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SH1 Basin Reserve Long Term Transport Solutions

Scheme Assessment Report

Volume 1 of 2

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Scheme Assessment Report

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Prepared for

Transit New Zealand

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1.0 Summary

2.0 Site Description

2.1 Description and Function

The Basin Reserve is located at the south end of Cambridge and Kent Terraces. It serves as the intersection point of Cambridge and Kent Terraces, Adelaide Road, Paterson Street and Buckle Street, as well as four other minor streets.

The intersection is rectangular in shape, with approximate dimensions of 220m by 190m. Traffic at the Basin is controlled in the form of a one-way circulating carriageway. The length of circulating carriageway is approximately 820m.

The carriageway varies in width along the length of the intersection. At various points, there are one, two, three or four circulating lanes.

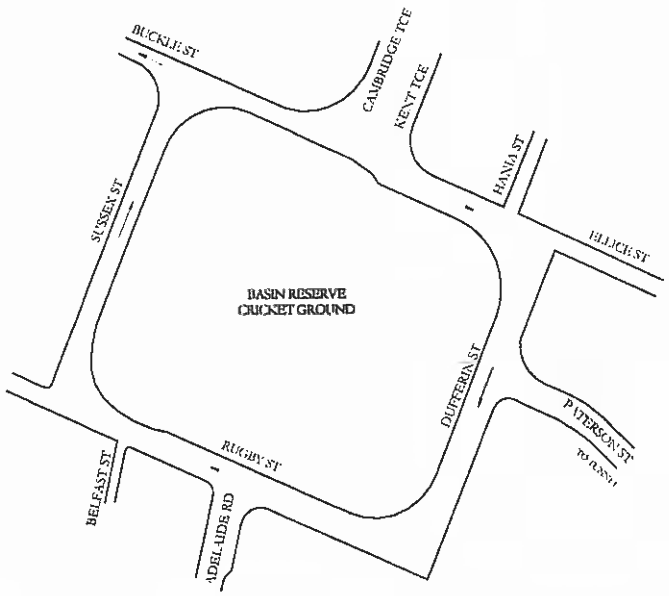


Figure 2.1.1 Existing Basin Reserve Layout

Kent Terrace, Dufferin, Paterson, Rugby, Sussex and Buckle Streets form part of SH 1 and fall under Transit New Zealand control. All other roads are controlled by Wellington City Council. Adelaide Road and Cambridge Terrace are classified as principal and arterial streets respectively. Hania and Ellice Streets are classified as local streets. Belfast Street is a small service lane.

The major roads that meet at the intersection provide links to many different areas of Wellington. In particular, Adelaide Road provides the main link between the Central Business District and Wellington Hospital. It also is the main link between the CBD and the southern suburbs.

Paterson Street leads into the Mt Victoria Tunnel, and beyond to Hataitai and the eastern suburbs of Kilbirnie, Lyall Bay, Rongotai, Strathmore, Seatoun and Miramar. From these eastern suburbs, another access to the CBD is provided by Evans Bay Parade and Oriental Parade. This link is most useful for vehicles moving to or from the harbour side of the CBD. For other movements, the route through the Basin is more convenient and generally preferred.

2.2 Surrounding Environment

The Basin Reserve intersection is positioned in a natural basin at the base of Mt Victoria. The land the Basin is located on is relatively flat, but does slope upwards on the eastern and western sides.

Topographical details:

- Coming out from the tunnel, the drop from the entrance to the tunnel to the end of Paterson Street is approximately 8 metres.

- Rugby Street rises a height of 5 metres from Adelaide Road to Sussex Street. The gradient is similar along Buckle Street from Cambridge Terrace to Sussex Street.

- Along Sussex Street, there is a slight rise (approx. 1 metre) between Rugby Street and Buckle Street.

- The eastern half of the intersection area has height above the city datum of 8.0 metres. Sussex Street has a height of approximately 14.0 metres.

2.3 Land Use

Surrounding the Basin Reserve are four streets acting as linkages in what is effectively a cross roads of Cambridge/Kent Terraces to Adelaide Road and Paterson Street to Buckle Street.

The land uses around the Basin differ on each street. An analysis of the land uses at both ground floor and above is provided in Appendix M. Residential activities fronting the Basin Reserve are quite limited although this has increased with the recent construction of student accommodation by Massey University on Sussex Street.

All the land fronting the Basin except for Rugby Street is zoned Inner Residential in the Proposed Wellington City District Plan. Rugby Street is a zoned suburban centre and is a mixed commercial frontage with car vehicle yards, a pub with accommodation, hairdressers, a retailer of recreational equipment and a dive centre.

Most of the above first floor is office but there is some residential. In the centre of the commercial frontage just west of Belfast Street are two residential villas that have been modernised in recent times.

Sussex Street has seen the most redevelopment in recent times. New land uses include a motel, family restaurant and the Massey University accommodation referred to above. In addition there are a couple of detached houses and a church set back from the road.

Buckle Street north of Cambridge Terrace is largely open space with a single small heritage building that is used as offices at the present time. On the Kent Terrace / Buckle Street corner is a mixture of retail activities with some accommodation at first floor level. This includes a jukebox retailer, fast food outlets and a trophy retailer.

St Marks Primary School and Wellington College are located east of the Basin and have direct access to the Basin from Dufferin Street. Wellington East Girls College is located further east of Wellington College. It is accessed from Paterson Street and Ellice Street via a roadway above the Mt Victoria Tunnel.

The block between Ellice and Paterson has a significant amount of open space with the rest being St Joseph's Church land, which includes residential activities as well as the Church.

A further church, St Marks, is located on Dufferin Street and is enveloped by St Marks School. There is also a childcare centre on the corner of Dufferin and Paterson and a three-storey block of flats.

The only recent resource consents granted for the area involve the Basin Reserve itself. These are:

- Subdivision consent to enable the lease of the area of the Basin Reserve within the fenceline to be leased to the Wellington Regional Stadium Trust.

- Land use consent to construct an indoor cricket-training centre on land at the southwest corner of the Basin Reserve.

A significant amount of land not currently used for road between Buckle Street and Paterson Street is currently owned by Transit New Zealand. This includes the small brick heritage building on Buckle Street and some of the shops between Kent Terrace and Hania Street.

The effects on land uses covers the following issues:

- Land lost for construction of the project: The cost of acquisition and compensation to owners and occupiers of land is taken into account in the project costs.

- Effect of the new roading configuration on existing activities: This includes ease of access to existing activities, parking, deliveries as well as the pedestrian environment for these activities.

- Effect of the project on potential future land use activities: This factor recognises that the objective of this project is to develop long-term transport solutions for the area. Over time new activities will replace existing activities and schemes can facilitate or hinder the efficient use of land and buildings in the area.

There are large Pohutakawa trees on the perimeter of the Basin Reserve along Dufferin and Rugby Streets. These trees overhang the inside lane of the circulating carriageway.

2.4 Traffic Facilities

There are five pedestrian crossings in the intersection area, located on:

- Kent Terrace, immediately before Ellice Street intersection
- The single circulating lane between Buckle and Ellice Streets.
- Rugby Street, at the Adelaide Road intersection
- Adelaide Road, at the Rugby Street intersection.
- Cambridge Terrace, just beyond Ellice Street.

Traffic signals have recently been installed at the Paterson Street / Dufferin Street intersection. These control the movements of traffic entering and leaving Paterson Street, and also vehicles on the circulating carriageway.

There is a recently installed signalised pedestrian crossing associated with the new traffic signals. This allows crossing of Dufferin Street and Paterson Street.

Traffic islands are located at the following points around the Basin:

- Adelaide Road and Rugby Street intersection. This serves as a central refuge for pedestrians crossing the road at the pedestrian crossings there.

- Dufferin and Ellice Streets intersection. This controls traffic movements between Ellice and Hania Streets and the circulating carriageway.

- Rugby and Sussex Streets intersection. This forms an entry lane for vehicles entering the Basin from carriageway.

- Sussex and Buckle Streets intersection. A traffic island at the end of Sussex Street splits traffic into left or right along Buckle Street.

- All signage around the Basin is installed on the berm either to one side of or at the end of the circulating roadway. There are no gantry structures across the road supporting signs. Direction signs are standard Transit NZ design.

2.5 Traffic Volumes

Montgomery Watson performed a 24-hour traffic count at the Basin Reserve in 1998. The traffic counts and 24-hour flow profile from this survey are used as the basis for analysis in this report. The volumes have been updated to represent year 2000 values using a growth factor of 2.0%.

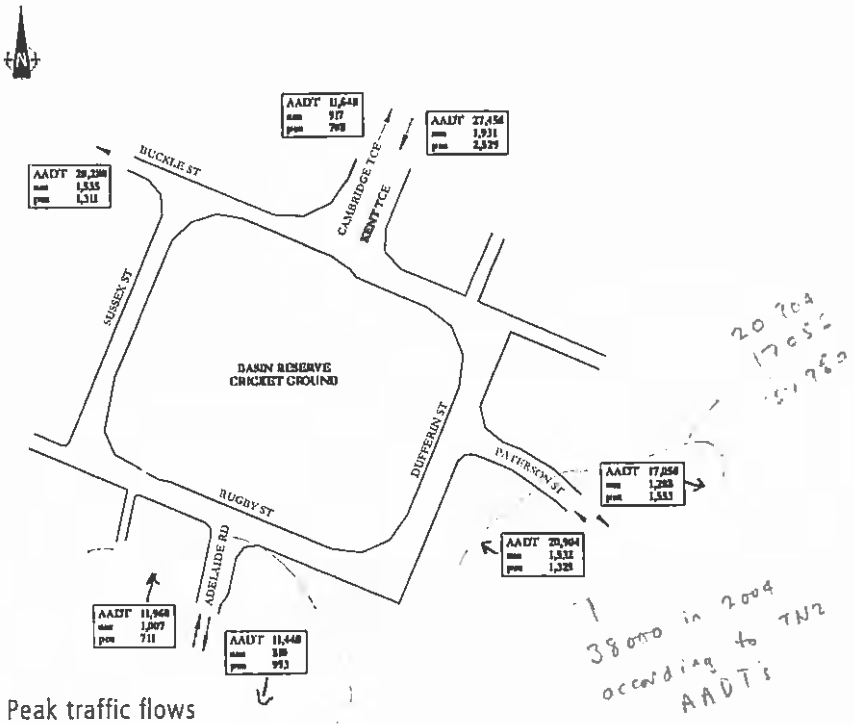


Figure 2.5.1 Peak traffic flows

The 2% growth factor has been derived from previous traffic surveys performed by WCC an Paterson Street between 1994 and 1998. This value is deemed to be more acurate that the 2.5% given in the PEM.

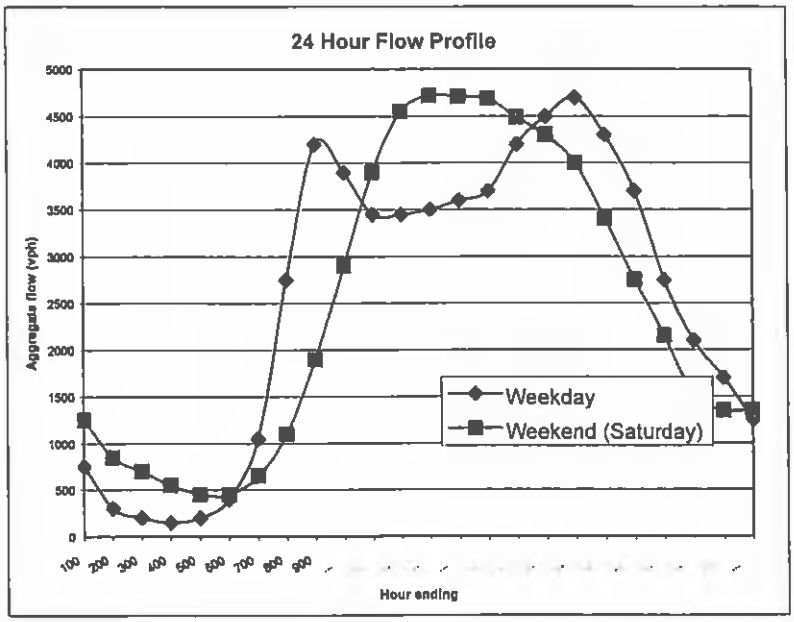


Figure 2.5.2 24 Hour flow profile

Peak flows used in the economic analysis have been determined from the 24-hour flow profile. The am peak is one hour long and occurs between 8:30 and 9:15 am. The pm peak is two hours long, and occurs between 4:30 and 6:30 pm.

During business hours, there is a reasonably constant flow of vehicles. At 3:00pm, the flow begins to grow noticeably to the pm peak value. It is likely that after school movements contribute to the growth in traffic at this time.

Weekend flows (represented by a Saturday flow – Sunday is assumed to be similar) are characterised by a large peak period during the middle of the day. This peak is between approximately 12:00 noon and 4:00 pm. The flow during this peak is approximately the same as the weekday pm peak, but is in both directions of travel.

2.6 Utilities

The Basin Reserve area is heavily congested with underground services, including sewer and stormwater pipes, watermains and electrical lines.

Three large stormwater pipes, 1000mm, 1200mm and 1800mm in diameter run along Cambridge and Kent Terrace, under the Basin Reserve, and then along Adelaide Road.

A 33kV electrical cable circulates the carriageway from Buckle Street to Rugby Street, and a Telecom fibre optic cable runs from Cambridge Terrace to Buckle Street.

There are also overhead trolley bus lines in the circulating carriageway. These run from Adelaide Road to Cambridge Terrace along Sussex Street, and from Kent Terrace to Adelaide Road along Dufferin Street.

2.7 Previous Work and Site Maintenance History

The most substantial work at the Basin Reserve in previous years took place at the start of 2000.

Traffic signals were installed at the intersection of Paterson Street and Dufferin Street. These signals control traffic moving in both directions on Paterson Street and circulating traffic on Dufferin Street.

