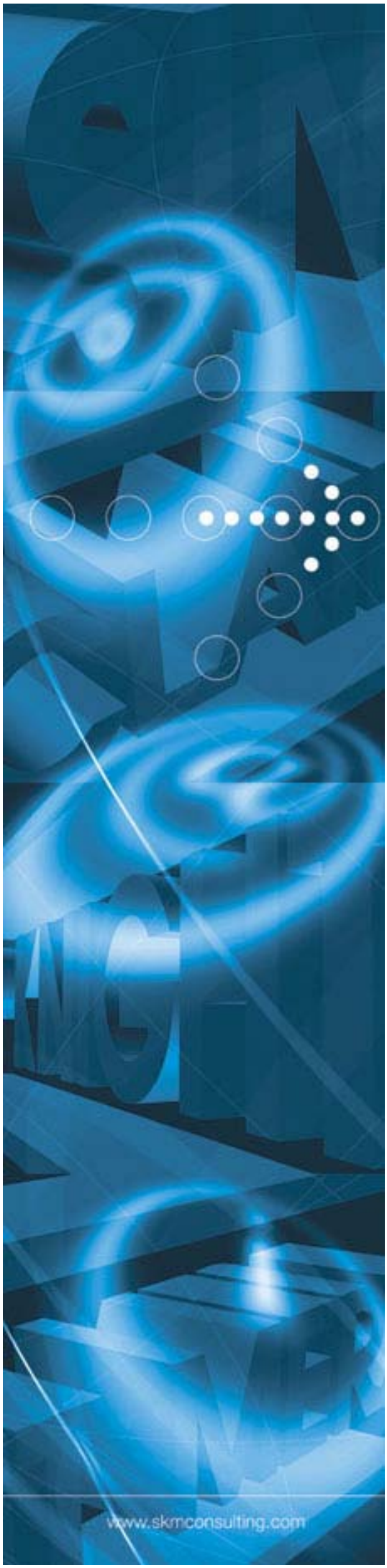

Department of Infrastructure

Northern Central City Corridor Study

Engineering Implications and Strategy Costs

August 2002

SINCLAIR KNIGHT MERZ

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1. Introduction

1.1 Strategies Tested

It has been agreed that there will be eight strategies tested as part of Northern Central City Corridor Study (NCCCS). These strategies are accumulative, each successive strategy being combined with the previous strategies.

The agreed strategies to be tested are, in order:

- Strategy A – Improved Public Transport.
- Strategy B – Reduced Traffic on Local Streets.
- Strategy C – Improved Pedestrian and Bicycle Networks.
- Strategy D – Reduced Car Dependency.
- Strategy E – Land Use Changes to Reduce Travel.
- Strategy F – Rapid Transit on Eastern Freeway Corridor.
- Strategy G – Improved Arterial Road Network.

This report provides estimates of construction cost for the associated infrastructure that will be required to deliver the strategies being tested. These estimated costs will be used to complete an economic evaluation (costs v benefits) of each of the strategies, the benefits being determined in part by the Zenith Model outputs.

Construction and operational impacts for each strategy are also summarised in this report. More detailed information on the operational impacts are contained in a report prepared by the Transport Specialist Team.

The individual elements of each strategy are defined in a previous paper produced by the Transport Specialist Team. This paper defined the specification for test runs of the Zenith Model and also the components to be costed. Components to be costed where agreed at three levels.

- L1 – NCCCS Projects, detailed costs required.
- L2 – Projects affecting NCCCS, generic costs required.
- L3 – Not NCCCS, future scenarios, no costs required.

The following sections report on the estimated costs for individual elements of the strategies, to the level of detail agreed in the Specification Paper noted above.

Attached as Appendices are the spreadsheets used to work up the individual cost estimates.

1.2 Engineering Assumptions

For each of the strategies costed, a summary of the engineering assumptions is provided below.

1.2.1 Improved Public Transport

The strategy consists of a number of elements, summarised as follows:

- Increasing rail frequencies on the Upfield, Ringwood, Epping and Hurstbridge lines and re-routing the Craigieburn line via Upfield.
- Improving station access.
- Improving tram frequencies.
- Route 109 upgrades to various tram routes.
- Various bus improvements.
- Provision of key modal interchanges.

Some of the elements relating to this strategy are costed separately by Booz Allan Hamilton.

1.2.2 Traffic on Local Streets

Traffic on local streets will be discouraged by implementing a series of traffic management measures to minimise through traffic on these streets. It is assumed that there will be no major change to the arterial road network or any roads that have tram services.

The traffic management measures may involve works on local streets themselves (kerb out-stands to create narrow sections and small roundabouts) or median closures, turn bans etc on the arterial road network.

1.2.3 Pedestrian and Bike Networks

Improvements for pedestrians include various projects including more pathways, better signage, more pedestrian signals for road crossings, better lighting of paths and more shop verandahs in shopping precincts.

A number of programs to encourage walking have also been considered and the administrative cost to implement these programs has been costed.

Extensive improvements to the bicycle network are proposed based on previous work carried out by Bicycle Victoria.

1.2.4 Reduce Car Dependency

The strategy tested includes two elements. The first is increasing the price of CBD commuter parking by $10 per day. The second is a program to initiate behavioural change, similar to the TravelSMART program undertaken in South Perth.

1.2.5 Land Use Policy Changes

No work was undertaken by the Engineering Specialist team relating to land use policy changes. Any costs associated with this strategy are outside the scope of this report.

1.2.6 Eastern Freeway Transit

This strategy relates to the provision of some form of mass rapid transit from the CBD to the Doncaster Hill area. The forms of mass rapid transit considered include:

- Guided bus-way.
- Light rail vehicles.
- Heavy rail.

The strategy also considers a number of transport modal interchanges at Doncaster Hill, at major road crossings of the Eastern Freeway and at Melbourne University.

A congestion charge on Eastern Freeway is also considered.

1.2.7 Arterial Road Improvements

Three arterial road improvement projects have been considered together with other ancillary works.

The arterial projects investigated are:

- Tunnel connection between the Eastern Freeway and City Link with intermediate interchanges at Nicholson Street and Royal Parade.
- Tunnel connection as above without the intermediate interchanges.
- Tunnel connection from Eastern Freeway to the CBD (Albert Street).

2. Strategy A – Improved Public Transport

Strategy A is made up of 14 elements (A1 – A14) as described in the following sections.

2.1 A1 – Improve Rail Frequencies

Includes the following three sub-elements:

- Upfield Line – doubling of the current frequency.
- Ringwood, Epping and Hurstbridge Lines – 50% increase in frequency.
- Craigieburn – re-route via Upfield Line.

An assessment of the feasibility of achieving these frequency increases in terms of existing signalling on these routes has been undertaken at a generic level. The results of this analysis are provided in **Table 2.1.**

Table 2.1 – Feasibility of Frequency Increases

Line (Sample Location) Number of Tracks	Existing Number of Trains Per Hour	Proposed Number of Trains Per Hour	Signalling Capacity (Trains Per Hour)	Feasibility of running the proposed number of trains within current Signalling Capacity
UPFIELD				
(Coburg) 2	3	6	8	Possible
(Upfield) 1	3	6	6	Marginal
EPPING				
(Reservoir) 2	5	7.5	15	Possible
(Epping) 1	5	7.5	6	Upgrade Required
HURSTBRIDGE				
(Heidelberg) 2	7	10.5	15	Possible
(Eltham) 1	3	4.5	4	Upgrade Required
Hurstbridge) 1	2	3	2	Upgrade Required
RINGWOOD				
(Box Hill) 3	8.5	12.75	15	Possible
(Blackburn) 2	17	25.5	19	Upgrade Required
(Nunawading) 2	14	21	19	Upgrade Required

In summary, the above table shows that to achieve the required frequency increases will require at least some re-signalling work but could also require duplication of some single track sections. To accurately determine this would require detailed investigation.

Cost estimates are based on the required frequency increase being achievable through signalling upgrades on all of the lines for the sections and distances as shown in **Table 2.2.** The cost of re-signalling adopted is $500,000 per kilometre.

The costs associated with additional rolling stock and additional operating costs are not included and will be determined from the Zenith Model outputs.

Table 2.2 – Estimated Signal Upgrade Costs

Line	Section	Distance	Estimated Cost
Upfield	Gowrie to Upfield	4 km	$2,000,000
Epping	Keon Park to Epping	4.5 km	$2,250,000
Hurstbridge	Greensborough to Hurstbridge	14 km	$7,000,000
Ringwood	Blackburn to Lilydale	19km	$9,500,000
Ringwood	Ringwood to Belgrave	16 km	$8,000,000
		TOTAL	**$28,750,000**

It is anticipated that the re-signalling program would be implemented over 5 years at an annual expenditure of $5.75 Million.

2.2 A2 – Improve Station Access

A generic cost has been applied to stations within the metropolitan area based on the following types of improvements:

- Improved car park security fences and lighting
- Improved bicycle storage.
- Better provision for “kiss and ride”.
- Weather protection on walkways (from car park, bike storage, kiss and ride).
- Improved scheduling between modes
- Provision of real time information.

If the improvements were carried out on a metropolitan wide basis, this would involve 200 stations. Limiting the improvements to the rail corridors directly impacting on the study area reduces the number of stations to 73. The rail corridors included in the latter case are Belgrave & Lilydale, Hurstbridge & Epping and the Upfield line.

The estimated cost per site is approximately $1,000,000 (refer spreadsheets **A2.1 & A2.2**) for a network wide cost of $203,000,000 (200 stations) or for those corridors directly impacting the study area, a cost of $74,000,000 (73 stations). Implementation would be staged over 20 years at a rate of around $10.0 Million or $3.7 Million per annum.

2.3 A3 – Improve Tram Frequencies

The cost of additional rolling stock and the additional operating cost for this element will be determined from the Zenith Model outputs.

2.4 A4 – Route 109 Type Upgrades

Upgrades are proposed to routes 1, 11, 19, 22, 23, 24, 30, 34, 42, 55, 59, 68, 86 & 96.

The total length of these routes is 84 km and a unit rate of approximately $3.5 million per kilometre has been adopted for Route 109 type upgrades. This per kilometre rate is based on recent work carried out by Sinclair Knight Merz for VicRoads on the estimated construction cost for implementation of improvements proposed for Route 109.

Based on the assumption that 50% of the length will be treated as per Route 109 and the remaining 50% is costed at half the Route 109 rate, the total cost for improvements

to the listed routes is $337,000,000 (refer spreadsheet **A4**). Implementation is expected over 20 years at a rate of $16.9 Million per annum.

2.5 A5 to A8 – Various Bus Improvements

Elements A5 to A8 comprise the following:

- A5 – upgrade bus frequencies.
- A6 – maximum 5 minute walk time to any service.
- A7 – reduction in bus running times.
- A8 – extended temporal coverage.

All elements A5 to A8 will be costed by Booz Allen Hamilton or determined by outputs from the Zenith Model.

2.6 A9 – Provision of Key Modal Interchanges

This element relates to the study area and interchanges have been costed at the following sites:

- Melbourne University.
- Clifton Hill and Victoria Park Stations.
- Improvements at all intersections where tram/bus routes intersect.