At the same time, a large enclosed refuge island was installed at the end of Paterson Street. This provides a signalised pedestrian crossing point across both sides of Paterson Street.

Associated with this work was the installation of a bus bay outside St Marks Primary School on Dufferin Street. This involved the construction of a concrete island and a steel fence on the left side of the circulating carriageway.

New concrete islands were also installed at the entrance to Government House at the corner of Dufferin and Rugby Streets.

This work was performed primarily to: improve safety for pedestrians in the area, improve safety for vehicular traffic, reduce congestion at Dufferin and Paterson Streets, and provide a safe drop-off and pick-up facility outside St Marks Primary School. This altered layout is a short-term solution which was able to be installed within the existing road reserve.

Another recent large item of work was the resurfacing of Paterson Street between the Mt Victoria tunnel and Dufferin Street.

Other site maintenance recently performed:

- Minor resurfacing of small areas of the circulating carriageway.
- Installation of new floodlights and beacons at the pedestrian crossing on Rugby Street.
- Realignment and installation of a 'Give Way' control at the intersection of the slip lane and Kent Terrace.

3.0 Problem Description

3.1 Congestion

During the am and pm peak traffic times, some sections of road at the Basin are operating at or near to capacity.

The sections of road with volumes greater than capacity are the end of Kent Terrace entering the Basin, and from the Dufferin Street signals to Adelaide Road.

Large queues form on the three approach roads, particularly Kent Terrace and during the pm peak. Here, the queue in the left hand lane can extend to the Vivian Street intersection, and along Vivian Street. Queues form during the am peak entering the intersection from Paterson Street and Adelaide Road.

The queue along Adelaide Road during am peak reaches approximately 20 vehicles in the right hand lane. At the same time, the queue along Paterson Street reaches approximately 25 vehicles in the left hand lane, somewhat less in the right hand lane.

Congestion during peak times creates a potential hazard for emergency services attempting to travel through the area. This is particularly relevant for ambulances moving to and from Wellington Hospital, which is located south of the intersection.

The predicted annual traffic growth rate of 2.0% means that existing congestion will only get worse for the existing layout.

3.2 Accidents

The accident rate for the Basin is higher than the national average. The overall rate is 0.31 injury accidents per million vehicles, while the Transfund New Zealand Project Evaluation Manual gives a typical rate of .115 for a 4-leg roundabout. Although a 4-leg roundabout is not directly comparable the rate does give a good indication of the accident rate.

Note that the accident rate above is that prior to traffic signals being installed at the intersection of Dufferin and Paterson Streets. These signals are likely to reduce the number of accidents at this intersection, and so reduce the total rate.

The analysis uses the accident record retrieved from the LTSA AIS database for the five-year period 1995 – 1999.

Total Accidents	Fatal	Serious	Minor	Non Injury
167	1	4	27	135

Figure 3.2.1: Accident data.

Individual intersections also show rates exceeding typical rates. For example, at the Kent/Ellice intersection the injury rate is 0.17 accidents per million vehicles, compared with the PEM typical rate of 0.068 for a priority T.

Sites with the highest number of accidents are:

Location	Fatal	Serious	Minor	Non Injury
Kent Terrace/Ellice Street	1	0	6	14
Adelaide Road/Rugby Street	0	1	2	30
Sussex Street	0	1	4	21

Figure 3.2.2: High accident rate sites

3.3 Substandard Level of Service and Traffic Operation

The overall geometry of the Basin creates a difficult driving environment. This is largely due to the 90-degree corners around the Reserve, and the changes in grade.

These two factors increase the hazard of lane changing around the Basin. This is particularly so during am and pm peak traffic times. 25 recorded accidents are the result of lane changing.

Weaving of vehicles was identified as a potential hazard in the scheme assessment report "Basin Reserve Traffic and Safety Improvements", Montgomery Watson, September 1999. Weaving is particularly prevalent along Rugby Street and Sussex Street, when traffic from Adelaide Road is merging with circulating traffic. While weaving has been observed on site, it is likely that the installation of traffic signals on Dufferin Street has reduced the frequency of such movements.

Pedestrian crossings at the Basin have also created accident potential. Seven pedestrians have been involved in accidents at crossings, and seventeen rear end collisions have occurred as a result of pedestrians crossing the road.

Other observed traffic operation issues:

- Lanes throughout the intersection area are unevenly utilised.

- The left hand lane along Kent Terrace is very wide. It is common for two vehicles to travel in this one lane, and then have difficulty merging at the intersection with Ellice Street.

- Uneven lane utilisation for vehicles moving between Cambridge and Mt Victoria Tunnel. A very large proportion of motorists use the right hand lane.

3.4 Traffic Issues Raised During Public Consultation

At the completion of Stage 1 of the consultation process (see section 6), the following have been deemed the key desired traffic features of any new layout:

Desired Speed Features

- Ensure uniform vehicle speeds along all roads

- Prevent any excessive speeds

- Provide traffic calming

Desired Truck Features

- Reduce or eliminate sharp corners

- Provide a solution without traffic signals

4.0 Pedestrian / Cyclist Issues

4.1 Pedestrians

There are five pedestrian crossings in the Basin area, located on:

- Kent Terrace, immediately before Ellice Street intersection
- The single circulating lane between Buckle and Ellice Streets.
- Rugby Street, at the Adelaide Road intersection
- Adelaide Road, at the Rugby Street intersection.
- Cambridge Terrace, just beyond Ellice Street

In addition, signalised pedestrian crossings have recently been installed with the traffic signals at the intersection of Dufferin and Paterson Streets.

The locations of these pedestrian crossings are shown below.

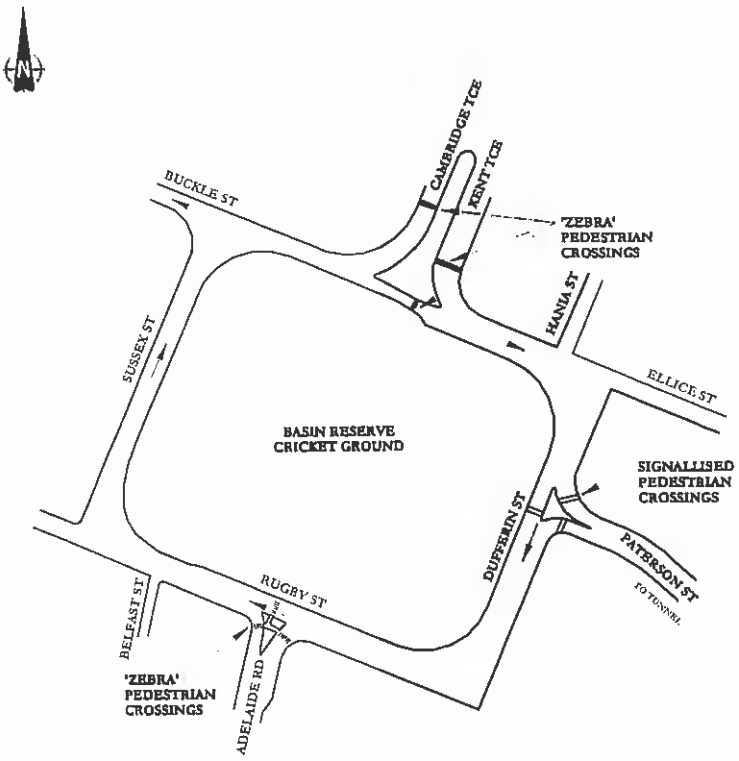


Figure 4.1.1: Location of pedestrian crossings

Montgomery Watson performed pedestrian counts at the Adelaide/Rugby crossings and at the recently removed Paterson Street crossing at Dufferin Street (since replaced by a signalised crossing) as part of a September 1999 report. The counts were performed on a typical weekday between 8:00 am and 6:00 pm.

Time	Paterson street	Adelaide Road	Rugby Street
hour beginning:	ped/h	ped/h	ped/h
0800	404	549	90
0900	34	85	33
1000	19	89	24
1100	30	86	30
1200	43	202	51
1300	42	265	88
1400	218	137	44
1500	192	383	66
1600	54	130	44
1700	55	138	45

Figure 4.1.2: Pedestrian crossing counts

A large proportion of pedestrians at the intersection are students from nearby schools. There is a smaller volume of pedestrians who use the intersection while walking to and from work at the start and end of the day. Pedestrians throughout the day would be mainly those using retail and service facilities on Adelaide Road and in the Ellice Street and Kent Terrace area.

The peak time for students using crossings is at the start and end of the school day, around 8:30 am and 3:30 pm. At these times, large numbers of students are using the crossings at Paterson Street and Adelaide Road.

The Adelaide Road crossing has significantly greater use during the rest of the day than the other two surveyed. This is likely to be due to the large number of shops and services located on Adelaide Road near the intersection. These facilities include: a service station, hairdresser, emergency pharmacy, art store and McDonalds restaurant, plus several other retail outlets.

A small amount of pedestrian traffic is generated by the retail facilities on Ellice Street. These include a pizza outlet and liquor store. Other facilities and services spread around the Basin Reserve do not generate any significant volumes of pedestrian traffic.

The pedestrian crossings on Kent Terrace, Cambridge Terrace and the circulating slip lane have not been surveyed. The Kent and Cambridge crossings are used by pedestrians walking from residences to and from work, and to and from the many shops and services along both Terraces.

The crossing on the slip lane is used by pedestrians travelling between Adelaide Road and Kent and Cambridge Terraces.

Sports events at the Basin Reserve are an important generator of pedestrian traffic. Most significantly, test cricket and other important cricket matches generate large crowds and so lead to very large pedestrian volumes over a short period of time. At the end of a days play, several thousand pedestrians leave the ground and walk throughout the intersection to leave the area.

The intersection area currently has no provisions, such as wide footpaths or pedestrian overbridges, to cope with large pedestrian volumes. Currently, this creates blockages of the circulating carriageway, and large delays for vehicular traffic. This situation, however, occurs infrequently, typically 15 to 20 days a year.

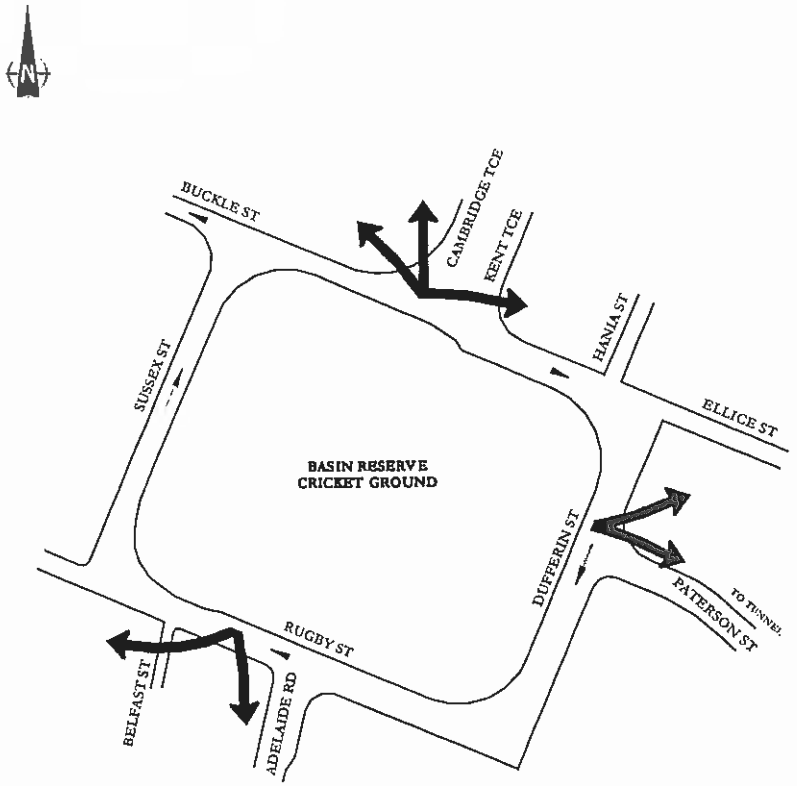


Figure 4.1.3: Pedestrian movements at the end of a day's play

4.2 Cyclists

The current intersection layout does not incorporate any cycle lanes or other cyclist amenities. The layout and environment is not particularly suited to cyclists, given:

- Large amount of lane changing by vehicles
- Many lane changes required by cyclists themselves to negotiate the intersection.
- Motorists being unaccustomed to seeing cyclists in this area, therefore not expecting them.
- Other alternative routes easier to negotiate, and perceived to be safer.

In 1992 cyclist counts were performed at the Basin. The results of these counts are shown in Appendix A.

No further cyclist surveys have been performed at the intersection, as the cyclist volumes remain very low. The LTSA Report *Travel Survey Highlights 1997/1998* states that "Between 1989/90 and 1997/98, on-road cycling has decreased by 19%, with the largest decrease among school-age children and teenagers".

The Wellington Regional Council Strategy states the objective of making cycling more attractive by improving and creating cycling facilities, such as cycle lanes and greater priority at intersections. The Wellington City Council Transport Strategy (1994) recognises that commuter cycling will not increase without targeted changes to the traffic system.

Both of these strategies promote and encourage commuter cycling. While at low levels through the intersection currently, there is potential to develop cycling in the area. The area from the CBD through to the Basin Reserve and beyond to Newtown is mostly flat land, and so is suitable for cycling compared with many other areas of the city.

At the completion of Stage 1 Consultation (see section 6), the following were identified as the key desired cyclist features for any new layout:

- Ensure uniform speeds of vehicles
- Prevent any excessive speeds
- Provide adequate cycle lanes
- Cater for all types of cyclists – novice and expert

5.0 Heritage Issues

5.1 History

The Basin Reserve is one of New Zealand's most historic and long serving sporting grounds. It has been used for many activities during its history, including athletics, softball, marching, cycling, and political rallies. These days, as in the recent past, it is mostly associated with cricket.

The Basin Reserve was first surveyed in 1840 for possible use as an enclosed shipping basin. However, earthquakes raised the land before this could be realised, and in 1857 it was set aside as a recreational reserve. The ground was designated as the future home of Wellington cricket in 1866, and the first game was played there in 1868.