Melbourne University
Estimates are provided for:

- Grade separated pedestrian overbridge, catering for tram users, pedestrians and cyclists accessing the university. This element is included as an immediate project.
- A below ground bus interchange with walkway to within the university grounds and to the surface street network. This project would be considered as the long term option.

Separate estimates are provided for:

- Combining grade separation of pedestrians at Melbourne University with all other projects that constitute this element; and
- Latter provision of a comprehensive underground intermodal interchange in the long term.

Railway Stations
A cost of $2,000,000 per site has been included for improvements at Clifton Hill and Victoria Park stations. This cost is based on the earlier estimate of $1,000,000 per site (refer Section 2.2 – Improve Station Access), thus allowing further enhancements to those proposed for general station improvements.

Bus/Tram Intersects
The estimate provides for the following works at the 11 No. bus/tram intersects within the study area:

- Shelters to provide weather protection for users.
- Improved seating.

- Improved lighting.
- Real time information.

The total estimated cost of all improvements including grade separation of pedestrians at Melbourne University (but not the Melbourne University bus interchange) is $15,000,000 (refer Spreadsheet **A9**). Implementation would be over 5 years at $3.0 Million per annum.

Within the same spreadsheet, a separate costing including the Melbourne University bus interchange brings the total cost to $50,000,000 (an additional $35,000,000).

2.7 A10 to A13 – Changes to Bus Services

Elements A10 to A13 comprise the following:

- A10 – increase coverage at City end (to Docklands and Spencer Street).
- A11 – increase services along Brunswick Road.
- A12 – 50% of Johnston Street buses via Elgin Street (Melbourne University).
- A13 – 50% Eastern Freeway buses via Melbourne University.

All elements A10 to A13 will be costed by Booz Allen Hamilton or determined by outputs from the Zenith Model.

2.8 A14 – Bus Priority on Hoddle Street

This element provides for bus priority lanes along Hoddle Street in both directions between Victoria Parade and the Eastern Freeway. The cost estimate includes signing, line marking and improved signal priority.

The total estimated cost is $230,000 (refer spreadsheet **A14**). This element would be funded in year 1.

3. Strategy B – Traffic on Local Streets

The aim of this strategy is to reduce the attractiveness (for through traffic) of using local streets by putting in place traffic management measures that would typically lower the "free flow speed" by 20 km/h.

The strategy assumes no change to the arterial road network or any roads that have tram services.

The estimated cost is based on generic route length treatments. It is estimated that the total length of local streets in the study area is 105 km. Each of these will be treated every 100 metres with treatments ranging from kerb out-stands ($10,000 per site) to small roundabouts or island to narrow the available pavement width ($40,000 per site). Other assumptions made in developing the strategy cost are:

- 30% of the total road length has already been treated
- There is 1 roundabout treatment to 4 kerb outstands, giving an average cost of $16,000 per treatment.

The total estimated cost of this element is $18,000,000 (refer spreadsheet **B1**). The strategy implementation is anticipated over 20 years at $0.9 Million per annum.

Local Government is responsible for existing implementation programs for the installation of Local Area Traffic Management (LATM) devices. Typically, expenditure per annum could be up to $0.5 Million per annum per municipality. Assuming a total of $1.0 Million for Melbourne City Council and the City of Yarra, approximately $0.4 Million is likely to be spent in the study area. This figure is based on the study area representing 30% of Melbourne City Council and 60% of City of Yarra total areas. The shortfall is therefore $0.5 Million per annum.

It is also likely that some of the traffic management measures required to meet the strategy aim could be achieved with traffic management works on arterial roads, such as median closures. The cost of these works would be the responsibility of State Government.

4. Strategy C – Pedestrian & Bike Networks

4.1 Improvements to Pedestrian Network

The types of improvements and programs to encourage walking envisaged have been detailed in a previous report from the Transport Specialist Team and include:

- Programs to encourage walking.
- Enforcement to dog leashing.
- Development of shared path codes.
- Consideration of pedestrians in development applications.
- Demolition of driveways included in demolition permits.
- Reduction in footpath clutter.
- New shared paths in parks.
- Navigation and signage improvements.
- New pedestrian operated signals.
- Improved street lighting.
- Pedestrian priority at traffic signals.
- Increased footpath repair and replacement.
- Improvement to laneways for pedestrians.
- Verandahs in shopping precincts.
- Additional seating.

4.1.1 Administration of Pedestrian Programs

The cost estimates to administer the various pedestrian programs proposed is based on the following inputs (total for both municipalities):

- Encourage walking – 2 staff full time
- Enforce dog leashing – 1 staff full time
- Develop shared path codes – notional $10,000 pa
- Pedestrian considerations in development applications – notional $10,000 pa
- Demolition of driveways – 50 per year at $1,000 each
- Reduce footpath clutter – ½ staff full time

4.1.2 Pedestrian Projects

The cost estimates for pedestrian improvement projects are based on:

- New shared paths in parks – length estimated at 2km
- Improved navigation and signage – notional cost of $20,000 pa
- New pedestrian operated signals – 58 sites identified at $60,000 each
- Improved street lighting – notional $200,000 pa
- Pedestrian priority at traffic signals – 120 sites identified at $10,000 each
- Increased repair/replacement of footpaths – 5% pa increase over current practice (of 5% increase, assume 90% repair, 10% replace)
- Improvement to laneways for pedestrians – total length 10km
- Verandahs in shopping precincts – 20km total, assume 40% done, do further 30%

Provision of shop verandahs will need to consider the historic significance of any buildings proposed to be altered.

The total estimated cost is $48,000,000 (refer spreadsheet **C1**). Implementation of the works would be over 20 years at an annual cost of $2.4 Million.

Existing expenditure per municipality on pedestrian improvements is estimated to be $0.2 Million per annum. The shortfall is therefore a total of $2.0 Million per annum. Some of the improvement works are also likely to take place on arterial roads (eg. additional pedestrian signals) and would be funded by the State Government.

4.2 Improvements to the Bicycle Network

Bicycle Victoria has already identified an extensive list of improvement projects at an estimated cost of $24,000,000. The submission by Bicycle Victoria is not extensive in detailing the scope of each individual project, however an appreciation of the magnitude of works involved can be gained and the project costs estimated by Bicycle Victoria are considered appropriate. The total of $24,000,000 includes all design, construction and project management overheads. In addition to these projects, the following initiatives are proposed:

- Legalise bikes in MCC gardens.
- Improved signage to assist navigation.
- Improved bicycle parking at places of employment.
- Provision of showers at work places (this item not costed against NCCCS).

The total cost of all initiatives is estimated to be $34,000,000 (refer spreadsheet **C2**). Implementation of the strategy is anticipated over 20 years at a rate of $1.7 Million per annum.

Existing expenditure per municipality on bicycle network improvements is estimated to be $0.1 Million per annum. The shortfall is therefore a total of $1.5 Million per annum.

5. Strategy D – Reduce Car Dependency

There are two elements to this strategy as described in the following sections.

5.1 Local Parking Changes

The aim is to limit the amount of free parking space and the duration of parking throughout the study area.

The estimated cost is based on generic route length treatments. It is estimated that the total length of local streets in the study area is 105 km. It is assumed that 10% of this route length will have metered parking introduced and the remainder will have shortened parking times.

For metered parking, meters will be spaced at 40 metre intervals (every 6 spaces) and each metre costing $10,000 to install.

For the remainder of the area, new signs will be required every 100 metres at a cost of $200 each to supply and install.

The total cost of this element is estimated to be $9,000,000 (refer spreadsheet **D1**). Implementation of the strategy is anticipated over 10 years at a rate of $0.9 Million per annum.

5.2 Behavioural Changes

Based on the experience in South Perth, population 35,000, where a budget of $1,300,000 was spent in targeted marketing via phone interviews and resulted in a significant mode shift to green transport modes (walk, cycle, public transport), the pro-rata cost for the 25% of the Melbourne Metropolitan area is $40 Million. Twenty five percent is taken as the proportion of the total Metropolitan area that directly impacts the NCCCS corridor.

It is anticipated that this would be programmed over 10 years at an annual expenditure of $4 Million.

6. Strategy E – Land Use Policy Changes

No work was undertaken by the Engineering Specialist team relating to land use policy changes. Any costs associated with this strategy are outside the scope of this report.

7. Strategy F – Eastern Freeway Transit

This strategy is to provide some form of rapid mass transit system from Doncaster Hill to the Central Business District. The specification for the system elements was developed through discussion between Graham Currie of Booz Allen & Hamilton and William McDougal/Bob Evans from the Department of Infrastructure.

For costing purposes only, the specification for the Doncaster Area Rapid Transit (DART) is:

- Guided bus-way or light rail vehicles (LRV) from Doncaster Hill to Alexandra Parade.
- Major interchange at Doncaster Hill.
- Tunnelled bus-way from Nicholson Street to Melbourne University interchange in the long term but not costed initially.
- Premium car/bus (or LRV) and bus/bus (or LRV) interchanges at Doncaster Road, Bulleen Road and Chandler Highway.
- Buses on freeway running as a limited express to the CBD.

In addition to the above, Strategy F is to provide:

- Bus priority for buses entering/departing and travelling along Hoddle Street.
- Dedicated bus lanes on Alexandra Parade.
- Possible tolling of Eastern Freeway.

The estimates produced for the above elements are described in the following sections.

7.1 Doncaster Area Rapid Transit

Two costing estimates are provided, one for a guided bus way system, the second for light rail vehicles (LRVs). Each option is described in more detail in the following sections.

7.1.1 Guided Bus Way

The costing is based on providing a concrete guided way for buses. The guided way commences at a proposed underground interchange at Doncaster Hill and continues to the western end of the Eastern Freeway at Alexandra Parade. The cost estimate for the interchange is included in the total cost of the DART scheme, and is estimated to be $35,000,000.

It is proposed that DART buses will travel as limited express from Doncaster Hill to the CBD. At each major road crossing of the freeway (Doncaster Road, Bulleen Road and Chandler Highway) bus services on the surrounding road network will be able to access the guide way in the freeway median via dedicated ramps on the city side of the interchange. Also provided at these major crossings will be park and ride facilities for car to bus interchange. The costing of these park and ride areas are included in the total cost of the DART scheme and are also provided as stand-alone costs (refer spreadsheet **F5**).

One lane in each direction on Alexandra Parade is converted to a dedicated bus lane between the Eastern Freeway and Nicholson Street. From Nicholson Street buses

travel in tram fairways via Nicholson Street and Elgin Street to Melbourne University. Grade separated pedestrian access will be provided at the University. In the longer term a tunnel could be constructed from Nicholson Street along the Neill Street alignment to an underground modal interchange at Melbourne University. The tunnel cost and the cost of the modal interchange at Melbourne University is not included as part of the DART scheme. A cost for this interchange has been estimated as part of Strategy A (refer spreadsheet **A9**).

The total estimated cost of the DART scheme is $115,000,000 (refer spreadsheet **F1a). Implementation over 3 years would require an average expenditure of $38.3 Million per annum.

7.1.2 Light Rail System

It is assumed that the system would commence at the same underground interchange at Doncaster Hill and continue to the existing light rail network at Nicholson Street.

As with the guided bus way, at the major road crossings of the freeway provision is made for car to light rail mode change. At these major crossings, bus to light rail mode change will also be provided for via a dedicated bus station constructed adjacent the freeway structures with lift/escalator access to the light rail stops in the freeway median.

No additional works are costed for light rail improvements from Nicholson Street to the CBD. These works are costed under other strategies.

The total estimated cost of the LRV scheme is $167,000,000 (refer spreadsheet **F1b**). Implementation is assumed over the same three year period at an annual expenditure of $55.7 Million per annum.

7.1.3 Heavy Rail System

The heavy rail system would depart from Victoria Park Station and access the freeway median via a rail bridge. Twin rail tracks would be provided along the freeway median to Bulleen where the freeway median ends. New rail bridges are required at Merri Creek and the Yarra River. The length of twin rail track constructed in the median is 8 kilometre.

From Bulleen Road to Doncaster Hill Station (underground rail station), two separate tunnels would be constructed, one for each direction of train travel. The length of twin rail tunnels constructed would be 4.5 kilometres.

No interchanges have been provided for the major road crossings of the freeway and it is assumed that connection to the existing rail network can be accommodated near Victoria Park Station.

The total estimated cost of the heavy rail scheme is $430,000,000 (refer spreadsheet **F1c**). Implementation is assumed over a four year period at an average annual expenditure of $107.5 Million per annum.

7.2 Hoddle Street Priority

This element is already costed as part of Strategy A (refer spreadsheet **A14**).

7.3 Bus Lanes Alexandra Parade

The cost included here is the marginal cost for extending the dedicated bus lanes beyond Nicholson Street to Swanston Street and then using tram fairways down Swanston Street to the CBD.

Included in the cost is signal priority modifications and additional detection loops in the tram reservation to call up existing tram priorities.

The total estimated cost is $585,000 (refer spreadsheet **F3**) and assumed to be funded in one year.

7.4 Doncaster Hill Interchange

The cost estimate for a premium interchange at Doncaster Hill is included in the total cost for the DART scheme (refer Section 7.1). It is assumed that the interchange would be near the intersection of Manningham and Doncaster Roads. The estimate includes a deck over the interchange for use as a car park or open plaza. For a premium interchange at this location, the estimated cost is $35,000,000.

7.5 Park and Ride

The cost estimate for a park and ride facilities at Doncaster Road, Bulleen Road and Chandler Highway are included in the total cost for the DART scheme (refer Section 7.1). A stand-alone estimate for these park and ride facilities is also provided.

The parking spaces provided at each site is:

- Doncaster Road – 400 spaces.
- Bulleen Road – 300 spaces.
- Chandler Highway – 200 spaces.

The total estimated cost is$9,000,000 (refer spreadsheet **F5**). It is likely that the sites would be developed over 3 years at an average expenditure of $3.0 Million per annum.

7.6 Melbourne University Interchange

The cost of an underground modal interchange at Melbourne University is included as long term option as part of Strategy A (refer spreadsheet **A9**). Initially grade separation of pedestrians will be provided.

7.7 Congestion Charge on Eastern Freeway

Cost is based on a toll gantry being placed immediately east of Hoddle Street to capture all vehicles using the freeway in either direction. This requires 2 No. Gantries and the cost per site is based on knowledge of the City Link electronic tolling system.

The total estimated cost is $9.3M (refer spreadsheet **F8**). Implementation is expected in 1 year.

8. Strategy G – Arterial Road Network

Various arterial road improvement options were considered and the favoured option was a tunnel linking the Eastern Freeway with City Link and providing connections to the surface street network near Nicholson Street and at Royal Parade.

Because of the close proximity of the existing City Link interchanges at Racecourse Road, Flemington Road and Brunswick Road the connection to City Link is via the existing interchanges at Racecourse Road (for southbound traffic) and Flemington Road (for northbound traffic). To facilitate these connections, the tunnel for westbound traffic will be terminated in Racecourse Road between Flemington Road and Boundary Road. This eliminates the need for westbound tunnel traffic to mix with other traffic at the congested Flemington Road/Racecourse Road intersection. The eastbound tunnel commences in Elliott Avenue just east of Flemington Road

Additional Zenith Model runs were completed for two other options. These comprised the tunnel connection as described above without connecting ramps to the surface street network and a separate option providing direct tunnel access to the CBD.

8.1 Eastern Freeway Connection to City Link

8.1.1 Tunnel Characteristics

The tunnel connection has the following characteristics:

- 2 x 2 lane driven tunnel approximately 30 metres below natural ground level.
- Commences in the Eastern Freeway median east of Hoddle Street and surfaces in Elliott Avenue for eastbound traffic and in Racecourse Road for westbound traffic.
- Provides a full diamond interchange on Alexandra Avenue near Brunswick Street and Nicholson Street.
- Provides a half-diamond interchange (easterly facing ramps) at Royal Parade near Macarthur Road.

The tunnel proposed is a deep tunnel to minimise impact on existing service authority assets, such as the main drain running along Alexandra Parade.

A deep tunnel is also preferred to get the alignment below a layer of basalt that exists along part of the alignment. Tunnelling through basalt would be difficult and expensive, possibly requiring blasting as the means of excavation.

At this stage it is unknown whether the tunnel would be “tanked” (built to withstand ground water pressure and fully sealed thus preventing ground water draw down) or “drained” (tunnel not sealed, ground water that penetrates the tunnel would be collected and pumped to an outfall). This decision would be made on the basis of detailed geotechnical investigation to determine the estimated ground water inflows and the resultant impact on ground water levels in the vicinity of the tunnel.

In this strategic study, the location of ventilation stacks has not been defined. A minimum of one stack for each direction of the tunnel would be required and ideally these would be located at the exit portals of each directional tunnel. Ventilation would

be designed so that no vitiated air is expelled through the portals, only through the vent stacks. Location selection would depend on land use/ownership, likely visual and air quality impacts in the immediate vicinity and public consultation.

Generally construction in the vicinity of the portals can take place in existing road reservations where surface works are required. The exceptions are:

- In Racecourse Road for the westbound exit portal where some land acquisition would be required; and
- Near Flemington Road for the eastbound entry portal. This will require that work take place in Royal Park during the construction phase, with the park then being reinstated to its original condition.

At Royal Parade, portals can be constructed within the existing road reservation with Cemetery Road West being closed at College Crescent.

The ramps accessing the tunnel near Nicholson Street can be constructed within the Alexandra Parade road reservation by staggering the location of the four portals and some realignment of the existing roadway.

At the eastern end of the tunnel, access is from portals constructed within the Eastern Freeway median.

8.1.2 Tunnel Construction Costs

The unit rate adopted for tunnel costing purposes is a composite rate developed through knowledge of the Melbourne City Link project (within Sinclair Knight Merz and also from ex-Transfield staff), input from Halcrow and additional input from Ted Nye of Sinclair Knight Merz.

Tunnel with Ramp Connections

The total estimated cost including all tunnel services and associated road works at the portals and proposed interchanges is $723,000,000 (refer spreadsheet **G1**). The estimated construction period is 3 years requiring an average expenditure of $241 Million per annum.

Tunnel without Ramp Connections

The total estimated cost including all tunnel services and associated road works at the portals is $592,000,000 (refer spreadsheet **G4**). The estimated construction period is 3 years requiring an average expenditure of $197.3 Million per annum.

8.1.3 Tunnel Operating Costs

Total tunnel operation and maintenance costs comprise a fixed component and a variable component based on the length of the tunnel. The total cost includes lighting, ventilation, pumps and provision of O&M personnel.

For a 4 lane (2 tunnels, each 2 lanes), typical fixed and variable cost components are:

Fixed cost (portal lighting, minimum fans, O&M personnel)	$2,000,000 per annum
Variable cost (all other lighting, ventilation pumps and power)	$500 per lineal metre

For a tunnel from Eastern Freeway to near City Link (length of 5 km), the total O&M cost is estimated to be $4.5 Million per annum.

8.1.4 Other Ancillary Works

With the proposed tunnel providing a link between Royal Parade and Flemington Road, it is possible to close of Macarthur Street at Royal Parade, thus enhancing the amenity of Royal Park. To allow local access to The Avenue, the former connection of The Avenue (south) to Royal Parade will need to be reinstated.

To limit the volume of traffic using Gatehouse Street as an access point to the tunnel at Royal Parade, Gatehouse Street at Royal Parade will be Left In/Left Out only. This will require some closures in the outer separator, between Gatehouse Street and Macarthur Road intersection.
The total estimated cost of these works is $210,000 (refer spreadsheet **G2**). These works would be implemented in 1 year.

8.2 Tunnel Access to CBD

A cost estimate has also been prepared for a tunnel accessing the CBD, commencing on the Eastern Freeway near Hoddle Street and terminating in the vicinity of the Victoria Parade/Nicholson Street intersection.

The total estimated cost including associated road works at the portals is $369,000,000 (refer spreadsheet **G3**). The estimated construction period is 3 years requiring an average expenditure of $123 Million per annum.

The estimated Operations & Maintenance cost for this 2.5 km tunnel is $3.3 Million per annum, based on the previously adopted unit rates.

9. Summary Strategy Costs

A summary of all of the strategy elements costed in this report is provided in **Table 9.1** below.

Table 9.1 – Strategy Estimated Costs

Strategy	Element	Level of Costing*	Estimated Cost ($M)
A – Improved Public Transport			
	A1 – Upgraded Signalling**	L2	28.8
	A2 – Station Access Improvement***	L2	203.0
	A2 – Station Access Improvement***	L2	74.0
	A4 – Route 109 Upgrades	L2	337.0
	A9 – Modal Interchanges in Study Area	L1	15.0
	A14 – Hoddle Street Bus Priority	L1	0.2
B – Reduced Traffic on Local Streets			
	B1 – Area Wide Traffic Management	L2	18.0
C – Improved Pedestrian and Bicycle Networks			
	C1 – Pedestrian Network Improvements	L2	48.0
	C2 – Bicycle Network Improvements	L2	34.0
D – Reduced Car Dependency			
	D1 – Changes to Local Parking	L2	9.0
	D2 – Behavioural Changes	L2	40.0
F – Rapid Transit on Eastern Freeway			
	F1a – Doncaster Transit , Busway >	L1	115.0
	F1b – Doncaster Transit, Light Rail >>	L1	167.0
	F1c – Doncaster Transit, Heavy Rail >>>	L1	430.0
	F2 – Hoddle Street Priority	L1	Refer A14
	F3 – Bus Lanes on Alexandra/Princess	L1	0.6
	F4 – Shopping Town Modal Interchange	L1	35.0
	F5 – Park and Ride	L1	9.0
	F6 – Melbourne University Modal I/C	L1	Refer A9
	F8 – Congestion Charge on Eastern Fway	L2	9.3
G – Improved Arterial Road Network			
	G1 – Tunnel to City Link with ramps <	L1	723.0
	G2 – Supplementary Roadworks	L1	0.2
	G3 – Tunnel to CBD <<	L1	369.0
	G4 – Tunnel to City Link, no ramps <<<	L1	592.0

Notes

* Levels of Costing L1 – Detailed
L2 – Generic

** The estimated cost does not include any new rolling stock (if required) or the additional operating cost.

*** Separate costs are provided for metropolitan wide improvements ($203 M) or improvements only to those routes directly impacting the study area ($74 M).