There have been many schemes devised since then to use the Basin Reserve as a thoroughfare for traffic. However on all occasions, public outcry prevented this from taking place.

Since then there have been a huge number of significant sporting and cultural events at the ground. These days, it is New Zealand's foremost cricket ground, and home of Wellington Cricket.

5.2 Heritage

The area has been a designated recreational reserve since 1857, essentially as long as the city has been settled.

The Basin Reserve is acknowledged as the home of cricket not only in Wellington, but the whole of New Zealand. It has been the scene of many great and historical cricketing performances, such as the world record partnership between Martin Crowe and Andrew Jones in 1991.

The ground also houses the Cricket Museum of New Zealand.

There are three historic structures within the Basin Reserve: the Museum Stand, the Groundsman's Shed and the William Wakefield Memorial. There is also an historic building on the land just north of the intersection of Buckle and Sussex Streets.

The Museum Stand was constructed 1924-25, and now houses the Cricket Museum. It is registered Category 2. The William Wakefield Memorial was erected in 1882, and is registered Category 2. The Groundsman's Shed is not registered.

The existing fence remains largely as it was built in 1917. The two main entrance gates were built in 1918, and remain in place today.

Along Dufferin and Rugby Streets there are large Pohutakawas, which are well established. These have a positive affect on the aesthetics of the area.

On the northern corner of the Paterson / Dufferin Street intersection is an old English Elm which is listed as a protected tree.

Prior to this century the regions of the Basin area were used for kumara cultivation.

5.3 Heritage Issues Raised During Consultation

Heritage issues have been raised during Stage 1 consultation, with many people concerned about preserving the 'city fabric' around the Basin. The following were deemed to be the key desired city fabric features following Stage 1 consultation (refer section 6):

- Preserve existing buildings as far as possible
- Maintain 50 km/hr speeds to keep consistent with other inner city speeds
- Maintain a rectangular street network
- Avoid a Thorndon overbridge type environment

6.0 Consultation

6.1 Overview of the Consultation Strategy

A Project Consultation Strategy has been prepared and agreed with the client. The strategy recognises the widespread public interest in the Basin Reserve area and its values. It also recognises that there have been a number of public processes associated with the future planning of transportation in this area over the last ten years

The strategy has been developed around the project development process, which involves the following stages as follows:

(i) Preliminary Consultation : The objective of this early phase of consultation is to establish an overall project process that provides an opportunity for all those that wish to have an input and facilitates the promotion of ideas from interested parties at an early stage of the project.

(ii) Draft Scheme Assessment Report: This SAR develops and evaluates the options arising from previous studies, consultation, and this strategy. Environmental issues have been investigated to identify the extent of issues and constraints and to confirm the nature of more detailed work required in later stages. As a result of the preliminary consultation a range of additional options are being considered.

(iii) Public Consultation: This will be the main stage of consultation where a limited number of options will be tested in detail and opportunity for input on the merits of those options provided.

(iv) Further Preliminary Design and Assessment: This phase of work will seek to address the issues raised in consultation, this may include verification of effects, mitigation and design refinements to project options.

(v) Consent Documentation and AEE: The nature of consent required for the preferred option will be resolved and an AEE prepared, drawing on the preliminary design work and consultation. This will then kick off the statutory consent process.

The scope of parties included in the consultation is wide. It includes the following groups of parties:

- Property owners potentially directly affected by options.
- Property owners, businesses and schools with access onto the Basin roads and whose land is not required for the options but who are affected by the project.
- Iwi

- Residents associations and transport groups in this part of Wellington
- Public transport and road user groups
- Social sector groups
- Heritage interests
- Local authorities
- Ministers of the Crown and Members of Parliament
- Emergency services
- Utility service companies
- Private interests not associated with any particular group.

A project newsletter has been established as the lead method of communication this will be supplemented by other media such as the press, project web site etc.

6.2 Stage 1 Consultation

The Stage 1 consultation has been completed. This has included the following:

- Briefing of Wellington City Council Transport and Infrastructure Committee and establishment of strong links to relevant departments.
- Briefing and preliminary consultation with key groups and affected parties.
- A public workshop aimed at identifying public perspectives on issues, constraints, opportunities and options.
- Formation of a Consultation Working Group involving key interested parties to obtain feedback during the design process. Two meetings have been held so far.

Appendix L has a consultation record of each of the key group meetings held to date. The groups met to date are:

- Wellington Regional Stadium Trust
- Wellington Cricket Inc

- St Marks Church School, Wellington College, and Wellington East Girls College
- St Joseph's Church
- Steve Boulieris (Property Owner)
- The Wellington Tenths Trust
- Stagecoach Wellington Ltd

Appendix L has a record of the issues raised at the public workshop.

6.3 Key Issues Raised in Stage 1 Consultation

Key issues raised in the key party meetings include:

- Wellington Cricket and Wellington Regional Stadium Trust consider that Basin Reserve is a unique facility with special character and the space within the Basin should be retained.
- Improved pedestrian facilities will be of benefit to future use of the Stadium Reserve.
- St Marks has a planned building development to the boundary with Paterson Street.
- Wellington East Girls College has significant access problems including school busses. These have been made exacerbated by the difficult of egress and entry to Ellice Street.
- Wellington College remains concerned about egress from the College despite the interim improvements.
- A number of parties would like to see improved overall visual amenity and reduced noise levels.
- St Joseph's Church would like to see final resolution of the threat to their land. They wish to remain in this location but would consider rebuilding the church on a different part of their site.

- The Basin Reserve routes are very important to public transport routes despite the use of the bus tunnel. Congestion is affecting the performance of public transport. Key decisions of the future of the trolley busses will be necessary in the next few years. Stagecoach considers that future investments are likely to be in alternative fuelled busses rather than light rail based transport systems.

- Mr Boulieris who owns the corner building from 85 Kent Terrace to 3 Ellice Street is willing to discuss sale of his property if it is required by Transit. Earthquake strengthening will be required in 2001 if the building is to continue to be used.

The pubic workshop, held in the Long Room at the R.A. Vance Stand, was well attended and provided an effective opportunity for interested parties to articulate issues of concern at an early stage of the project. It also provided an opportunity for feedback on the recently implemented interim improvements to Patterson and Dufferin Streets. Options suggested at the workshop included:

- Connection of Hania and Ellice Streets with no connection to the Basin.
- Linkage of Paterson Street directly to Buckle Street.
- Tunnel from Kent Terrace to Adelaide Road.
- Wider use of the Pirie Street bus tunnel.
- A street level light rail system
- Park and ride facilities in Newtown.
- Traffic restraint and traffic calming options.
- Grade separate east west from north south traffic.
- Include public space improvements similar to Courtney Place.
- Pedestrian overbridges and ramps from St Marks and at Adelaide Road.
- Include high occupancy vehicle lane.
- Provide dedicated cycleways.

More details on the issues raised are included in Appendix L.

6.4 Consultation with Iwi

An initial meeting has been held with The Wellington Tenths Trust who represents mana whenau for Wellington and the Hutt Valley. It is proposed that a Project Memorandum of Understanding be established between Transit New Zealand and The Wellington Tenths Trust that will detail processes for further consultation through the project process and the assessment of cultural impacts. The consultation with iwi is being implemented in accordance with the *Transit New Zealand Guidelines For The Management Of Consultation With Iwi Or Hapu Version 2 June 2000.*

Wellington Tenths Trust also has significant property development interests in the south Wellington area including the Massey University joint venture development on Buckle Street and the Athletic Park retirement complex. Considerable areas of public land in south Wellington are also included in the Wellington Tenths Waitangi Tribunal claim.

6.5 The Consultation Working Group

A key initiative taken to assist in managing input from the diverse interests in the project is the establishment of a Consultation Working Group (CWG). This group has been successfully formed and is operating. The terms of reference for the CWG is attached as Appendix L.

(i) To provide a consultative forum of representatives of a range of public and private interests providing the project team with comment on design and assessment issues.

(ii) To provide a forum to assist in reconciliation of different interests on design and assessment issues.

(iii) To assist with identification of options and / or key features in the early stages of the project.

Membership of the CWG has been carefully selected to represent the range of interests in the project. The specific members are as follows:

(i) Neil Bartlett, Strathmore Park Progressive Association (Inc)

(ii) Gerald Blunt, Wellington City Council – Urban Designer

(iii) Robin Boldarin, Miramar / Maupuia Progressive Association

(iv) John Christianson, New Zealand Automobile Association

(v) Peter Crawford, Wellington Chamber of Commerce, Employers and Manufacturers Association (Central)

(vi) Jane Dawson / Alan Whiting, Cycle Aware Wellington

(vii) Paul Kerr-Hislop, Newtown Residents Association

(viii) Mathew Jensen, St Josephs Parish

(ix) Michael Mellor, Seatoun & Bays Progressive Association, Wellington City Council Eastern Suburbs Steering Committee

(x) Alan Olliver, Mt Victoria Residents Association

(xi) Nigel Piper, Stagecoach

(xii) Mike Dennehy, Road Transport Association

(xiii) Chris Rees, Capital Coast Health Ltd

(xiv) Tim Ryan, Wellington Regional Stadium Trust

(xv) Steve Spence, Wellington City Council – Traffic

(xvi) Margot Wilson, St Marks Church School

(xvii) Janice Campbell, Principal, Wellington East Girls College

Input will be sought from the CWG and specified stages of the project process. It has been emphasised that the CWG input is one of many inputs into the project process and will complement wider public consultation that is to be undertaken as part of Stage 2.

Two meetings have been held to date and have focussed on a review of a long list of project options and opportunities that have been developed out of the work of the project team and earlier consultation. The minutes of both meetings are included in Appendix L.

6.6 Stage 2 Consultation

Stage 2 of the consultation process will be undertaken once this SAR has been approved. It will be based on a wide public process of scrutiny of feasible preferred options and will include:

- A Project Consultation Package suitable for all parties issued to all parties including invitation for written submissions.
- Face to face meetings with key parties.
- Publication of a project supplement in print media.
- Open House Day
- Analysis of written submissions and preparation of a consultation report.
- Feedback to all parties through Newsletters.
- Further meetings with the Consultation Working Group.

This process will assist in identifying the scope of additional specialist assessments required and further design development for lodging required designation and resource consent documentation and an associated Assessment of Environmental Effects.

7.0 Option Development

7.1 Public Workshop

The pubic workshop was well attended and provided an effective opportunity for interested parties to articulate issues of concern at an early stage of the project. Options suggested at the workshop included:

- Connection of Hania and Ellice Streets with no connection to the Basin.
- Linkage of Paterson Street directly to Buckle Street.
- Tunnel from Kent Terrace to Adelaide Road.
- Wider use of the Pirie Street bus tunnel.
- A street level light rail system
- Park and ride facilities in Newtown.
- Traffic restraint and traffic calming options.
- Grade separate east west from north south traffic.
- Include public space improvements similar to Courtney Place.
- Pedestrian overbridges and ramps from St Marks and at Adelaide Road.
- Include high occupancy vehicle lane.
- Provide dedicated cycleways

More details on the issues raised are included in Appendix L.

The ideas proposed during the public workshop are summarised in the table below:

Features	Options	Larger scale ideas
Through/local traffic split	Tunnel between Kent / Cambridge Terrace & Adelaide Road	Light rail
Safe pedestrian route near Ellice Street	Grade separation	Use bus tunnel

Features	Options	Larger scale ideas
Pedestrian linkages: Brougham – Wellington College Mt Victoria – Basin – Massey Street Marks – Basin grounds	Traffic between Kent – Adelaide – Cambridge channelised east of Basin	Divert Adelaide traffic prior to Basin
Pedestrian overbridge at Adelaide	Direct Paterson – Buckle link	
Enhance pedestrianisation		
Traffic calming		
Prevent frontage access		
Make Hania Street safer (parking)		
Courtney Place style upgrade (landscape, parking)		
Improve sight distance / visibility		
Remove agapanthus at Sussex/Buckle		
Consider bus and HOV movements – do not preclude with 4 lanes		
Improve line marking		
Hania/Ellice – improve Pirie		
Buffer zones		

Most of the suggestions received fit into the category of 'features'. These are smaller scale details that are suggested as improvements around the Basin. They do not consider traffic movements around the Basin. As many of these features as possible, where deemed appropriate, will be included in the options proposed.

Larger scale ideas are outside the scope of this particular project. Further investigation of these ideas would need to be considered by the Regional Land Transport Committee.

Four ideas came out of the consultation to be considered as preliminary options:

(i) A tunnel between Kent/Cambridge Terrace and Adelaide Road

(ii) A direct linkage between Paterson and Buckle Streets

(iii) Grade separation of the north-south and east-west flows

(iv) All north-south traffic to travel on the east side of the Basin

To further expand these options and to help consider any others, it is useful to consider the overall objectives of the four options. The objectives arising from these options are considered to be:

(i) Grade separation

(ii) A direct link for west bound traffic between Paterson and Buckle Streets

(iii) Channel north/south traffic along one side of the Basin

The ideas from the initial consultation and from the project team were then used to draw up preliminary plans of possible new road alignments around the Basin. Also, previous layouts designed by other groups, such as Wellington City Council, were identified and included to make sure we considered all possible solutions.

The preliminary options are listed below:

A. New Signals at Adelaide Road
B. New Signals at Adelaide Road and Kent/Cambridge Terraces
C. Full Roundabout (no signals)
D. Tunnel Between Adelaide Road and Kent/Cambridge Terraces
E. Paterson – Buckle Link, Sussex Route, Double Intersection
F. Paterson – Buckle Link, Sussex Route, Combined Intersection
G. Paterson – Buckle Link, Dufferin Route, Combined Intersection
H. Paterson – Buckle Link, Dufferin/Sussex Route, Twin Overpass
I. Paterson – Buckle Link, Sussex Route, Overpass and Intersection
J. Paterson – Buckle Link, Sussex Route, Underpass and Intersection

Plans of each option are shown on the A3 pullouts on the following 10 pages.