>	DART (guided bus-way) estimate includes cost of interchange at Shopping Town, park and ride schemes at the major crossings and grade separation for pedestrians at Melbourne University. Nominal allowance is made for service alterations.
>>	DART (LRV system) estimate includes cost of interchange at Shopping Town, park and ride schemes at the major crossings, bus to LRV interchanges at major crossings and grade separation for pedestrians at Melbourne University. Nominal allowance is made for service alterations.
>>>	DART (Heavy Rail system) estimate includes cost of an underground station at Shopping Town with no other intermediate stations. Estimate also assumes connection to existing track network near Victoria Park Station can be accommodated.
<	Tunnel from Eastern Freeway to City Link with connecting ramps to the surface street network near Nicholson Street and Royal Parade.
<<	Tunnel from Eastern Freeway to CBD has no connecting ramps to the surface street network and the portal is assumed to be in Albert Street near Nicholson Street.
<<<	Tunnel from Eastern Freeway to City Link with no connecting ramps to the surface street network.

Implementation of the various strategies will occur over time. The assumed implementation period and expenditure profiles are tabulated in **Table 9.2** on the following page.

Table 9.2 – Strategy Expenditure Profiles

Strategy	Element	Implementation Period (years)	Cost ($M pa)
A – Improved Public Transport			
	A1 – Upgraded Signalling	5	5.75
	A2 – Station Access Improvement	20	10.0 or 3.7
	A4 – Route 109 Upgrades	20	16.9
	A9 – Modal Interchanges in Study Area	5	3.0
	A14 – Hoddle Street Bus Priority	1	0.23
B – Reduced Traffic on Local Streets			
	B1 – Area Wide Traffic Management	20	0.90
C – Improved Pedestrian and Bicycle Networks			
	C1 – Pedestrian Network Improvements	20	2.40
	C2 – Bicycle Network Improvements	20	1.7
D – Reduced Car Dependency			
	D1 – Changes to Local Parking	10	0.90
	D2 – Behavioural Changes	10	4.00
F – Rapid Transit on Eastern Freeway			
	F1a – Doncaster Transit, Busway	3	38.3
	F1b – Doncaster Transit, Light Rail	3	55.7
	F1c – Doncaster Transit, Heavy Rail	4	107.5
	F2 – Hoddle Street Priority	Refer A14	NA
	F3 – Bus Lanes on Alexandra/Princess	1	0.585
	F4 – Shopping Town Modal Interchange	5	20.0
	F5 – Park and Ride	3	3.0
	F6 – Melbourne University Modal I/C	Refer A9	NA
	F8 – Congestion Charge on Eastern	1	9.3
G – Improved Arterial Road Network			
	G1 – Tunnel to City Link with ramps	3	241.0
	G2 – Supplementary Roadworks	1	0.21
	G3 – Tunnel to CBD	3	123.0
	G4 – Tunnel to City Link without ramps	3	197.3

Appendix A Strategy A Costing Spreadsheets

A2 – Station Access Improvement

A4 – Route 109 Upgrades

A9 – Modal Interchanges in Study Area

A14 – Hoddle Street Bus Priority

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy A2 - Station Access Improvement

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 60,220**
	Project Management	Item		8%	60,220	
B	**Design and Investigation**					**$ 28,952**
	Detailed Design & Investigation	Item		4%	28,952	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction**					**$ 723,800**
1.0	**GENERAL ITEMS**					$ 65,800
1.1	Site Establishment	Item		5%	$ 32,900	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 32,900	
2.0	**WALKWAYS**					
2.1	Covered walkways	600	m²	50	$ 30,000	$ 30,000
3.00	**ROADWORKS**					$ 220,000
3.01	Improved "Kiss & Ride" access	100	m²	200	$ 20,000	
3.02	Buses/Trams closer to Station	Item			$ 200,000	
4.00	**SECURITY**					$ 108,000
4.01	Car Park Fencing	1,000	m	38.00	$ 38,000	
4.02	Security Lighting	Item			$ 50,000	
4.03	Bicycle Storage	Item			$ 20,000	
5.00	**SCHEDULE CO-ORDINATION**					$ 300,000
5.01	Real Time Information	2	per site	100000	$ 200,000	
5.02	Schedule Improvement	Item			$ 100,000	
	TOTAL A - D					**$ 812,972**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 81,297
	Upper Bound Contingency (30%)	Item		30%		$ 243,892
	PROJECT BUDGET					
	Lower Bound Estimate					$ 894,269
	Upper Bound Estimate					$ 1,056,864
	Project Budget (75% Confidence)			**Per Site (200 No.)**		**$ 1,016,215**
					TOTAL	**$ 203,243,040**

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy A2.1 - Station Access Improvement (Network Wide, 200 stations)

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 60,220**
	Project Management	Item		8%	60,220	
B	**Design and Investigation**					**$ 28,952**
	Detailed Design & Investigation	Item		4%	28,952	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction**					**$ 723,800**
1.0	**GENERAL ITEMS**					$ 65,800
1.1	Site Establishment	Item		5%	$ 32,900	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 32,900	
2.0	**WALKWAYS**					
2.1	Covered walkways	600	m²	50	$ 30,000	$ 30,000
3.00	**ROADWORKS**					$ 220,000
3.01	Improved "Kiss & Ride" access	100	m²	200	$ 20,000	
3.02	Buses/Trams closer to Station	Item			$ 200,000	
4.00	**SECURITY**					$ 108,000
4.01	Car Park Fencing	1,000	m	38.00	$ 38,000	
4.02	Security Lighting	Item			$ 50,000	
4.03	Bicycle Storage	Item			$ 20,000	
5.00	**SCHEDULE CO-ORDINATION**					$ 300,000
5.01	Real Time Information	2	per site	100000	$ 200,000	
5.02	Schedule Improvement	Item			$ 100,000	
	TOTAL A - D					**$ 812,972**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 81,297
	Upper Bound Contingency (30%)	Item		30%		$ 243,892
	PROJECT BUDGET					
	Lower Bound Estimate					$ 894,269
	Upper Bound Estimate					$ 1,056,864
	Project Budget (75% Confidence)			**Per Site (200 No.)**		**$ 1,016,215**
					TOTAL	**$ 203,243,040**

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy A2.2 - Station Access Improvement (NCCCS Direct Impact, 73 stations)

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 60,220**
	Project Management	Item		8%	60,220	
B	**Design and Investigation**					**$ 28,952**
	Detailed Design & Investigation	Item		4%	28,952	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction**					**$ 723,800**
1.0	**GENERAL ITEMS**					$ 65,800
1.1	Site Establishment	Item		5%	$ 32,900	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 32,900	
2.0	**WALKWAYS**					
2.1	Covered walkways	600	m²	50	$ 30,000	$ 30,000
3.00	**ROADWORKS**					$ 220,000
3.01	Improved "Kiss & Ride" access	100	m²	200	$ 20,000	
3.02	Buses/Trams closer to Station	Item			$ 200,000	
4.00	**SECURITY**					$ 108,000
4.01	Car Park Fencing	1,000	m	38.00	$ 38,000	
4.02	Security Lighting	Item			$ 50,000	
4.03	Bicycle Storage	Item			$ 20,000	
5.00	**SCHEDULE CO-ORDINATION**					$ 300,000
5.01	Real Time Information	2	per site	100000	$ 200,000	
5.02	Schedule Improvement	Item			$ 100,000	
	TOTAL A - D					**$ 812,972**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 81,297
	Upper Bound Contingency (30%)	Item		30%		$ 243,892
	PROJECT BUDGET					
	Lower Bound Estimate					$ 894,269
	Upper Bound Estimate					$ 1,056,864
	Project Budget (75% Confidence)				**Per Site (73 No.)**	**$ 1,016,215**
					TOTAL	**74,183,710**

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy A4 - Route 109 Type Upgrades

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 19,958,400**
	Project Management	Item		8%	19,958,400	
B	**Design and Investigation**					**$ 9,595,385**
	Detailed Design & Investigation	Item		4%	9,595,385	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction**					**$ 239,884,615**
1.0	**GENERAL ITEMS**					$ 21,807,692
1.1	Site Establishment	Item		5%	$ 10,903,846	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 10,903,846	
2.0	**STRUCTURES**					$ 218,076,923
2.1	Bridge Construction		m²			
2.2	Route 109 Improvements	84	km	3,461,538	$ 218,076,923	
2.3	Major Culverts		m			
3.00	**ROADWORKS**					$ -
3.01	Stripping topsoil		m²	5	$ -	
3.02	Excavation		m³	25	$ -	
3.03	Disposal of excavated material		m³	15	$ -	
3.04	Compaction of sub grade		m²	6	$ -	
3.05	Soft areas - excavation, remove and replace		item			
4.00	**PAVEMENT**					$ -
4.01	Deep Strength Asphalt		m²	175.00	$ -	
4.02	Granular with Asphalt Surfacing		m²	125.00	$ -	
4.03	Asphalt Surfacing (40mm)		m²	15.00	$ -	
5.00	**DRAINAGE**					$ -
5.01	subsoil drains 100mm dia		m	35	$ -	
5.02	375 RCP (Class 2)					
5.03	Pits/Inspection Openings		no	200	$ -	
6.00	**SM2 & SM3 Kerb &channel**		m	35	$ -	$ -
7.00	**POWER & LIGHTING**					
7.01	Design & installation of public lighting (60m spacing)		no			
8.0	**SIGNING (E Fway & Doncaster Road)**		m²	1.50	$ -	$ -
9.0	**LINEMARKING (E Fway & Doncaster Road)**		m²	1.50	$ -	$ -
	TOTAL A - D					**$ 269,438,400**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 26,943,840
	Upper Bound Contingency (30%)	Item		30%		$ 80,831,520
	PROJECT BUDGET					
	Lower Bound Estimate					$ 296,382,240
	Upper Bound Estimate					$ 350,269,920
	Project Budget (75% Confidence)					**336,798,000**

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy A9 - Modal Interchanges in Study Area

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management (including bus interchange at Melbourne University)**					**$ 2,972,570**
	Project Management (including pedestrian grade separation at Melb Univ)					**$ 892,570**
	Project Management	Item		8%	2,972,570	
		Item		8%	892,570	
B	**Design and Investigation (including bus interchange at Melbourne University)**					**$ 1,429,120**
	Design and Investigation (including pedestrian grade separation at Melb Univ)					**$ 429,120**
	Detailed Design & Investigation	Item		4%	1,429,120	
		Item		4%	429,120	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction (including bus interchange at Melbourne University)**					**$ 35,728,000**
	Construction (including pedestrian grade separation at Melbourne University)					**$ 10,728,000**
1.0	**GENERAL ITEMS**					$ 3,248,000
1.1	Site Establishment	Item		5%	$ 1,624,000	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 1,624,000	
2.0	**MELBOURNE UNIVERSITY**					$ 25,180,000
2.1	Grade Seperated Crossing	120	m²	1500	$ 180,000	
2.2	Underground Interchange	3,500	m²	10000	$ 25,000,000	
3.00	**BUS/TRAM INTERCONNECTS (11 No.)**					$ 3,300,000
3.01	Seating and Weather Protection	Item			$ 50,000	
3.02	Lighting Improvements	Item			$ 50,000	
3.03	Real Time Information	Item			$ 200,000	
4.00	**STATIONS**					$ 4,000,000
4.01	Clifton Hill	Item			$ 2,000,000	
4.02	Victoria Park	Item			$ 2,000,000	
	TOTAL A - D (including bus interchange at Melbourne University)					**$ 40,129,690**
	TOTAL A - D (including pedestrian grade separation at Melbourne University)					**$ 12,049,690**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 4,012,969
	Upper Bound Contingency (30%)	Item		30%		$ 12,038,907
	Lower Bound Contingency (10%)	Item		10%		1,204,969
	Upper Bound Contingency (30%)	Item		30%		3,614,907
	PROJECT BUDGET					
	Lower Bound Estimate					$ 44,142,659
	Upper Bound Estimate					$ 52,168,596
	Lower Bound Estimate					$ 13,254,659
	Upper Bound Estimate					$ 15,664,596
	Project Budget (75% Confidence, with bus interchange at Melb University)					**$ 50,162,112**
	Project Budget (75% Confidence, with pedestrian grade separation at Melb U)					**$ 15,062,112**

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy A14 - Bus Lanes both Directions in Hoddle St

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY	
A	**Project Management**					**$ 13,536**	
	Project Management	Item		8%	13,536		
B	**Design and Investigation**					**$ 6,508**	
	Detailed Design & Investigation	Item		4%	6,508		
C	**Land Acquisition**					**$ -**	
	Acquire land		m²				
D	**Construction**					**$ 162,690**	
1.0	**GENERAL ITEMS**					$ 14,790	
1.1	Site Establishment	Item		5%	$ 7,395		
1.2	Site Management & Supervision (including QA)	Item		5%	$ 7,395		
2.0	**STRUCTURES**					$ -	
2.1	Bridge Construction		m²				
2.2	Tunnel Construction		km				
2.3	Major Culverts		m				
3.00	**ROADWORKS**					$ -	
3.01	Stripping topsoil		m²	5	$ -		
3.02	Excavation		m³	25	$ -		
3.03	Disposal of excavated material		m³	15	$ -		
3.04	Compaction of sub grade		m²	6	$ -		
3.05	Soft areas - excavation, remove and replace		item				
4.00	**PAVEMENT**					$ -	
4.01	Deep Strength Asphalt		m²	175.00	$ -		
4.02	Granular with Asphalt Surfacing		m²	125.00	$ -		
4.03	Asphalt Surfacing (40mm)		m²	15.00	$ -		
5.00	**DRAINAGE**					$ -	
5.01	subsoil drains 100mm dia		m	35	$ -		
5.02	375 RCP (Class 2)						
5.03	Pits/Inspection Openings		no	200	$ -		
6.00	**SM2 & SM3 Kerb &channel**		m	35	$ -	$ -	
7.00	**POWER & LIGHTING**						
7.01	Design & installation of public lighting (60m spacing)		no				
8.0	**SIGNING (Hoddle St)**	49,300	m²	1.50	$ 73,950	$ 73,950	
9.0	**LINEMARKING (Hoddle St)**	49,300	m²	1.50	$ 73,950	$ 73,950	
10.0	**MISCELLANEOUS**						
10.1	Traffic Signal Priority (6 Hoddle St)	6	no	20000	$ 120,000	$ 120,000	
10.2	Bus Detection Loops (6 Hoddle St)	12	no	20000	$ 240,000	$ 240,000	needed?
	TOTAL A - D					**$ 182,733**	
E	**Contingency**						
	Lower Bound Contingency (10%)	Item		10%		$ 18,273	
	Upper Bound Contingency (30%)	Item		30%		$ 54,820	
	PROJECT BUDGET						
	Lower Bound Estimate					$ 201,007	
	Upper Bound Estimate					$ 237,553	

	Project Budget (75% Confidence)				**$**	**228,417**

Appendix B Strategy B Costing Spreadsheets

B1 – Area Wide Traffic Management

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy B1 - Traffic Management in Local Streets (20% speed reduction)

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 1,076,275**
	Project Management	Item		8%	1,076,275	
B	**Design and Investigation**					**$ 517,440**
	Detailed Design & Investigation	Item		4%	517,440	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction**					**$ 12,936,000**
1.0	**GENERAL ITEMS**					$ 1,176,000
1.1	Site Establishment	Item		5%	$ 588,000	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 588,000	
2.0	**STRUCTURES**					$ -
2.1	Bridge Construction		m²			
2.2	Tunnel Construction		km			
2.3	Major Culverts		m			
3.00	**ROADWORKS**					$ 11,760,000
3.01	Speed reduction measures	735	no	16000	$ 11,760,000	
4.00	**PAVEMENT**					$ -
4.01	Deep Strength Asphalt		m²	175.00	$ -	
4.02	Granular with Asphalt Surfacing		m²	125.00	$ -	
4.03	Asphalt Surfacing (40mm)		m²	15.00	$ -	
5.00	**DRAINAGE**					$ -
5.01	subsoil drains 100mm dia		m	35	$ -	
5.02	375 RCP (Class 2)					
5.03	Pits/Inspection Openings		no	200	$ -	
6.00	**SM2 & SM3 Kerb &channel**		m	35	$ -	$ -
7.00	**POWER & LIGHTING**					
7.01	Design & installation of public lighting (60m spacing)		no			
8.0	**SIGNING (E Fway & Doncaster Road)**		m²	1.50	$ -	$ -
9.0	**LINEMARKING (E Fway & Doncaster Road)**		m²	1.50	$ -	$ -
	TOTAL A - D					**$ 14,529,715**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 1,452,972
	Upper Bound Contingency (30%)	Item		30%		$ 4,358,915
	PROJECT BUDGET					
	Lower Bound Estimate					$ 15,982,687
	Upper Bound Estimate					$ 18,888,630
	Project Budget (75% Confidence)					**$ 18,162,144**

Appendix C Strategy C Costing Spreadsheets

C1 – Pedestrian Network Improvements

C2 – Bicycle Network Improvements

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy C1 - Pedestrian Improvements

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 2,513,597**
	Project Management	Item		8%	2,513,597	
B	**Design and Investigation**					**$ 1,208,460**
	Detailed Design & Investigation	Item		4%	1,208,460	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction**					**$ 30,211,500**
1.0	**GENERAL ITEMS**					$ 2,746,500
1.1	Site Establishment	Item		5%	$ 1,373,250	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 1,373,250	
2.0	**PROGRAMS/ENFORCEMENT**					$ 3,200,000
2.1	Encourage Walking	2	no	50000	$ 2,000,000	
2.2	Leashing Enforcement	1	no	50000	$ 1,000,000	
2.3	Shared Path Code	Item		10000	$ 200,000	
3.00	**DEVELOPMENT PERMITS**					$ 1,200,000
3.01	Development Applications	Item		10000	$ 200,000	
3.02	Demolition Permits	1,000	no	1000	$ 1,000,000	
4.00	**PATH IMPROVEMENTS**					$ 18,060,000
4.01	Reduce Footpath Clutter	0.5	no	50000	$ 500,000	
4.02	New Paths in Parks	2000	m	90.00	$ 180,000	
4.03	Navigation and Signage	Item			$ 400,000	
4.04	New Pedestrian Signals	58	no	60000.00	$ 3,480,000	
4.05	Improved Street Lighting	Item			$ 4,000,000	
4.06	Traffic Signal Priority	120	no	10000.00	$ 1,200,000	
4.07	Extend Verandahs (Shopping Precincts)	6,000	m	1050.00	$ 6,300,000	
4.08	Additional Seating	Item			$ 2,000,000	
5.00	**MAINTENANCE EXPANSION**					$ 9,405,000
5.01	Repair and Replace	15,750	metre pa	27	$ 8,505,000	
5.02	Improve Laneways	10,000	metre pa	90	$ 900,000	
	TOTAL A - D					**$ 38,333,557**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 3,833,356
	Upper Bound Contingency (30%)	Item		30%		$ 11,500,067
	PROJECT BUDGET					
	Lower Bound Estimate					$ 42,166,912
	Upper Bound Estimate					$ 49,833,624
	Project Budget (75% Confidence)					**$ 47,916,946**

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy C2 - Cyclist Improvements

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY	
A	**Project Management**					**$ 228,800**	
	Project Management	Item		8%	228,800		
B	**Design and Investigation**					**$ 110,000**	
	Detailed Design & Investigation	Item		4%	110,000		
C	**Land Acquisition**					**$ -**	
	Acquire land		m^2				
D	**Construction**					**$ 26,750,000**	
1.0	**GENERAL ITEMS**					$ 250,000	
1.1	Site Establishment	Item		5%	$ 125,000		
1.2	Site Management & Supervision (including QA)	Item		5%	$ 125,000		
2.0	**STRUCTURES**					$ -	
2.1	Bridge Construction		m^2				
2.2	Tunnel Construction		km				
2.3	Major Culverts		m				
3.00	**ROADWORKS**					$ -	
3.01	Stripping topsoil		m^2	5	$ -		
3.02	Excavation		m^3	25	$ -		
3.03	Disposal of excavated material		m^3	15	$ -		
3.04	Compaction of sub grade		m^2	6	$ -		
3.05	Soft areas - excavation, remove and replace		item				
4.00	**PAVEMENT**					$ -	
4.01	Deep Strength Asphalt		m^2	175.00	$ -		
4.02	Granular with Asphalt Surfacing		m^2	125.00	$ -		
4.03	Asphalt Surfacing (40mm)		m^2	15.00	$ -		
5.00	**DRAINAGE**					$ -	
5.01	subsoil drains 100mm dia		m	35	$ -		
5.02	375 RCP (Class 2)						
5.03	Pits/Inspection Openings		no	200	$ -		
6.00	**SM2 & SM3 Kerb &channel**		m	35	$ -	$ -	
8.00	**BICYCLE PROJECTS (costed by Bicycle Vic)**	Item			$ 24,000,000	$ 26,500,000	
8.01	Legalise bikes in MCC gardens	Item			$ 100,000		
8.02	Signage to assist navigation		per year	20000.00	$ 400,000		
8.03	Improved bike parking at employment	100,000	per job	20.00	$ 2,000,000		
8.04	Showers at workplace	Item			$ 2,000,000		Not costed against NC
	TOTAL A - D					**$ 27,088,800**	
E	**Contingency**						
	Lower Bound Contingency (10%)	Item		10%		$ 2,708,880	
	Upper Bound Contingency (30%)	Item		30%		$ 8,126,640	
	PROJECT BUDGET						
	Lower Bound Estimate					$ 29,797,680	
	Upper Bound Estimate					$ 35,215,440	
	Project Budget (75% Confidence)					**$ 33,861,000**	

:CCS

Appendix D Strategy D Costing Spreadsheets

D1 – Changes to Local Parking

D2 – Behavioural Changes

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy D1 - Changes to Local Parking Arrangements