Option A : New Signals at Adelaide Road

Description
The layout remains as existing. Signalised intersections are installed at Adelaide Road / Rugby Street and Kent/Cambridge Terraces / Buckle Street.

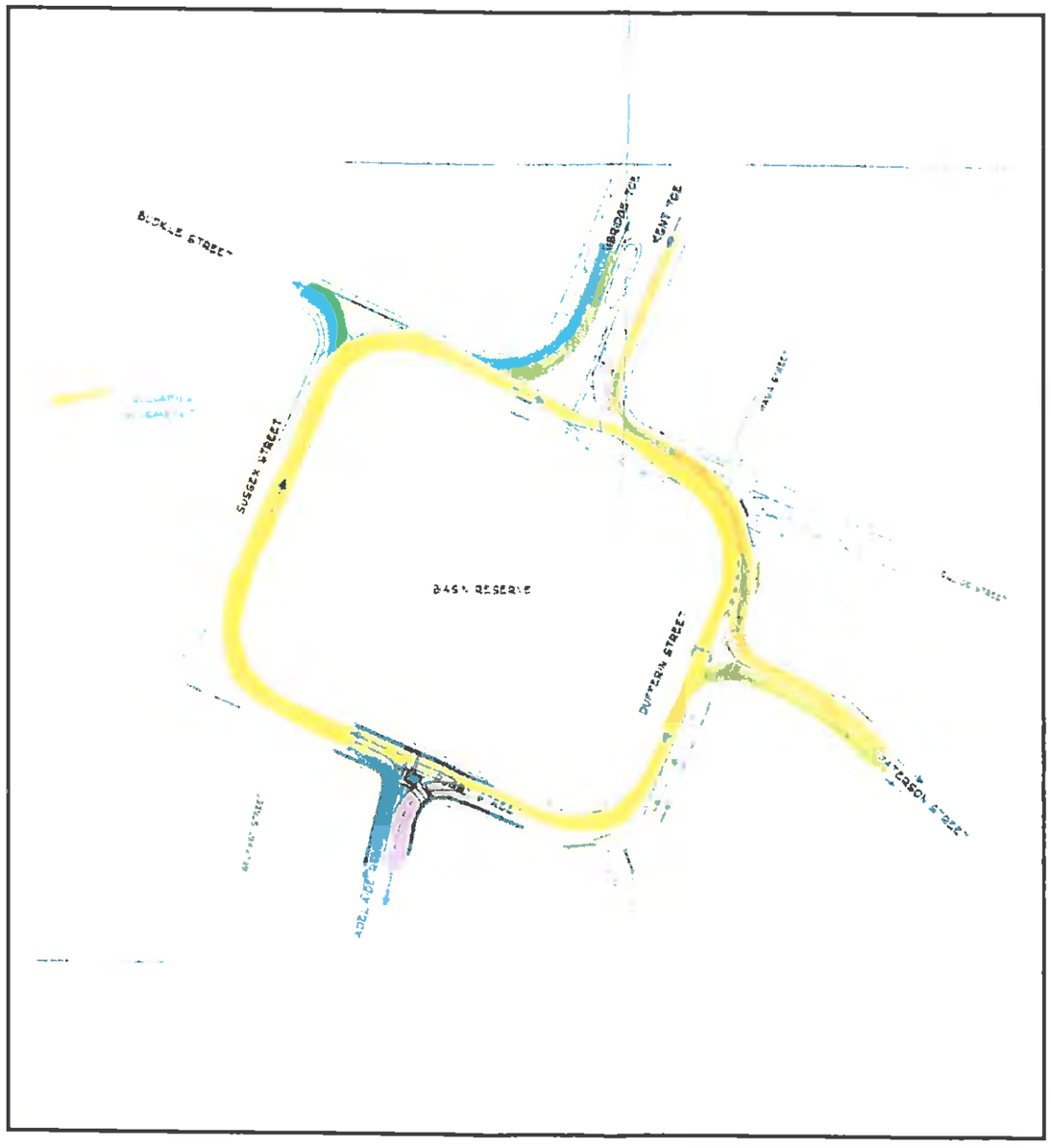
Traffic Movements
The movement of traffic is not altered. However, all vehicle movements at the intersections become signal controlled.

Impact on Services
No major relocation of underground services are anticipated.

Property Purchases
No property purchases are required.

Key Advantages
- Improved access from Adelaide Road
- Reduced merging
- Increased pedestrian safety

Key Disadvantages
- Increased delay at Rugby Street
- Interim improvement



Option A : New Signals at Adelaide Road

Option B : New Signals at Adelaide Road and Kent / Cambridge Terraces

Description
The layout remains as existing. Signalised intersections are installed at Adelaide Road / Rugby Street and Kent/Cambridge Terraces / Buckle Street.

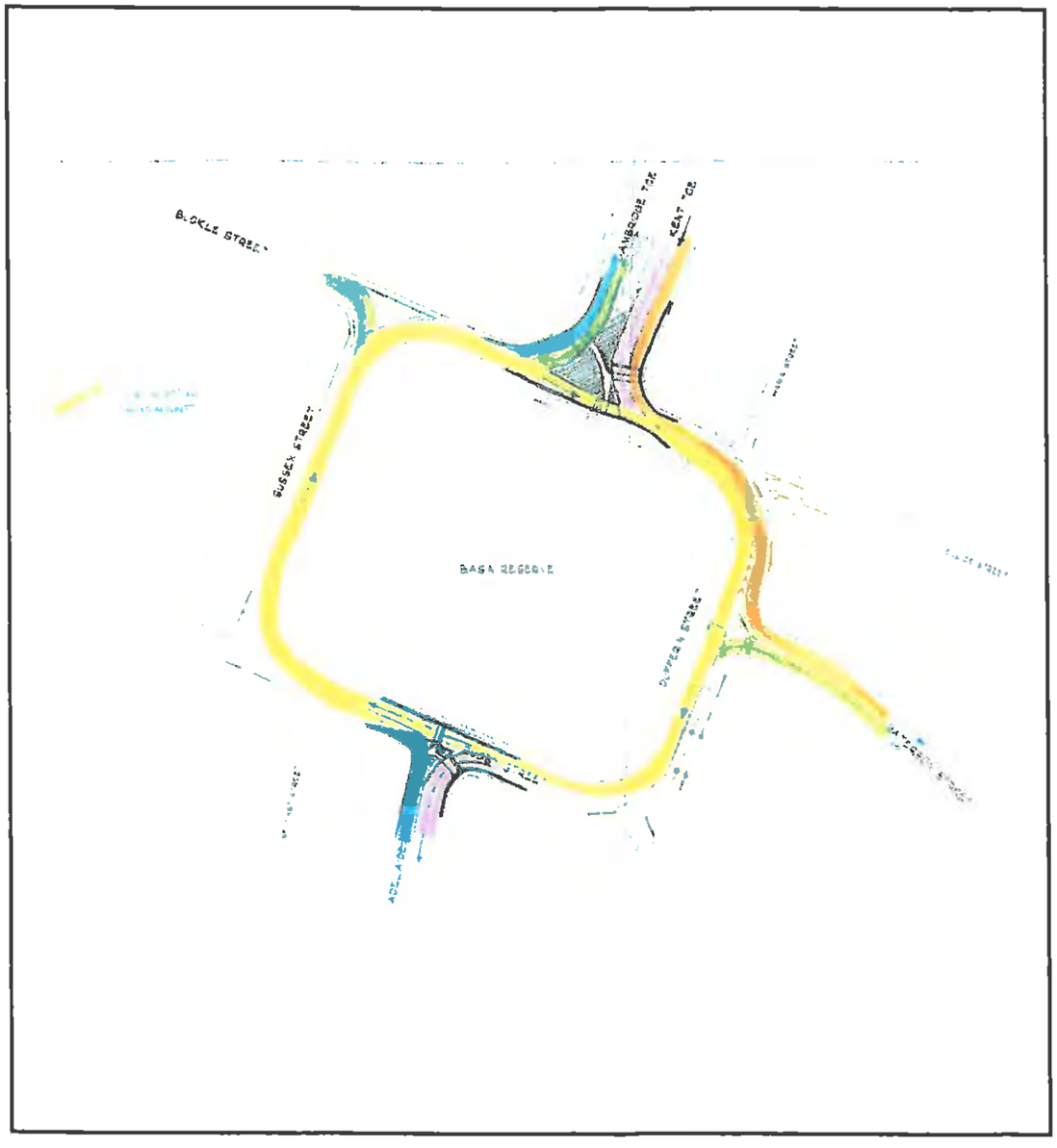
Traffic Movements
The movement of traffic is not altered. However, all vehicle movements at the intersections become signal controlled.

Impact on Services
No major relocation of underground services are anticipated.

Property Purchases
No property purchases are required.

Key Advantages
- Improved access from Adelaide Road
- Reduced merging
- Increased pedestrian safety
- Easier for circulating traffic on slip lane

Key Disadvantages
- Increased delay at Rugby Street
- Interim improvement
- Hidden queuing at start of Cambridge Terrace
- Hindered bus movement at the end of Kent Terrace



Option B : New Signals at Adelaide Road and Kent / Cambridge Terraces

Option C : Full Roundabout (No Signals)

Description
The layout remains as existing. The signals at the Dufferin/Paterson intersection are replaced by a Give Way control.

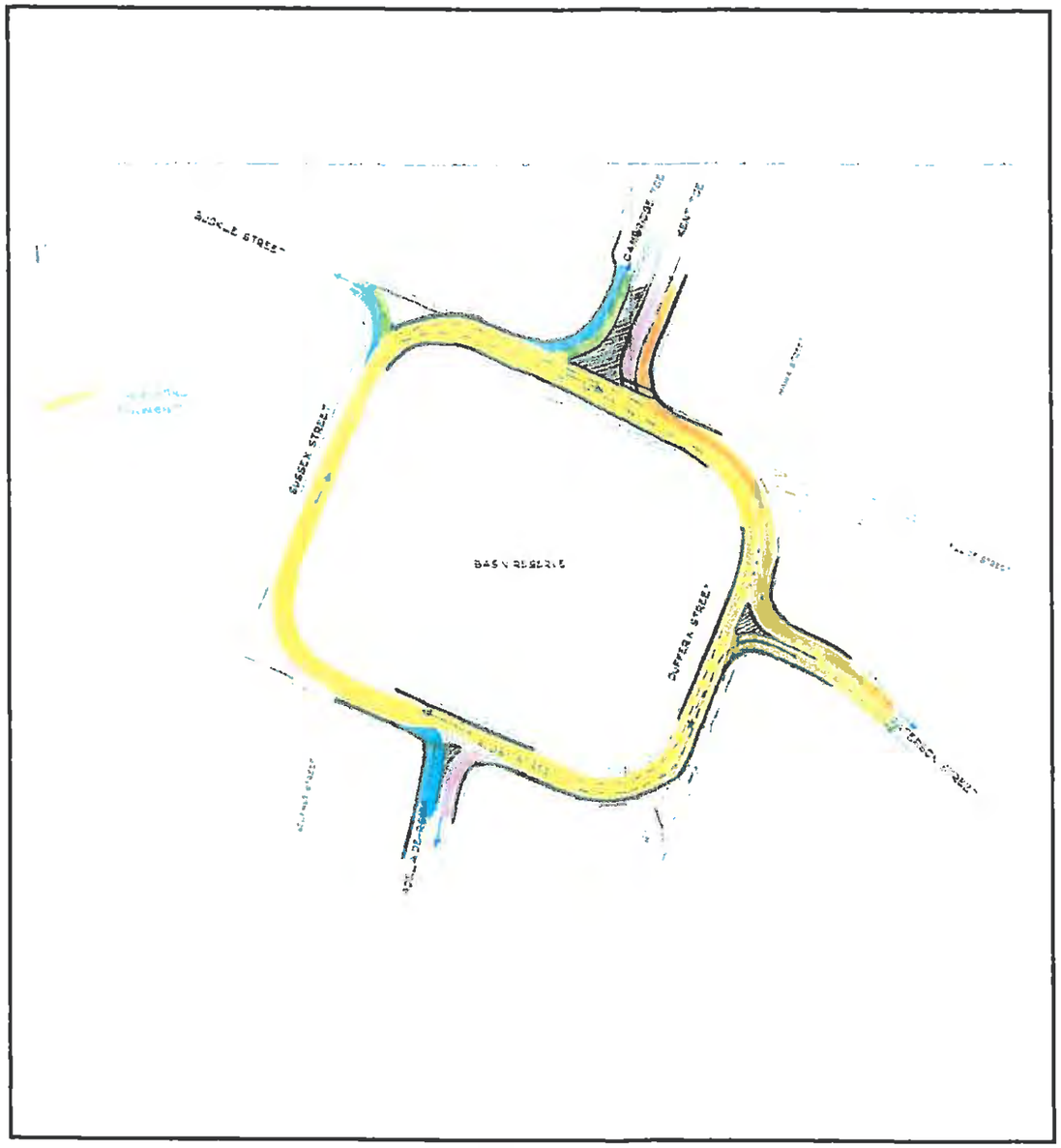
Traffic Movements
The movement of traffic is not altered. However, all vehicle movements at the intersections are priority controlled. Circulating traffic does not need to stop at any intersection.

Impact on Services
No major relocation of underground services are anticipated.

Property Purchases
No property purchases are required.

Key Advantages
- None identified

Key Disadvantages
- Increased merging
- Reduced pedestrian safety
- Reduced all vehicle safety
- Increased Paterson Street delay



Option C : Full Roundabout (No Signals)

Option D : Tunnel Between Adelaide Road and Kent / Cambridge Terraces

Description

- A 10 metre wide two way tunnel is constructed below the Basin Reserve between Kent / Cambridge Terraces and Adelaide Road.
- The tunnel returns to grade approximately 90 metres north and south of the Basin Reserve perimeter.
- No other roading alterations are made.