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 529,901**
	Project Management	Item		8%	529,901	
B	**Design and Investigation**					**$ 254,760**
	Detailed Design & Investigation	Item		4%	254,760	
C	**Land Acquisition**					**$ -**
	Acquire land		m^2			
D	**Construction**					**$ 6,369,000**
1.0	**GENERAL ITEMS**					$ 579,000
1.1	Site Establishment	Item		5%	$ 289,500	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 289,500	
2.0	**STRUCTURES**					$ -
2.1	Bridge Construction		m^2			
2.2	Tunnel Construction		km			
2.3	Major Culverts		m			
3.00	**ROADWORKS**					$ -
3.01	Stripping topsoil		m^2	5	$ -	
3.02	Excavation		m^3	25	$ -	
3.03	Disposal of excavated material		m^3	15	$ -	
3.04	Compaction of sub grade		m^2	6	$ -	
3.05	Soft areas - excavation, remove and replace		item			
4.00	**PAVEMENT**					$ -
4.01	Deep Strength Asphalt		m^2	175.00	$ -	
4.02	Granular with Asphalt Surfacing		m^2	125.00	$ -	
4.03	Asphalt Surfacing (40mm)		m^2	15.00	$ -	
5.00	**DRAINAGE**					$ -
5.01	subsoil drains 100mm dia		m	35	$ -	
5.02	375 RCP (Class 2)					
5.03	Pits/Inspection Openings		no	200	$ -	
6.00	**SM2 & SM3 Kerb &channel**		m	35	$ -	$ -
7.00	**SIGNING**	2,700	no	200.00	$ 540,000	$ 540,000
8.00	**METERED PARKING EXTENSION**	525	no	10000.00	$ 5,250,000	$ 5,250,000
	TOTAL A - D					**$ 7,153,661**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 715,366
	Upper Bound Contingency (30%)	Item		30%		$ 2,146,098
	PROJECT BUDGET					
	Lower Bound Estimate					$ 7,869,027
	Upper Bound Estimate					$ 9,299,759
	Project Budget (75% Confidence)					**$ 8,942,076**

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy D2 - Changes to Road User Behaviour

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 2,317,714**
	Project Management	Item		8%	2,317,714	
B	**Design and Investigation**					**$ 1,114,286**
	Detailed Design & Investigation	Item		4%	1,114,286	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction**					**$ 27,857,143**
1.0	**GENERAL ITEMS**					$ -
1.1	Site Establishment	Item				
1.2	Site Management & Supervision (including QA)	Item				
2.0	**STRUCTURES**					$ -
2.1	Bridge Construction		m²			
2.2	Tunnel Construction		km			
2.3	Major Culverts		m			
3.00	**ROADWORKS**					$ -
3.01	Stripping topsoil		m²	5	$ -	
3.02	Excavation		m³	25	$ -	
3.03	Disposal of excavated material		m³	15	$ -	
3.04	Compaction of sub grade		m²	6	$ -	
3.05	Soft areas - excavation, remove and replace		item			
4.00	**PAVEMENT**					$ -
4.01	Deep Strength Asphalt		m²	175.00	$ -	
4.02	Granular with Asphalt Surfacing		m²	125.00	$ -	
4.03	Asphalt Surfacing (40mm)		m²	15.00	$ -	
5.00	**DRAINAGE**					$ -
5.01	subsoil drains 100mm dia		m	35	$ -	
5.02	375 RCP (Class 2)					
5.03	Pits/Inspection Openings		no	200	$ -	
6.00	**SM2 & SM3 Kerb &channel**		m	35	$ -	$ -
7.00	**POWER & LIGHTING**					
7.01	Design & installation of public lighting (60m spacing)		no			
8.0	**BEHAVIOURAL CHANGE**	21	no	1300000.00	$ 27,857,143	$ 27,857,143
9.0	**LINEMARKING (E Fway & Doncaster Road)**		m²		$ -	$ -
	TOTAL A - D					**$ 31,289,143**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 3,128,914
	Upper Bound Contingency (30%)	Item		30%		$ 9,386,743
	PROJECT BUDGET					
	Lower Bound Estimate					$ 34,418,057
	Upper Bound Estimate					$ 40,675,886
	Project Budget (75% Confidence)					**$ 39,111,429**

Appendix E Strategy F Costing Spreadsheets

F1a – Doncaster Area Rapid Transit (guided bus-way)

F1b – Doncaster Area Rapid Transit (light rail vehicles)

F1c – Doncaster Area Rapid Transit (heavy rail vehicles)

F3 – Bus Lanes Alexandra Pde/Princess St

F4 – Shopping Town Modal Interchange

F5 – Park and Ride

F8 – Congestion Charge on Eastern Freeway

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy F1a - Eastern Freeway Mass Rapid Transit (Guided Bus Way)

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY	
A	**Project Management**					**$ 6,794,191**	
	Project Management	Item		8%	6,794,191		
B	**Design and Investigation**					**$ 3,266,438**	
	Detailed Design & Investigation	Item		4%	3,266,438		
C	**Land Acquisition**					**$ -**	
	Acquire land		m²				
D	**Construction**					**$ 81,660,950**	
1.0	**GENERAL ITEMS**					$ 7,416,450	
1.1	Site Establishment	Item		5%	$ 3,708,225		
1.2	Site Management & Supervision (including QA)	Item		5%	$ 3,708,225		
2.0	**DONCASTER HILL I/C**					$ 40,000,000	
2.1	Premium I/C	7,000	m²	5000	$ 35,000,000		
2.2	Associated roadworks to access interchange	Item			$ 5,000,000		
3.00	**GUIDED BUSWAY**					$ 9,070,000	
3.01	concrete guideway	28,000	m	263	$ 7,350,000		
3.02	prepare base	112,000	m²	10	$ 1,120,000		
3.03	associated roadworks to accommodate	6		100000	$ 600,000		
4.00	**STRUCTURES**					$ 6,000,000	
4.01	on/off ramps (for access by other bus services)	3,000	m²	2000.00	$ 6,000,000		
5.00	**PREMIUM I/C (Donaster, Bulleen & Chandler)**					$ 9,000,000	
5.01	car/bus interchange and facilities (refer F5)	Item			$ 9,000,000		
6.00	**TUNNEL (Alex/Nich to Grattan)**					$ 75,000,000	Not included in Strategy Cost (Lor
6.01	tunnel construction (Not included in Strategy)	1,500	m	50000	$ 75,000,000		
7.00	**SERVICES ALLOWANCE**					$ 10,000,000	
7.01	Services Works Allowance		no		$ 10,000,000		
8.0	**SIGNING (Alexandra Pde)**	31,500	m²	1.50	$ 47,250	$ 47,250	
9.0	**LINEMARKING (Alexandra Pde)**	31,500	m²	1.50	$ 47,250	$ 47,250	
10.0	**MISCELLANEOUS**						
10.1	Traffic Signal Priority (4 No.)	4	no	20000	$ 80,000	$ 80,000	
	TOTAL A - D					**$ 91,721,579**	
E	**Contingency**						
	Lower Bound Contingency (10%)	Item		10%		$ 9,172,158	
	Upper Bound Contingency (30%)	Item		30%		$ 27,516,474	
	PROJECT BUDGET						
	Lower Bound Estimate					$ 100,893,737	
	Upper Bound Estimate					$ 119,238,053	
	Project Budget (75% Confidence)					**$ 114,651,974**	

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy F1b - Eastern Freeway Mass Rapid Transit (Light Rail Vehicles)

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 9,899,968**
	Project Management	Item		8%	9,899,968	
B	**Design and Investigation**					**$ 4,759,600**
	Detailed Design & Investigation	Item		4%	4,759,600	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction**					**$ 118,990,000**
1.0	**GENERAL ITEMS**					$ 10,810,000
1.1	Site Establishment	Item		5%	$ 5,405,000	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 5,405,000	
2.0	**DONCASTER HILL I/C**					$ 40,000,000
2.1	Premium I/C	7,000	m²	5000	$ 35,000,000	
2.2	Associated roadworks to access interchange	Item			$ 5,000,000	
3.00	**LRV INFRASTRUCTURE**					$ 35,600,000
3.01	track	14	km	1600000	$ 22,400,000	
3.02	overhead	14	km	300000	$ 4,200,000	
3.03	sub stations	6		1500000	$ 9,000,000	
4.00	**PREMIUM I/C (Donaster, Bulleen & Chandler)**					$ 22,500,000
4.01	elevated bus/LRV interchange	3,750	m	2000	$ 7,500,000	
4.02	waiting lounge (including lifts/escalators)	3	No	2000000	$ 6,000,000	
4.03	car/bus interchange and facilities (refer F5)	Item			$ 9,000,000	
5.00	**SERVICE ALTERATIONS**					$ 10,000,000
5.01	Allowance for Service Alterations		no		$ 10,000,000	
6.0	**SIGNING**		m²	1.50	$ -	$ -
7.0	**LINEMARKING**		m²	1.50	$ -	$ -
8.0	**MISCELLANEOUS**					
8.1	Traffic Signal Priority (4 No.)	4	no	20000	$ 80,000	$ 80,000
	TOTAL A - D					**$ 133,649,568**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 13,364,957
	Upper Bound Contingency (30%)	Item		30%		$ 40,094,870
	PROJECT BUDGET					
	Lower Bound Estimate					$ 147,014,525
	Upper Bound Estimate					$ 173,744,438
	Project Budget (75% Confidence)					**$ 167,061,960**

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy F1c - Eastern Freeway Mass Rapid Transit (Heavy Rail Vehicles)

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 25,488,320**
	Project Management	Item		8%	25,488,320	
B	**Design and Investigation**					**$ 12,254,000**
	Detailed Design & Investigation	Item		4%	12,254,000	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction**					**$ 306,350,000**
1.0	**GENERAL ITEMS**					$ 27,850,000
1.1	Site Establishment	Item		5%	$ 13,925,000	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 13,925,000	
2.0	**DONCASTER HILL STATION**					$ 50,000,000
2.1	Underground Rail Station				$ 50,000,000	
3.00	**HEAVY RAIL INFRASTRUCTURE**					$ 44,000,000
3.01	Track	8	km	1900000	$ 15,200,000	
3.02	Overhead	8	km	800000	$ 6,400,000	
3.03	Signalling	8	km	800000	$ 6,400,000	
3.04	Rail Bridge to Freeway Median	2,000	m²	2000	$ 4,000,000	
3.05	Merri Creek Bridge	1,000	m²	2000	$ 2,000,000	
3.06	Yarra River Bridge	1,500	m²	2000	$ 3,000,000	
3.07	Connection to Existing Rail Network		Item		$ 7,000,000	
4.00	**RAIL TUNNEL**					$ 180,000,000
4.01	Bulleen Road to Doncaster Hill	4.5	km	40000000	$ 180,000,000	
5.00	**NEW SUBSTATIONS**					$ 4,500,000
5.01	Allowance for 3 sub stations	3	no	1500000	$ 4,500,000	
6.0	**SIGNING**		m²		$ -	$ -
7.0	**LINEMARKING**		m²		$ -	$ -
8.0	**MISCELLANEOUS**					
8.1	Traffic Signal Priority (4 No.)		no		$ -	$ -
	TOTAL A - D					**$ 344,092,320**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 34,409,232
	Upper Bound Contingency (30%)	Item		30%		$ 103,227,696
	PROJECT BUDGET					
	Lower Bound Estimate					$ 378,501,552
	Upper Bound Estimate					$ 447,320,016
	Project Budget (75% Confidence)					**$ 430,115,400**

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy F3 - Dedicated Bus Lanes on Alexandra/Princes/Swanston Streets (Marginal Cost to F1a)

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 34,630**
	Project Management	Item		8%	34,630	
B	**Design and Investigation**					**$ 16,649**
	Detailed Design & Investigation	Item		4%	16,649	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction**					**$ 416,230**
1.0	**GENERAL ITEMS**					$ 6,930
1.1	Site Establishment	Item		5%	$ 3,465	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 3,465	
2.0	**STRUCTURES**					$ -
2.1	Bridge Construction		m²			
2.2	Tunnel Construction		km			
2.3	Major Culverts		m			
3.00	**ROADWORKS**					$ -
3.01	Stripping topsoil		m²	5	$ -	
3.02	Excavation		m³	25	$ -	
3.03	Disposal of excavated material		m³	15	$ -	
3.04	Compaction of sub grade		m²	6	$ -	
3.05	Soft areas - excavation, remove and replace		item			
4.00	**PAVEMENT**					$ -
4.01	Deep Strength Asphalt		m²	175.00	$ -	
4.02	Granular with Asphalt Surfacing		m²	125.00	$ -	
4.03	Asphalt Surfacing (40mm)		m²	15.00	$ -	
5.00	**DRAINAGE**					$ -
5.01	subsoil drains 100mm dia		m	35	$ -	
5.02	375 RCP (Class 2)					
5.03	Pits/Inspection Openings		no	200	$ -	
6.00	**SM2 & SM3 Kerb &channel**		m	35	$ -	$ -
7.00	**POWER & LIGHTING**					
7.01	Design & installation of public lighting (60m spacing)		no			
8.0	**SIGNING (Alexandra/Princes)**	23,100	m²	1.50	$ 34,650	$ 34,650
9.0	**LINEMARKING (Alexandra/Princes)**	23,100	m²	1.50	$ 34,650	$ 34,650
10.0	**MISCELLANEOUS**					
10.1	Traffic Signal Priority (3 Alexandra/Princes)	3	no	20000	$ 60,000	$ 60,000
10.2	Bus Detection Loops (7 Swanston)	14	no	20000	$ 280,000	$ 280,000
	TOTAL A - D					**$ 467,510**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 46,751
	Upper Bound Contingency (30%)	Item		30%		$ 140,253
	PROJECT BUDGET					
	Lower Bound Estimate					$ 514,260
	Upper Bound Estimate					$ 607,762
	Project Budget (75% Confidence)					**$ 584,387**

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy F4 - Improved Modal Interchange at Doncaster Shoppingtown

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 3,660,800**
	Project Management	Item		8%	3,660,800	
B	**Design and Investigation**					**$ 1,760,000**
	Detailed Design & Investigation	Item		4%	1,760,000	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction**					**$ 44,000,000**
1.0	**GENERAL ITEMS**					$ 4,000,000
1.1	Site Establishment	Item		5%	$ 2,000,000	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 2,000,000	
2.0	**DONCASTER HILL I/C**					$ 35,000,000
2.1	Premium I/C	7,000	m²	5000	$ 35,000,000	
3.00	**ROADWORKS**					$ 5,000,000
3.01	Associated roadworks to access interchange	Item			$ 5,000,000	
4.00	**PAVEMENT**					$ -
4.01	Deep Strength Asphalt		m²	175.00	$ -	
4.02	Granular with Asphalt Surfacing		m²	125.00	$ -	
4.03	Asphalt Surfacing (40mm)		m²	15.00	$ -	
5.00	**DRAINAGE**					$ -
5.01	subsoil drains 100mm dia		m	35	$ -	
5.02	375 RCP (Class 2)					
5.03	Pits/Inspection Openings		no	200	$ -	
6.00	**SM2 & SM3 Kerb &channel**		m	35	$ -	$ -
7.00	**POWER & LIGHTING**					
7.01	Design & installation of public lighting (60m spacing)		no			
8.0	**SIGNING (E Fway & Doncaster Road)**		m²	1.50	$ -	$ -
9.0	**LINEMARKING (E Fway & Doncaster Road)**		m²	1.50	$ -	$ -
	TOTAL A - D					**$ 49,420,800**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 4,942,080
	Upper Bound Contingency (30%)	Item		30%		$ 14,826,240
	PROJECT BUDGET					
	Lower Bound Estimate					$ 54,362,880
	Upper Bound Estimate					$ 64,247,040
	Project Budget (75% Confidence)					**$ 61,776,000**

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy F5 - Park and Ride (Doncaster Road, Bulleen Road, Chandler Hwy)

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 239,500**
	Project Management	Item		8%	239,500	
B	**Design and Investigation**					**$ 115,144**
	Detailed Design & Investigation	Item		4%	115,144	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction**					**$ 2,878,600**
1.0	**GENERAL ITEMS**					$ 252,600
1.1	Site Establishment	Item		5%	$ 126,300	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 126,300	
2.0	**STRUCTURES**					$ -
2.1	Bridge Construction		m²			
2.2	Tunnel Construction		km			
2.3	Major Culverts		m			
3.00	**ROADWORKS (Doncaster Road-400 spaces)**					$ 1,072,000
3.01	Stripping topsoil	12,000	m²	5	$ 60,000	
3.02	Excavation	12,000	m³	25	$ 300,000	
3.03	Disposal of excavated material	12,000	m³	15	$ 180,000	
3.04	Import improved sub-grade	6,000	m³	30	$ 180,000	
3.05	Compaction of sub grade	12,000	m²	6	$ 72,000	
3.06	Soft areas - excavation, remove and replace		item		$ 100,000	
3.07	Landscaping	3,600	m²	50	$ 180,000	
4.00	**PAVEMENT**					$ 1,050,000
4.01	Deep Strength Asphalt	8,400	m²	125.00	$ 1,050,000	
4.02	Granular with Asphalt Surfacing		m²	125.00	$ -	
4.03	Asphalt Surfacing (40mm)		m²	15.00	$ -	
5.00	**DRAINAGE**					$ 298,000
5.01	subsoil drains 100mm dia	2,000	m	35	$ 70,000	
5.02	375 RCP (Class 2)	1,200	m	160	$ 192,000	
5.03	Pits/Inspection Openings	24	no	1500	$ 36,000	
6.00	**SM2 & SM3 Kerb &channel**	2,000	m	35	$ 70,000	$ 70,000
7.00	**POWER & LIGHTING**					
7.01	Design & installation of public lighting	Item			$ 100,000	
8.00	**SIGNING**	12,000	m²	1.50	$ 18,000	$ 18,000
9.00	**LINEMARKING**	12,000	m²	1.50	$ 18,000	$ 18,000
10.00	**BUILDINGS**					
10.01	Waiting Lounge/Toilets	100	m²	1000.00	$ 100,000	$ 100,000
11.00	**Other Park and Rides**					
11.01	Bulleen Road (300 spaces)				$ 3,031,166	$ 3,031,166
11.02	Chandler Hwy (200 spaces)				$ 2,020,777	$ 2,020,777
	TOTAL A - D					**$ 3,233,244**
E	**Contingency**					

	Lower Bound Contingency (10%)	Item		10%		$	323,324
	Upper Bound Contingency (30%)	Item		30%		$	969,973
	PROJECT BUDGET						
	Lower Bound Estimate					$	3,556,568
	Upper Bound Estimate					$	4,203,217
	Project Budget (75% Confidence)					**$**	**4,041,554**

Doncaster	**$**	**4,000,000**
Bulleen	**$**	**3,000,000**
Chandler	**$**	**2,000,000**
Total	**$**	**9,000,000**

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy F8 - Congestion Charge on Eastern Freeway

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 549,120**
	Project Management	Item		8%	549,120	
B	**Design and Investigation**					**$ 264,000**
	Detailed Design & Investigation	Item		4%	264,000	
C	**Land Acquisition**					**$ -**
	Acquire land		m²			
D	**Construction**					**$ 6,600,000**
1.0	**GENERAL ITEMS**					$ 600,000
1.1	Site Establishment	Item		5%	$ 300,000	
1.2	Site Management & Supervision (including QA)	Item		5%	$ 300,000	
2.0	**STRUCTURES**					$ -
2.1	Bridge Construction		m²			
2.2	Tunnel Construction		km			
2.3	Major Culverts		m			
3.00	**ROADWORKS**					$ -
3.01	Stripping topsoil		m²	5	$ -	
3.02	Excavation		m³	25	$ -	
3.03	Disposal of excavated material		m³	15	$ -	
3.04	Compaction of sub grade		m²	6	$ -	
3.05	Soft areas - excavation, remove and replace		item			
4.00	**PAVEMENT**					$ -
4.01	Deep Strength Asphalt		m²	175.00	$ -	
4.02	Granular with Asphalt Surfacing		m²	125.00	$ -	
4.03	Asphalt Surfacing (40mm)		m²	15.00	$ -	
5.00	**DRAINAGE**					$ -
5.01	subsoil drains 100mm dia		m	35	$ -	
5.02	375 RCP (Class 2)					
5.03	Pits/Inspection Openings		no	200	$ -	
6.00	**SM2 & SM3 Kerb &channel**		m	35	$ -	$ -
7.00	**POWER & LIGHTING**					
7.01	Design & installation of public lighting (60m spacing)		no			
8.0	**TOLL GANTRIES/COMMS ETC**	2	no	3000000	$ 6,000,000	$ 6,000,000
	TOTAL A - D					**$ 7,413,120**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 741,312
	Upper Bound Contingency (30%)	Item		30%		$ 2,223,936
	PROJECT BUDGET					
	Lower Bound Estimate					$ 8,154,432
	Upper Bound Estimate					$ 9,637,056
	Project Budget (75% Confidence)					**$ 9,266,400**

Appendix F Strategy G Costing Spreadsheets

G1 – Tunnel Connection, Eastern Freeway to City Link (with ramps)

G2 – Ancillary Road Works

G3 – Tunnel Access to CBD

G4 – Tunnel Connection, Eastern Freeway to City Link (no ramps)

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy G1 - Driven Tunnel, Hoddle St to Elliott Ave (2 x 2 lane, I/Cs @ Nicholson St & Royal Pde)