Traffic Movements

- North – south traffic travels below the Basin Reserve.
- All other traffic circulates around the Basin at ground level as existing.

Impact on Services

Tunnelling on the north side of the Basin would involve the relocation of a 33 kV electrical cable, and a Telecom fibre optic cable. This would also involve the relocation of three large diameter stormwater pipes and other smaller ones.

Tunnelling on the south side of the Basin would require relocating a 33 kV cable and several large stormwater pipes.

Many other services on Kent/Cambridge Terraces and on Adelaide Road would need to be relocated.

Property Purchases

Property purchases are required:

(i) Both sides of Adelaide Road for approximately 90 metres south of the Basin.

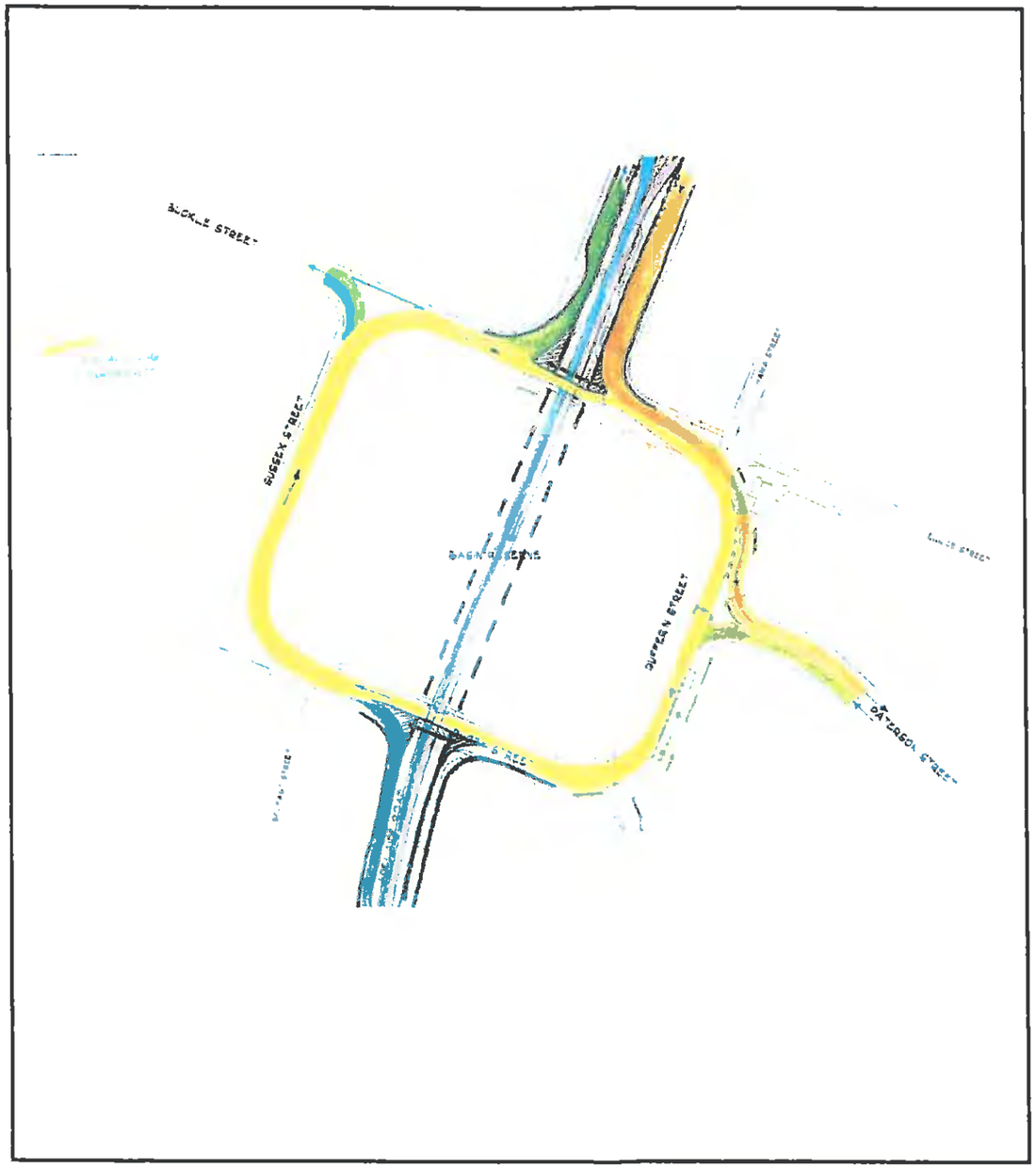
(ii) The corners of Adelaide Road and Rugby Street.

Key Advantages

- Separate N-S and E –W traffic
- Reduced the number of circulating vehicles
- Reduced delay
- Reduced corners

Key Disadvantages

- High cost
- Geotechnical issues
- Merge at both ends
- Adelaide Road building and Impact
- Tunnel traffic speeds and merging



Option D : Tunnel Between Adelaide Road and Kent / Cambridge Terraces

Option E : Paterson Buckle Link, Sussex Route, Double Intersection

Description
The layout is configured as two intersecting arterial roads, running north-south and east-west.
The roads intersect at two signallised intersections on the north side of the Basin Reserve.
Dufferin Street becomes a cul-de-sac. It provides access mainly for schools.
All roads are at grade.

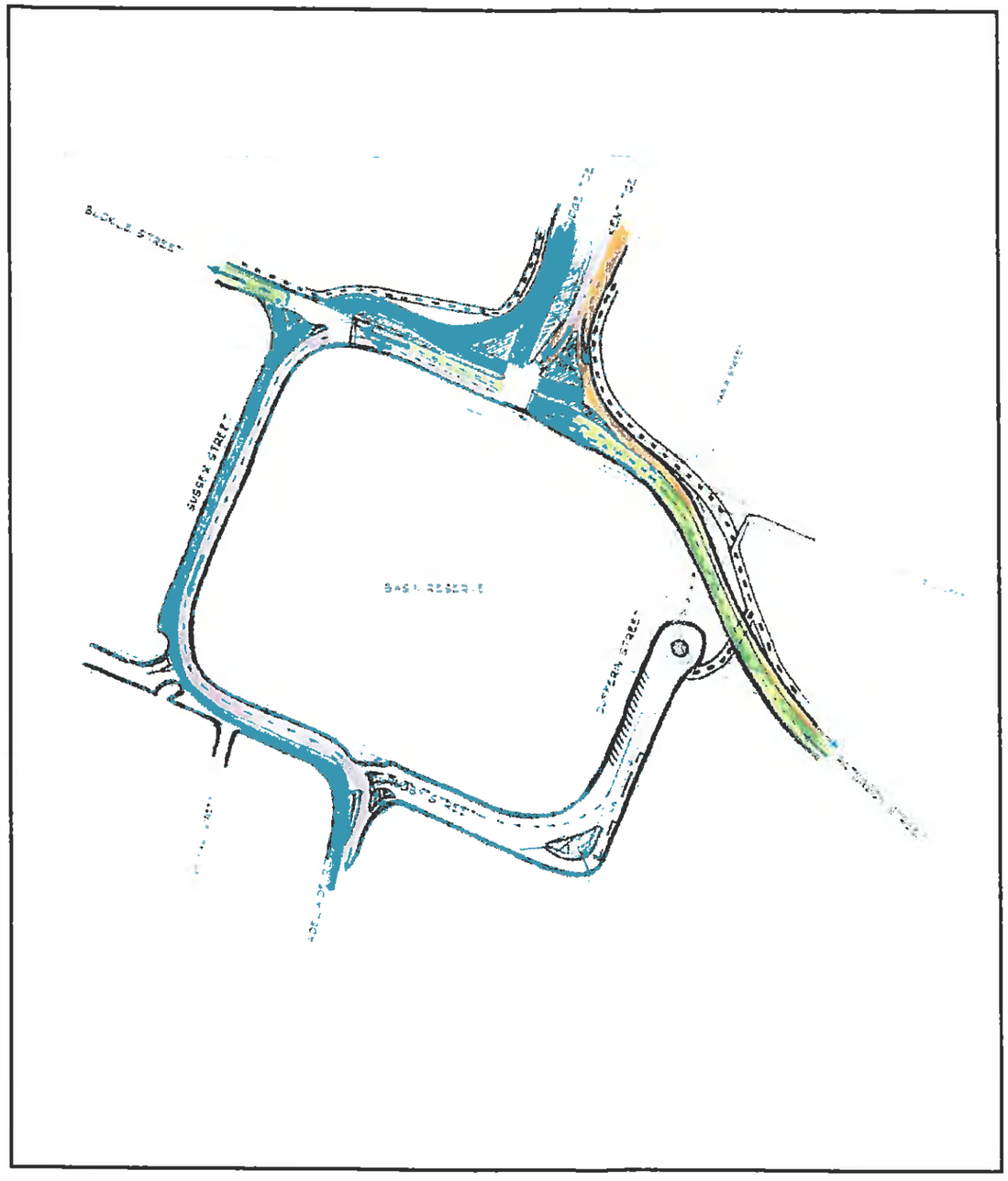
Traffic Movements
Traffic from Paterson Street to Buckle Street does not need to circulate around the Basin Reserve.
Traffic from Kent Terrace to Adelaide Road travels around the west side of the Reserve.
Dufferin Street is not used by circulating traffic.
The movements from Paterson Street to Buckle Street and Cambridge Terrace are more direct than currently.
The movement from Kent Terrace to Buckle Street is more direct than currently.

Impact on Services
As the whole intersection is at grade, no major relocations of underground services are anticipated. Underground services will only be a problem if they are currently located close to the existing ground surface and will affect the construction of new subgrade. However, underground services will need to be relocated at the pedestrian underpass on Paterson Street. There is a 33 kV power line in this vicinity, as well as a 400mm dia stormwater pipe.

Property Purchases
Property purchases are required:
(i) Between Paterson and Ellice Street
(ii) Corner of Kent Terrace and Ellice Street
(iii) Corner of Cambridge Terrace and Buckle Street

Key Advantages
- Direct Paterson-Buckle route
- Less traffic near schools
- Government House access

Key Disadvantages
- Delay at double intersections
- Complicated / confusion
- All traffic down Sussex – 2 way
- Impacts on NE buildings
- Access to the Basin
- Interim Option – does not provide 4 lanes N/S



Option E : Paterson Buckle Link, Sussex Route, Double Intersection

Option F : Paterson Buckle Link. Sussex Route Combined Intersection

Description
The layout is configured as two intersecting arterial roads, running north-south and east-west.
The roads intersect at one signallised intersection on the north side of the Basin Reserve.
Dufferin Street becomes a cul-de-sac. It provides access mainly for schools.
All roads are at grade.

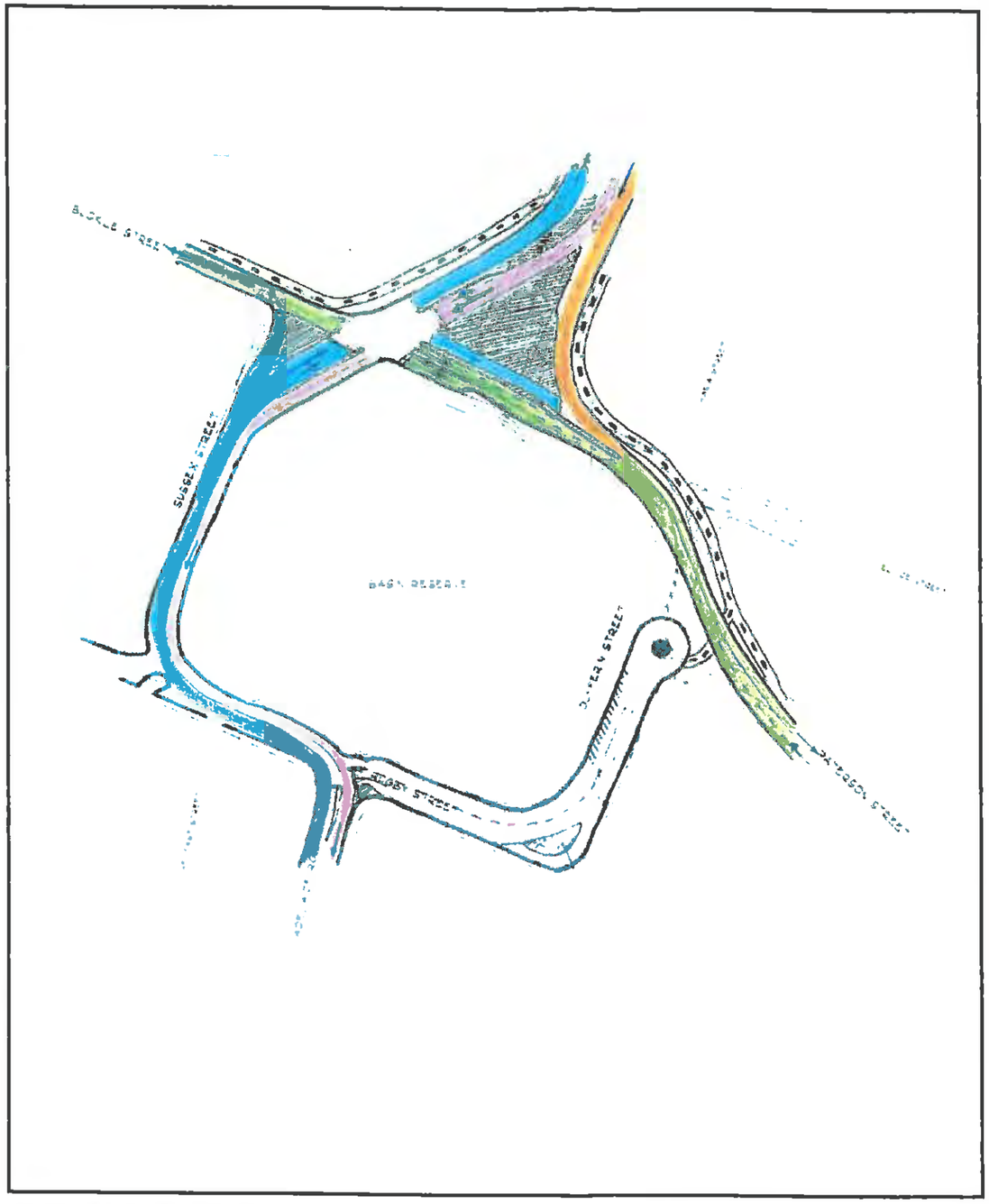
Traffic Movements
Traffic from Paterson Street to Buckle Street does not need to circulate around the Basin Reserve.
Traffic from Kent Terrace to Adelaide Road travels around the west side of the Reserve.
Dufferin Street is not used by circulating traffic.
The movements from Paterson Street to Buckle Street and Cambridge Terrace are more direct than currently.
The movement from Kent Terrace to Buckle Street is more direct than currently.

Impact on Services
As the whole intersection is at grade, no major relocations of underground services are anticipated. Underground services will only be a problem if they are currently located close to the existing ground surface and will affect the construction of new subgrade. However, underground services will need to be relocated at the pedestrian underpass on Paterson Street. There is a 33 kV power line in this vicinity, as well as a 400mm dia stormwater pipe.

Property Purchases
Property purchases are required:
(i) Between Paterson and Ellice Street
(ii) Corner of Kent Terrace and Ellice Street
(iii) Corner of Cambridge Terrace and Buckle Street

Key Advantages
- Direct Paterson-Buckle route
- Less traffic near schools
- Government House access

Key Disadvantages
- Delay at intersections
- Dramatic change to the NW environment
- All traffic down Sussex – 2 way
- Impacts on NE buildings
- Access to the Basin
- Interim option – does not provide 4 lanes N/S



Option F : Paterson Buckle Link, Sussex Route, Combined Intersection

Option G : Paterson Buckle Link, Dufferin Route, Combined Intersection

Description
The layout is configured as two intersecting arterial roads, running north-south and east-west
The roads intersect at a signallised intersection at the NE of the Basin
All north – south traffic travels along Dufferin Street
Sussex Street becomes a cul-de-sac
All roads are at grade

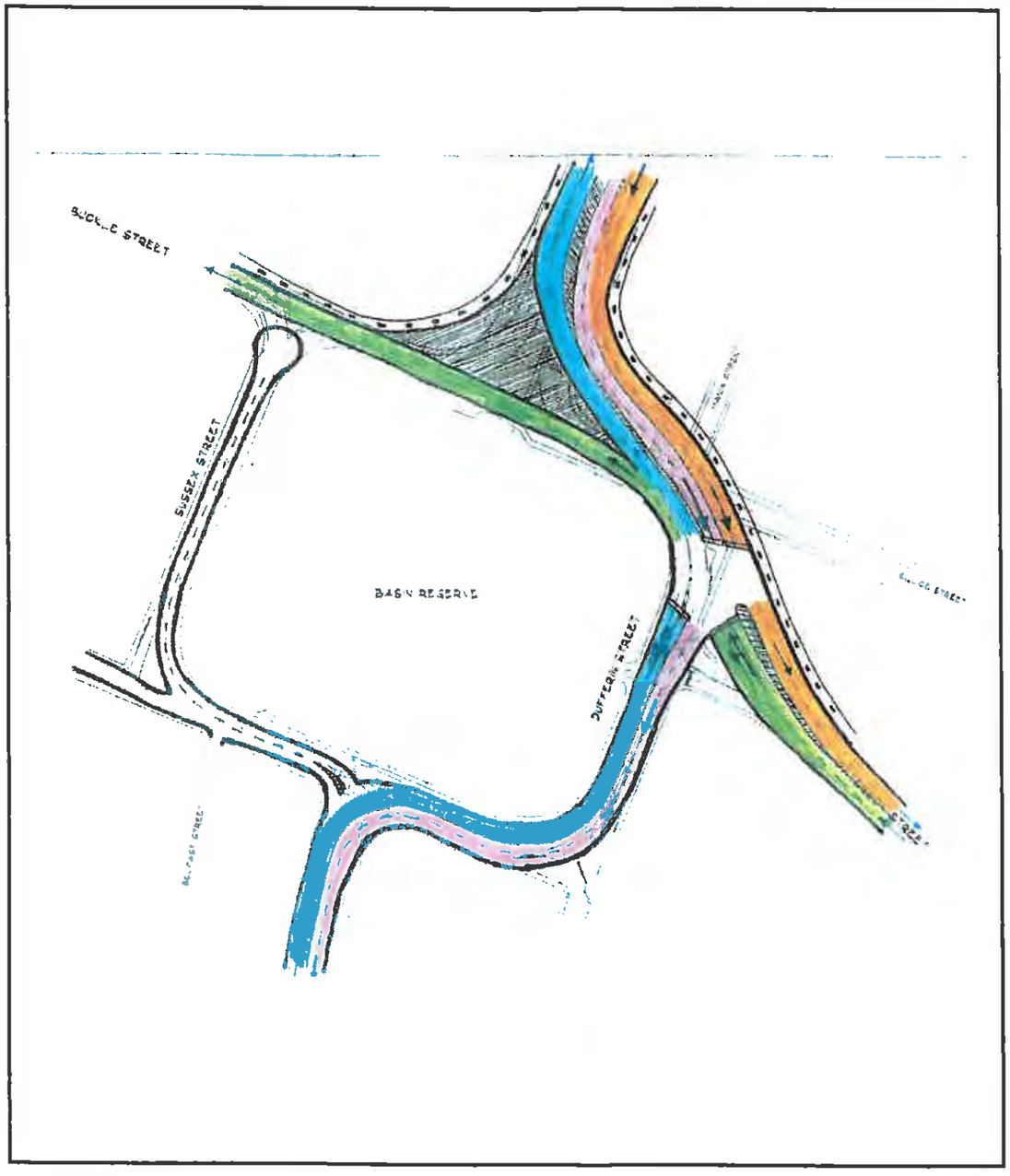
Traffic Movements
Traffic from Paterson Street to Buckle Street does not need to circulate around the Basin Reserve.
Traffic from Kent Terrace to Adelaide Road travels around the east side of the Reserve.
Sussex Street is not used by circulating traffic.
The movements from Paterson Street to Buckle Street and Cambridge Terrace are more direct than currently.
There is no realistic provision for the Kent Terrace to Buckle Street movement

Impact on Services
As the whole intersection is at grade, no major relocations of underground services are anticipated. Underground services will only be a problem if they are currently located close to the existing ground surface and will affect the construction of new subgrade

Property Purchases
Property purchases are required:
(i) Between Paterson Street and Ellice Street
(ii) Corner of Kent Terrace and Ellice Street
(iii) Corner of Cambridge Terrace and Buckle Street
(iv) Along the school frontages on Dufferin Street

Key Advantages
- Reduced traffic on Sussex Street
- Direct Paterson – Buckle route

Key Disadvantages
- Safety along Dufferin Street
- Loss of school facilities
- Large loss of land
- Government House access



Option G : Paterson Buckle Link, Dufferin Route, Combined Intersection

Option H : Paterson Buckle Link, Dufferin / Sussex Route Twin Overpass

Description
A two lane flyover from Paterson Street to Buckle Street
An underpass for Sussex Street traffic to Cambridge Terrace
An underpass for Kent Terrace traffic to Adelaide Road.

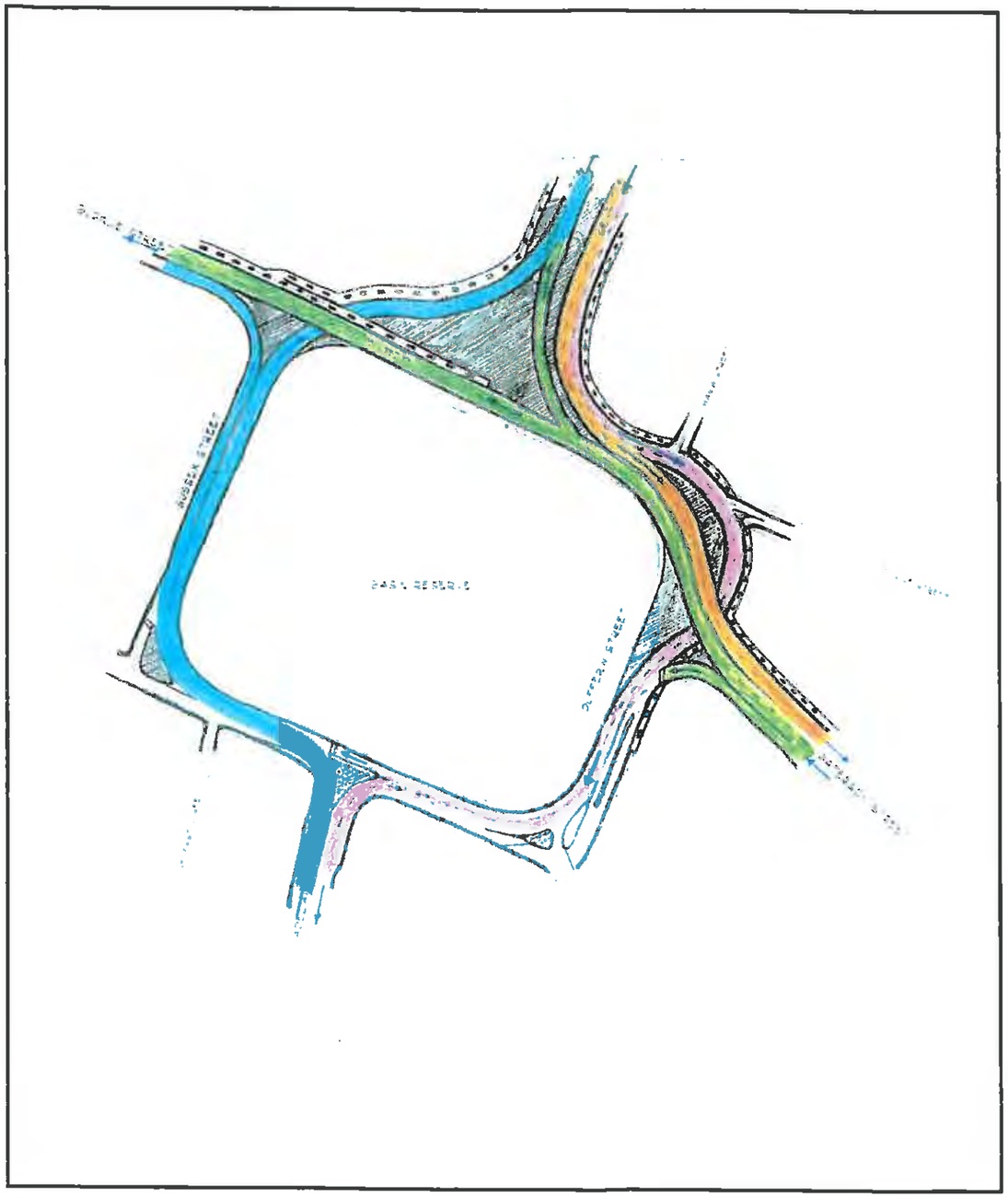
Traffic Movement
Traffic from Paterson Street to Buckle Street has a direct link.
The road alignments between Cambridge / Kent Terraces are changed, but the movements are much the same as they are currently. Traffic will continue to move clockwise around the Basin Reserve.
There is no mixing of traffic travelling between Cambridge/Kent Terraces and Adelaide Road, and traffic travelling between Buckle Street and Paterson Street.
There is a more direct link between Paterson Street and Cambridge Terrace.

Impact on Services
Dufferin Street passing under Paterson Street is to be trenched. This requires the relocation of an 11 kV and a 33 kV electrical cable.
Sussex Street passing under Buckle Street is also to be trenched. This would involve the relocation of a 33 kV electrical cable, and a Telecom fibre optic cable.

Property Purchases
Property purchases are required:
(i) Between Paterson and Ellice Street
(ii) Corner of Kent Terrace and Ellice Street
(iii) Corner of Cambridge Terrace and Buckle Street

Key Advantages
- Direct Paterson – Buckle link
- No intersections: safety, delay benefits
- Eliminates weaving
- Simple and clear
- Room for cycle lanes, pedestrians

Key Disadvantages
- Landform: bridges
- Adelaide to Dufferin movement
- Land under bridges



Option H : Paterson Buckle Link, Dufferin / Sussex Route, Twin Overpass

Option 1 : Paterson Buckle Link Sussex Route, Overpass and Intersection

Description
Signal controlled intersection for Sussex Street / Cambridge Terrace / Kent Terrace
Two lanes from Paterson Street at grade to a bridge over Sussex Street to Buckle Street
Kent Terrace to Adelaide Street via Sussex Street
Underpass for Sussex Street traffic to Cambridge Terrace

Traffic Movement
Traffic from Paterson Street to Buckle Street does not need to circulate around the Basin Reserve.
Traffic moving from Kent Terrace to Adelaide Road now goes along Sussex Street.
Traffic volumes in Dufferin Street will be reduced. The only major traffic movement using this street is from Paterson Street to Adelaide Road.
Traffic from Kent Terrace to Buckle Street needs to circulate the entire perimeter of the Basin
There is no mixing of traffic travelling between Cambridge/Kent Terraces and Adelaide Road, and traffic travelling between Buckle Street and Paterson Street.
Traffic from Paterson Street has a direct link to Cambridge Terrace.

Impact on Services
Sussex Street passing under Buckle Street is to be trenched. This would involve the relocation of a 33 kV electrical cable, and a Telecom fibre optic cable.
Trolley bus lines will need to be relocated on the west side of the Reserve between Kent Terrace and Adelaide Road. Will also need to be relocated for new alignment between Adelaide Road and Cambridge Terrace.