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY	
A	**Project Management**					**$ 42,466,714**	
	Project Management	Item		8%	42,466,714		
B	**Design and Investigation**					**$ 20,416,689**	
	Detailed Design & Investigation	Item		4%	20,416,689		
C	**Land Acquisition**					**$ 5,000,000**	
	Acquire land	Item			$ 5,000,000		guess
D	**Construction**					**$ 510,417,230**	
1.0	**GENERAL ITEMS**					$ 46,337,930	
1.1	Site Establishment	Item		5%	$ 23,168,965		
1.2	Site Management & Supervision (including QA)	Item		5%	$ 23,168,965		
2.0	**STRUCTURES**					$ 460,000,000	
2.1	Bridge Construction		m^2				
2.2	Tunnel Construction (2 tunnels each 2 lane)	4.7	km	70,000,000	$ 329,000,000		
2.3	Tunnel Construction (I/C ramps, single lane)	3.0	km	27,000,000	$ 81,000,000		
2.4	Tunnel Portal, Eastern Freeway	Item			$ 30,000,000		
2.5	Tunnel Portal, Elliott Avenue	Item			$ 20,000,000		
3.00	**ROADWORK (realign Alexandra/Royal @ I/C)**					$ 484,200	
3.01	Stripping topsoil	13,200	m^2	5	$ 66,000		
3.02	Excavation	6,600	m^3	25	$ 165,000		
3.03	Disposal of excavated material	6,600	m^3	15	$ 99,000		
3.04	Compaction of sub grade	13,200	m^2	6	$ 79,200		
3.05	Soft areas - excavation, remove and replace	Item			$ 75,000		
4.00	**PAVEMENT**					$ 2,359,500	
4.01	Deep Strength Asphalt	13,200	m^2	175.00	$ 2,310,000		
4.02	Granular with Asphalt Surfacing		m^2	125.00	$ -		
4.03	Asphalt Surfacing (40mm)	3,300	m^2	15.00	$ 49,500		
5.00	**DRAINAGE**					$ 312,000	
5.01	subsoil drains 100mm dia	2,400	m	35	$ 84,000		
5.02	375 RCP (Class 2)	1,200	m	160	$ 192,000		
5.03	Pits/Inspection Openings	24	no	1500	$ 36,000		
6.00	**SM2 & SM3 Kerb &channel**	2,400	m	35	$ 84,000	$ 84,000	
7.00	**POWER & LIGHTING**						
7.01	Design & Installation (60m spacing)	Item			$ 100,000	$ 100,000	
8.0	**SIGNING**	13,200	m^2	1.50	$ 19,800	$ 19,800	
9.0	**LINEMARKING**	13,200	m^2	1.50	$ 19,800	$ 19,800	
10.0	**MISCELLANEOUS**						
10.1	Signalised intersection works	6	no	100,000	$ 600,000	$ 600,000	
10.2	Other intersection works at Royal Pde	Item			$ 100,000	$ 100,000	
	TOTAL A - D					**$ 578,300,633**	
E	**Contingency**						
	Lower Bound Contingency (10%)	Item		10%		$ 57,830,063	
	Upper Bound Contingency (30%)	Item		30%		$ 173,490,190	
	PROJECT BUDGET						
	Lower Bound Estimate					$ 636,130,696	
	Upper Bound Estimate					$ 751,790,823	
	Project Budget (75% Confidence)					**$ 722,875,791**	

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy G2 - Close MacArthur St and Left in/out at Gatehouse St

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY
A	**Project Management**					**$ 12,480**
	Project Management	Item		8%	12,480	
B	**Design and Investigation**					**$ 6,000**
	Detailed Design & Investigation	Item		4%	6,000	
C	**Land Acquisition**					**$ -**
	Acquire land		m^2			
D	**Construction**					**$ 150,000**
1.0	**GENERAL ITEMS**					$ -
1.1	Site Establishment	Item		5%	$ -	
1.2	Site Management & Supervision (including QA)	Item		5%	$ -	
2.0	**STRUCTURES**					$ -
2.1	Bridge Construction		m^2			
2.2	Tunnel Construction (2 tunnels each 2 lane)		km	70,000,000	$ -	
2.3	Tunnel Construction (I/C ramps, single lane)		m	45,000,000	$ -	
3.00	**ROADWORKS (realign Alexandra at I/C)**					$ -
3.01	Stripping topsoil		m^2	5	$ -	
3.02	Excavation		m^3	25	$ -	
3.03	Disposal of excavated material		m^3	15	$ -	
3.04	Compaction of sub grade		m^2	6	$ -	
3.05	Soft areas - excavation, remove and replace					
4.00	**PAVEMENT**					$ -
4.01	Deep Strength Asphalt		m^2	175.00	$ -	
4.02	Granular with Asphalt Surfacing		m^2	125.00	$ -	
4.03	Asphalt Surfacing (40mm)		m^2	15.00	$ -	
5.00	**DRAINAGE**					$ -
5.01	subsoil drains 100mm dia		m	35	$ -	
5.02	375 RCP (Class 2)					
5.03	Pits/Inspection Openings		no	200	$ -	
6.00	**SM2 & SM3 Kerb &channel**		m	35	$ -	$ -
7.00	**POWER & LIGHTING**					
7.01	Design & Installation (60m spacing)		no			
8.00	**MISCELLANEOUS**					
8.01	Close MacArthur Street, re-open The Avenue Sth	Item			$ 50,000	$ 50,000
8.02	Other median works in Royal Pde	Item			$ 100,000	$ 100,000
	TOTAL A - D					**$ 168,480**
E	**Contingency**					
	Lower Bound Contingency (10%)	Item		10%		$ 16,848
	Upper Bound Contingency (30%)	Item		30%		$ 50,544
	PROJECT BUDGET					
	Lower Bound Estimate					$ 185,328
	Upper Bound Estimate					$ 219,024
	Project Budget (75% Confidence)					**$ 210,600**

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy G3 - Driven Tunnel, Hoddle St to Victoria Parade (2 x 2 lane)

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY	
A	**Project Management**					**$ 21,523,840**	
	Project Management	Item		8%	21,523,840		
B	**Design and Investigation**					**$ 10,348,000**	
	Detailed Design & Investigation	Item		4%	10,348,000		
C	**Land Acquisition**					**$ 5,000,000**	
	Acquire land	Item			$ 5,000,000		guess
D	**Construction**					**$ 258,700,000**	
1.0	**GENERAL ITEMS**					$ 23,500,000	
1.1	Site Establishment	Item		5%	$ 11,750,000		
1.2	Site Management & Supervision (including QA)	Item		5%	$ 11,750,000		
2.0	**STRUCTURES**					$ 235,000,000	
2.1	Bridge Construction		m^2				
2.2	Tunnel Construction (2 tunnels each 2 lane)	2.5	km	70,000,000	$ 175,000,000		
2.3	Tunnel Portal, Eastern Freeway	Item			$ 30,000,000		
2.4	Tunnel Portal and Assoc Works, Victoria Parade	Item			$ 30,000,000		
3.00	**ROADWORK**					$ -	
3.01	Stripping topsoil		m^2	5	$ -		
3.02	Excavation		m^3	25	$ -		
3.03	Disposal of excavated material		m^3	15	$ -		
3.04	Compaction of sub grade		m^2	6	$ -		
3.05	Soft areas - excavation, remove and replace	Item					
4.00	**PAVEMENT**					$ -	
4.01	Deep Strength Asphalt		m^2	175.00	$ -		
4.02	Granular with Asphalt Surfacing		m^2	125.00	$ -		
4.03	Asphalt Surfacing (40mm)		m^2	15.00	$ -		
5.00	**DRAINAGE**					$ -	
5.01	subsoil drains 100mm dia		m	35	$ -		
5.02	375 RCP (Class 2)		m	160	$ -		
5.03	Pits/Inspection Openings		no	1500	$ -		
6.00	**SM2 & SM3 Kerb &channel**		m	35	$ -	$ -	
7.00	**POWER & LIGHTING**						
7.01	Design & Installation (60m spacing)	Item				$ -	
8.0	**SIGNING**		m^2	1.50	$ -	$ -	
9.0	**LINEMARKING**		m^2	1.50	$ -	$ -	
10.0	**MISCELLANEOUS**						
10.1	Signalised intersection works	2	no	100,000	$ 200,000	$ 200,000	
	TOTAL A - D					**$ 295,571,840**	
E	**Contingency**						
	Lower Bound Contingency (10%)	Item		10%		$ 29,557,184	
	Upper Bound Contingency (30%)	Item		30%		$ 88,671,552	
	PROJECT BUDGET						
	Lower Bound Estimate					$ 325,129,024	
	Upper Bound Estimate					$ 384,243,392	
	Project Budget (75% Confidence)					**$ 369,464,800**	

NORTHERN CENTRAL CITY CORRIDOR STUDY

Strategy G4 - Driven Tunnel, Hoddle St to Elliott Ave (2 x 2 lane)

ITEM	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	AMOUNT	SUMMARY	
A	**Project Management**					**$ 34,686,080**	
	Project Management	Item		8%	34,686,080		
B	**Design and Investigation**					**$ 16,676,000**	
	Detailed Design & Investigation	Item		4%	16,676,000		
C	**Land Acquisition**					**$ 5,000,000**	
	Acquire land	Item			$ 5,000,000		guess
D	**Construction**					**$ 416,900,000**	
1.0	**GENERAL ITEMS**					$ 37,900,000	
1.1	Site Establishment	Item		5%	$ 18,950,000		
1.2	Site Management & Supervision (including QA)	Item		5%	$ 18,950,000		
2.0	**STRUCTURES**					$ 379,000,000	
2.1	Bridge Construction		m^2				
2.2	Tunnel Construction (2 tunnels each 2 lane)	4.7	km	70,000,000	$ 329,000,000		
2.3	Tunnel Portal, Eastern Freeway	Item			$ 30,000,000		
2.4	Tunnel Portal, Elliott Avenue	Item			$ 20,000,000		
3.00	**ROADWORK**					$ -	
3.01	Stripping topsoil		m^2	5	$ -		
3.02	Excavation		m^3	25	$ -		
3.03	Disposal of excavated material		m^3	15	$ -		
3.04	Compaction of sub grade		m^2	6	$ -		
3.05	Soft areas - excavation, remove and replace	Item					
4.00	**PAVEMENT**					$ -	
4.01	Deep Strength Asphalt		m^2	175.00	$ -		
4.02	Granular with Asphalt Surfacing		m^2	125.00	$ -		
4.03	Asphalt Surfacing (40mm)		m^2	15.00	$ -		
5.00	**DRAINAGE**					$ -	
5.01	subsoil drains 100mm dia		m	35	$ -		
5.02	375 RCP (Class 2)		m	160	$ -		
5.03	Pits/Inspection Openings		no	1500	$ -		
6.00	**SM2 & SM3 Kerb &channel**		m	35	$ -	$ -	
7.00	**POWER & LIGHTING**						
7.01	Design & Installation (60m spacing)	Item				$ -	
8.0	**SIGNING**		m^2	1.50	$ -	$ -	
9.0	**LINEMARKING**		m^2	1.50	$ -	$ -	
10.0	**MISCELLANEOUS**						
10.1	Signalised intersection works		no	100,000	$ -	$ -	
10.2	Other intersection works at Royal Pde	Item				$ -	
	TOTAL A - D					**$ 473,262,080**	
E	**Contingency**						
	Lower Bound Contingency (10%)	Item		10%		$ 47,326,208	
	Upper Bound Contingency (30%)	Item		30%		$ 141,978,624	
	PROJECT BUDGET						
	Lower Bound Estimate					$ 520,588,288	
	Upper Bound Estimate					$ 615,240,704	
	Project Budget (75% Confidence)					**$ 591,577,600**	