Property Purchases
Property purchases are required:
(i) Between Paterson and Ellice Street
(ii) Corner of Kent Terrace and Ellice Street
(iii) Corner of Cambridge Terrace and Buckle Street
(iv) Along Sussex Street

Key Advantages
- Direct Paterson – Buckle route
- Less traffic near schools
- Reduced weaving

Key Disadvantages
- Access to Dufferin Street
- All traffic down Sussex Street – 2 way
- Sussex Street properties
- Pedestrian access to S and W of the Basin

Option 1 · Paterson Buckle Link, Sussex Route. Overpass and Intersection

Option J : Paterson Buckle Link, Sussex Route, Underpass and Intersection

Description
Signal controlled intersection for Sussex Street / Cambridge Terrace / Kent Terrace
Two lanes from Paterson Street at grade to a bridge over Sussex Street to Buckle Street
Kent Terrace to Adelaide Street via Sussex Street
Overpass for Sussex Street traffic to Cambridge Terrace

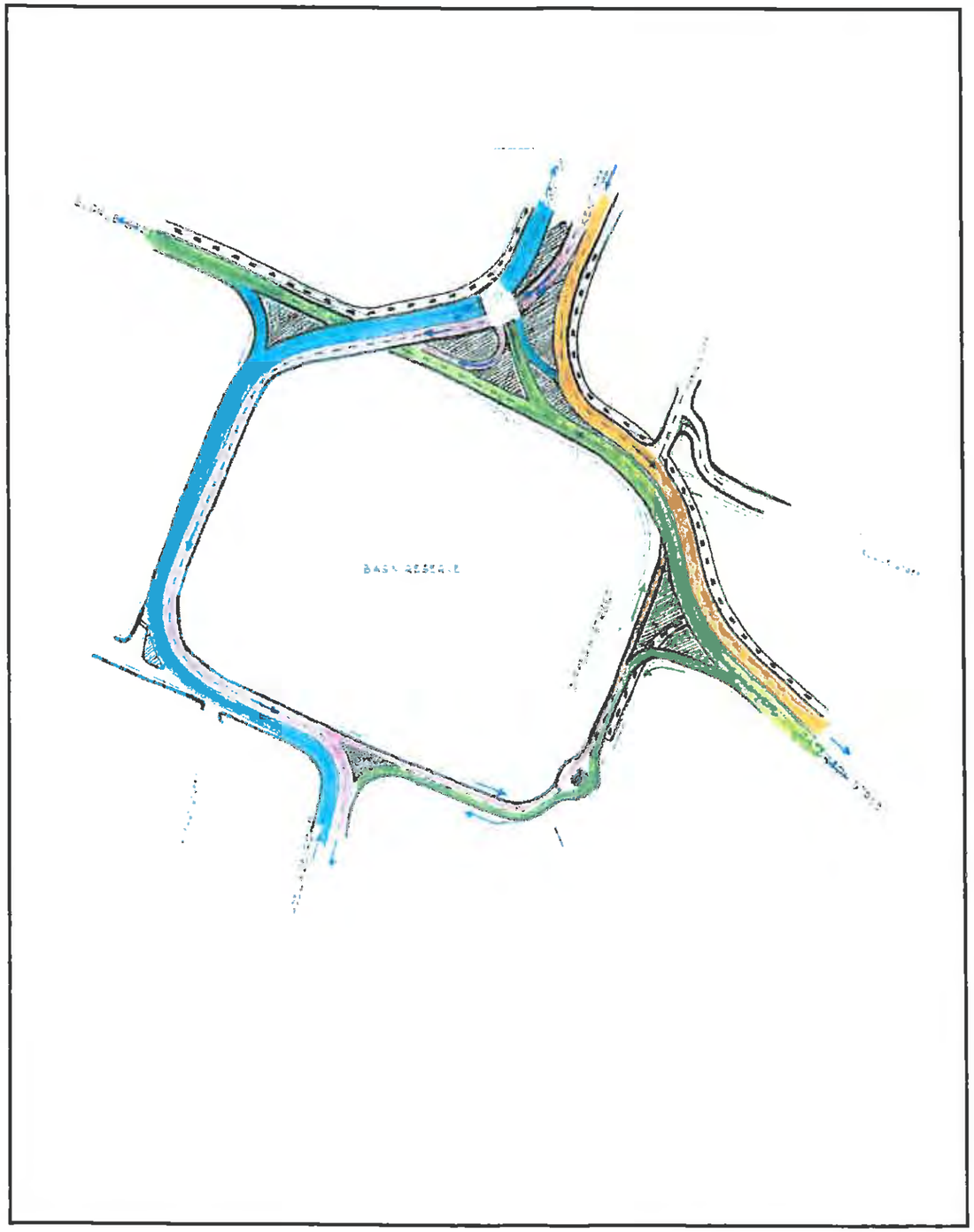
Traffic Movements
Traffic from Paterson Street to Buckle Street does not need to circulate around the Basin Reserve.
Traffic moving from Kent Terrace to Adelaide Road now goes along Sussex Street.
Traffic volumes in Dufferin Street will be reduced. The only major traffic movement using this street is from Paterson Street to Adelaide Road.
There is no mixing of traffic travelling between Cambridge/Kent Terraces and Adelaide Road, and traffic travelling between Buckle Street and Paterson Street.
Traffic from Paterson Street has a direct link to Cambridge Terrace.

Impact on Services
Buckle Street passing under Sussex Street is to be trenched. This would involve the relocation of a 33 kV electrical cable, and a Telecom fibre optic cable.
Trolley bus lines will need to be relocated on the west side of the Reserve between Kent Terrace and Adelaide Road.

Property Purchases
Property purchases are required:
(i) Between Paterson and Ellice Street
(ii) Corner of Kent Terrace and Ellice Street
(iii) Corner of Cambridge Terrace and Buckle Street
(iv) Along Sussex Street
(v) At the NW corner of the Basin Reserve ground

Key Advantages
- Direct Paterson – Buckle route
- Less traffic near schools
- Reduced weaving

Key Disadvantages
- Access to Dufferin Street
- All traffic down Sussex – 2 way
- Sussex Street properties
- Large, raised intersection at NW corner
- NW Basin land
- On – off at Buckle link/intersection



Option J : Paterson Buckle Link, Sussex Route, Underpass and Intersection

7.2 Consultation Working Group Meeting 2

A second meeting with the CWG was held on Wednesday the 25th of October. In this meeting, the 10 options were discussed amongst the group and key advantages and disadvantages of each were identified. The results of this evaluation were recorded on A1 size flipcharts during the meeting. The points written on these charts are documented in Appendix L. The key advantages and disadvantages are also noted on the A3 pullouts on the following 10 pages.

Separate charts of all the suggested advantages and disadvantages were also produced to make it easier to compare one option to another. These charts are in Appendix L.

Option Groups

Options were divided into three separate categories determined by the size and nature of the proposed changes. The three groups are: interim options, at grade options, grade separated options.

Doing this means that options were compared only with those of a similar nature. This makes it easier to consider the relative merits of each project.

Group 1: Interim Options

These options are considered to be viable only in the short term, around five years. They would not provide adequate vehicular capacity or safety beyond this time. These options are:

A. New Signals at Adelaide Road
B. New Signals ate Adelaide Road and Kent/Cambridge Terraces
C. Full Roundabout (no signals)

Option C was clearly not favoured during the discussion, nor is it considered an acceptable option by the project team, and so is not carried forward for further evaluation. This option would likely lead to a reduction in safety and capacity at the Basin. There were no advantages identified for it.

Option B is a further development of Option A, and was generally seen by the Consultation Working Group to have more advantages than Option A. Option B is therefore taken to the economic analysis phase detailed in further sections.

Group 2: Long Term At Grade Options

These options provide long term transport solutions all at grade.

E. Paterson – Buckle Link, Sussex Route, Double Intersection
F. Paterson – Buckle Link, Sussex Route, Combined Intersection
G. Paterson – Buckle Link, Dufferin Route, Combined Intersection

Option G was clearly considered the least favourable of the options. It involves taking all north-south traffic along Dufferin Street, effectively removing all school roadside facilities. It would indicatively have similar economic feasibility to options E and F, but the loss of school facilities rules it out, so it is not taken forward for further analysis.

Options E and F were deemed more acceptable in that they take all north-south traffic along Sussex Street, freeing up Dufferin Street. While there was some preference by the CWG for option E, both options have been taken forward for economic analysis to see if there are any significant differences in the benefits of each.

Group 3: Long Term Grade Separated Options

These options provide the benefit of uninterrupted flow between Mt Vic Tunnel and Buckle Street (or Adelaide Road and Kent/Cambridge Terraces for the tunnel option).

D. Tunnel Between Adelaide Road and Kent/Cambridge Terraces
H. Paterson – Buckle Link, Dufferin/Sussex Route, Twin Overpass
I. Paterson – Buckle Link, Sussex Route, Overpass and Intersection
J. Paterson – Buckle Link, Sussex Route, Underpass and Intersection

During discussion of this group, the CWG found it difficult to compare the four options. Option G is obviously significantly different to the other three, and so is not easily comparable. It was deemed difficult to properly visualise the other layouts involving grade-separated intersections.

It was recorded, however, that having two-way flow along Sussex Street was a significant disadvantage.

All four options from this group have been taken forward for further analysis.

Options Taken Forward for Further Analysis

Options B, D, E, F, H, I, J have been taken forward for further analysis, including economic analysis. Along with these, a further option, Option K, is to be analysed. Option K involves a tunnel underneath the northern part of the Basin Reserve for traffic from Paterson Street to Buckle Street.

The following options have been considered to be of significantly less benefit than those above, and so are not evaluated further.

Option	Reasons for withdrawal
A	Lesser alternative to Option B
C	Would significantly reduce safety.
G	Major impact on schools. No real advantage over Sussex Street options

8.0 Urban Design Issues

8.1 Landscape Evaluation

Landscape evaluation has been performed by Promised Land Ltd. The full report, summarised in this section, is in Appendix N.

The options were evaluated for their impacts on key views and attributes that define the character and quality of the area.

Option E
The general experience of the roadway would be altered all the way round, especially along the northern side where the two signalised intersections would dominate a very large area. These intersections would have adverse visual and amenity impacts at the end of Kent and Cambridge Terrace. Planting would be required to soften these impacts.

Overall, minor changes to the long views and vistas of motorists as the whole intersection remains at grade.

The environment for pedestrians and cyclists would be much improved.

Option F
The general effects are the same as those for Option E, except the area of roading corridor is increased at the northwest corner.

This option effectively pushes the adverse effects of the upgrade further north up Kent and Cambridge Terraces than Option E. This would make the visual impact of the intersection greater when looking down Kent Terrace and when approaching from the Tunnel.

The removal of trees at the northwest corner inside the Basin would make the Vance Stand more visually dominant.

Option H
The roading experience around the Basin for this option is significantly altered on the northern side, but is little changed on the southern side.

Looking at the Basin from Kent Terrace, the road formation would reflect the broad sweep of the landform as it rises up to Buckle Street. The rise would be absorbed to some extent by existing buildings, both within the Basin and those on the rise to the west.

Motorists travelling from the Tunnel to Buckle Street would have an enhanced experience, as the visual flow of the alignment would follow the natural topography. The alignment would also reflect the ease of movement down and then up out of the Basin.

In general, the functional flow for a motorist travelling through the Basin is improved.

As in the other options, the environment for pedestrians and cyclists would be much improved.

Option I
Entering the intersection from Kent Terrace, the signalised intersection would divert attention away from the Basin and up towards Sussex Street. The dominated view would be the road formation and associated structure. However, a large area at the end of Kent Terrace would become available for planting and landscaping.

The view moving from the Tunnel to Buckle Street would be enhanced as the roadway slopes down and then back up again, similar to that of Option H.

The roading corridor increases significantly along Sussex Street, and become particularly intrusive at the northwest corner.

The environment for pedestrians would be greatly improved along Dufferin Street adjacent to the schools. However, access to the Basin from the north may appear severed by the large intersection area.

Option J
The effects on the environment for this option are much the same as for Option I. However, the intersection at the end of Cambridge and Kent Terrace will be even more visually obtrusive as it will be elevated.

The large four-lane overbridge leading onto Sussex Street will also dominate views in the area. There would no longer be the sense of crossing a broad and expansive basin area.

The pedestrian environment around the elevated intersection would be particularly unattractive.

8.2 Traffic Noise

A preliminary assessment of traffic noise impacts was carried out by Malcolm Hunt Associates. The full document is in Appendix O.

The assessment considers the potential changes in traffic noise due to the proposed upgrade options on the basis of increase or decrease in existing ambient noise levels. The method of assessing traffic noise impact is based on the procedures contained in Transit New Zealand's "Guidelines for the Management of Traffic Noise".

Monitoring Sites

The sites shown below were monitored to find the existing ambient sound levels. From this information, future levels at these sites, taking into account traffic growth and alignment changes, were predicted.

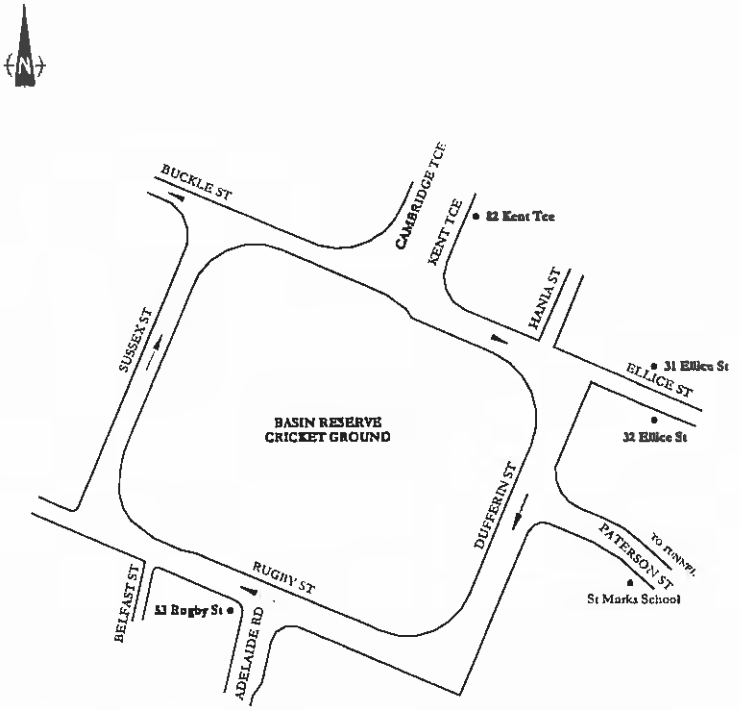


Figure 8.2.3 Noise monitoring sites

Results

A list of how predicted noise levels at the monitored sites compare with guidelines is shown in the following table. The predicted noise levels come from 10-year design traffic flows.

Monitoring site	Complies without mitigation?		
	Option H	Option I	Option J
31 Ellice Street	No	No	No
53 Rugby Street	Yes	Yes	Yes
82 Kent Terrace	Yes	Yes	Yes
32 Ellice Street	No	No	No
St Marks School	Yes	Yes	Yes

Figure 8.2.2: Noise monitoring results

Conclusion

The preliminary review has found that there are some reasonably significant changes in traffic noise levels. However despite this, it is not expected that roading upgrades will result in significant adverse noise effects, as long as mitigation measures are put in place.

Although mitigation details are not discussed here, required reductions in noise levels appear to be within limits achievable with practical mitigation measures.

9.0 Geotechnical Assessment

A preliminary geotechnical assessment has been produced, based on existing geological information and previous investigations in the area. The full report is included in Appendix H.

The two locations of geotechnical interest are in the Paterson/Dufferin Streets area, and the Buckle/Sussex Streets area. These are the two areas where bridges and cuts are proposed. All other areas of the Basin are proposed to be at grade.

9.1 Geotechnical conditions around the Basin

9.1.1 Dufferin/Patterson Street Area

This area is underlain by up to 3 m of fill. The fill is underlain by medium dense alluvium comprising gravely, sandy clay. Basement rock is at 9.5 m depth on Paterson Street and appears to be sloping steeply to the west, deepening to 30 m depth beneath Dufferin Street.

Standard Penetration Tests in this area show N values of 1 and less for the top 3 m. This layer is identified as a potentially liquefiable layer. Below 3 m, SPT N values increase rapidly from 7 at 3 m to greater than 50 at 8 m depth.

A water level has been measured at this site approximately 0.5 m below ground surface and most likely represents a piezometric pressure at depth and not a static water level in the surrounding ground.

9.1.2 Sussex/Buckle Street Area

From previous investigations it appears that this area is underlain by approximately 25 m of alluvium comprising medium dense to very dense gravel, silt, sand and clay. Basement rock is located at 27 m depth and appears to be sloping gradually to the east deepening to greater than 30 m depth on the other side of the Basin below Dufferin Street.

SPT show N values to be variable between 11 and 96 for the upper 11 m. Below this depth N values vary between 24 and 75, and are greater than 100 within 2 m of the basement contact.

A water level has been measured as approximately 2 m below ground surface and most likely represents a piezometric pressure at depth.

10.0 Property Acquisition

An investigation into property purchases has been performed by The Property Group. The full document is included as Appendix G.

The estimated acquisition costs come from the areas of land purchase shown on the preliminary plans. These areas may change slightly following the final geometric design.

Transit New Zealand owns a number of properties around the Basin shown in blue opposite.

The Do minimum option is based on the premise that Transit will sell all it's land holdings which provides a negative cost (i.e. a return). The options are similarly costed with a negative value for all remaining land that Transit can sell and a positive cost for land purchases required.

The costing makes allowance for compensation issues and fees.

Options E and F make an allowance for purchasing future land to allow Sussex Street / Rugby Street to be widened to four lanes.

Please refer to Appendix G for detailed spreadsheets.

A summary of the property purchase costs is given below.

Option	Total Land Cost including Disposal Return ($ Million)	Future Land Cost to Provide Long Term Solution ($ Million)
Do Minimum	<$6.06>	
E	<$2.28>	$8.55
F	<$1.57>	$8.55
H	<$0.52>	
I	$7.36	
J	$5.54	

Figure 10.1: Property

11.0 Economic Analysis

11.1 Summary

Following are the results of the full economic analysis performed on options: E, F, H, I, J.

Options D and K were not were deemed to not require full analysis, as initial analysis performed showed that the options were far from being economically viable. Option B was not analysed as a previous report has found it to be not viable. Initial analysis of these options is detailed later in this section.

The economic evaluation has been undertaken in accordance with the full procedures of the Transfund New Zealand Project Evaluation Manual, first revision (effective from 1 May 1997).

A summary of the discounted Cost-Benefit Ratios is shown below:

Option	NPV Total Costs $ Million	NPV Total Benefits $ Million				BCR
		Travel time savings	Vehicle operating savings	Accident reductions	CO2 reductions	
B	1.0	-3.8	-3.0	3.8	-	-3.0
D	16.0	33.7	13.1	6.2	0.7	3.3
E	7.4	20.8	8.1	6.4	0.4	4.8
F	8.3	19.5	9.4	6.4	0.5	4.3
H	11.7	33.7	13.1	6.2	0.7	4.6
I	18.3	29.2	11.5	5.6	0.6	2.6
J	19.3	30.6	12.3	5.8	0.6	2.6
K	19.3	33.7	13.1	6.2	0.7	2.8

Figure 13.1: Summary of Benefits and Costs

11.2 Incremental Analysis

The results of incremental cost-benefit analysis of the projects are shown below.

Base option for comparison	Next higher cost option	Incremental BCR	Base option for next steps
E	F	0.0	E
E	H	4.2	H
H	D	0	H
H	I	-1.0	H

Figure 13.9: Incremental analysis of options

11.3 General Details and Assumptions

- The economic analysis has been carried out for the period 2000 to 2025. The altered layout is assumed to be completed and in use by 2002.

- Traffic growth rate has been deemed as 2%. This was derived from analysis of WCC counts on Paterson Street between 1994 and 1998.

- The traffic analysis indicates that given 2% growth 4 lanes will be required in the North / South direction in 20 years. It is also noted that the Wellington Regional Land Transport Strategy identifies a roading initiative by 2004.

> *"Upgrade the route through Newtown on Adelaide Road from the Basin Reserve to John Street ($3M)".*

We have conservatively modelled the costs to upgrade Sussex Street to four lanes in options E and F between years 15 and 20 with an overall discounted cost of $1.5 Million.

11.4 Costs

11.4.1 Construction Costs

Cost estimates for each option have been calculated to an appropriate Scheme Assessment level of accuracy based on the preliminary design drawings.

Rates for physical works are sourced from actual rates on construction jobs managed by Meritec. Service relocation costs, for services such as telecom fibre optic cable and power mains, have been supplied by the specific companies.

Option	Total Construction Cost ($ 000's)
E	9,029
F	9,706
H	12,624
I	30,086
J	17,784

Figure 13.3: Construction costs

11.4.2 Maintenance Costs

Maintenance costs have been sourced from information given by the current Network Maintenance Contractor. These costs provided cover road surface resealing, routine maintenance, specific maintenance, traffic signal maintenance and line marking.

Surface resealing is assumed to occur every ten years, following information given by the previous Network Maintenance Contractor. All other costs have been considered as annual costs.

In addition to these existing costs, new maintenance costs for the upgraded layouts will include landscaping maintenance and bridge maintenance.

Option	Total discounted maintenance costs ($)
E	$377,054
F	$337,405
H	$284,000
I	$370,000
J	$390,000

Figure 13.4: Maintenance cost

11.5 Benefits

11.5.1 Travel Time Costs

Travel time costs were calculated considering the distance and vehicle speed along sections of road, and the delay at intersections.

Links

Links are the sections of road between intersections, or between the extents of the whole area under analysis. The costs over these sections are a function of the distance of the link, the number of vehicles travelling on the link, and the vehicle operating speed.

A network computer model was not deemed necessary to calculate the costs of travel along the links. This was done more simply in a spreadsheet form.

The overall speed on the links was assumed to be in the range of 35 to 40 km/h for the existing network, and 35 to 50 km/h for the options. These speeds were based on a floating car travel time surveys in the network.

The travel time value of $15.50/h was adopted from PEM (1998) for urban arterial, all periods.

Intersections
Intersection costs were calculated using the intersection analysis program INTANAL. INTANAL is capable of analysing signal and priority controlled intersections as well as roundabouts. In addition INTANAL analyses the economics of traffic operation and produces output in terms of the annual time costs and vehicle operating costs.

INTANAL Modelling
INTANAL contains several sets of default values that have to be replaced to reflect the local conditions. The relevant default values have been replaced with the values determined by traffic surveys or given in Transfund New Zealand Project Evaluation Manual. The substituted values were:

- annual number of hours for various traffic conditions
- unit cost of time
- vehicle operating cost rate, and
- unit fuel cost.

Adopted Approach to Modelling
While traffic volume growth is assumed to be linear, delays do not increase in proportion to the volume increase. Especially when the flow approaches the ultimate capacity, the delay rises steeply. Therefore the model has a tendency to produce very high delays for turning vehicles, which may find it difficult to find gaps of adequate size in the conflicting heavy traffic. In practice however such a situation seldom occurs, as drivers would accept smaller gaps or find alternative routes, if faced with a long waiting time at an intersection.

In order to overcome the above modelling problem, future year analyses were performed at five-year intervals, thus minimising the discrepancy between the traffic volume growth and delay growth.

INTANAL Model Data
All INTANAL inputs and outputs are in Appendix J.

11.5.2 Vehicle Operating Costs

The VOC's were calculated on the basis of two network features - the overall speed on the links (as discussed earlier) and the road roughness. Operation of intersections also causes an increase in vehicle operating costs. These costs are derived from INTANAL analysis, explained above.

Rates for speed and roughness have come from the Transit New Zealand PEM (1998).

Note that for new sections of roadway, roughness counts of 50 have been assumed. The rate for this value is 0 c/km, therefore there are no costs resulting from roughness.

11.5.3 Congestion

Congestion costs were calculated using PEM procedures given in section A4.5. The assumed saturation flow was 1,200 veh/h/lane. The duration of the peak was assumed to be two hours per day.

Congestion costs have been included in the analysis of travel time.

CO_2 Costs

CO_2 costs have considered as being 5% of the value of the VOC.

11.5.4 Accident Reductions

The area examined for accidents are the four streets around Basin Reserve, and 100m lengths from the Basin up Adelaide Road, Buckle Street, Cambridge and Kent Terraces, and Paterson Street. The analysis uses the accident record retrieved from the LTSA AIS database for the five-year period 1995 – 1999.

The summary of the accidents statistics is shown in the table.

Total Accidents	Fatal	Serious	Minor	Non Injury
167	1	4	27	135

Figure 11.5: Recorded accidents

Assumptions

An assessment of accident costs for the options was based on an assumed overall reduction of a specific type of accident rather than the detailed analysis of each accident site. The reduction was based on the proposed type of network upgrading.

Options E and F - all accidents were assumed to be reduced by 70 per cent. This is the assumed reduction for these two layouts given by Montgomery Watson in the 1998 report "Basin Reserve: Review of Wellington City Council Proposal and Suggestion of Alternative Layouts". This reduction appears to be quite large when compared to the assumed reductions for the other options.

Option H – all accidents were assumed to be reduced by 50 per cent, except head-on accidents (100 % reduction) and pedestrian accidents (no reduction).

Option I – all accidents were assumed to be reduced by 50 per cent, except head-on accidents (50 % reduction), rear end accidents (20 % reduction) and pedestrian accidents (no reduction).

Option J – all accidents were assumed to be reduced by 50 per cent, except head-on accidents (20 % reduction), rear end accidents (20 % reduction) and pedestrian accidents (no reduction).

11.6 Initial Analysis of Options B, D and K

Option B: Signals at Adelaide Road and Kent/Cambridge Terraces
A proposal to signalise all three major intersections at the Basin Reserve has previously been developed by Wellington City Council and Sims Harding.

This proposal was reviewed by Montgomery Watson in September 1998. The review aimed to assess the proposal in terms of capacity, traffic efficiency, safety, pedestrian needs, frontage activity, and the implications of the Inner City Bypass and possible widening of the Mt Victoria Tunnel. The review is summarised below.

Operational features
Degrees of saturation
Sims used a design year of 2011 for their analyses, and expected degrees of saturation to be in the range of 0.9-1.0 by that time at the Paterson/Dufferin and Rugby/Adelaide intersections. Subsequent SIDRA analysis based on 1997 traffic flows indicates that the degrees of saturation will be close to saturation much earlier than 2011.

	Kent/Ellice intersection	Paterson/Duffer in intersection	Rugby/Adelaide intersection
Sims (predicted flows for 2011)	0.67	0.91	0.96
SIDRA analysis based on 1997 flows	0.62	0.93	1.00

SIDRA results indicate that in the morning peak there will be queuing problems between the Paterson Street and Adelaide Road entries.

Discharge Conditions
For most signal intersections, platoons from successive phases discharge into different streets. However, for a signalised rotary successive platoons discharge into the same section of roadway. They follow each other in quick succession and often trailing vehicles of one platoon will be overtaken by leading ones of the next. This means that at peak times roadways downstream of the Paterson Street and Adelaide Road entries will be continually full.

Safety

While the scheme will undoubtedly have an improved safety performance, some significant potential hazards will remain:

- Potential for hidden queues around each corner of the circulating roadway. Good coordination of the signals will reduce the extent of queuing, but queues will still extend up to 150 m back from intersections.

- Potential for accidents at the corner of Rugby and Sussex Streets will remain significant.

Accident reductions

While the option should address a significant number of accidents, poor segregation of local and arterial traffic and continued potential for rear-end and loss of control accidents limits the extent of reduction. A net reduction of 50% is assumed.

Evaluation

Montgomery Watson performed a full evaluation of a fully signalised option, slightly different to that we have proposed as Option B. The only difference is that their option had three traffic lanes on Dufferin Street and Rugby Street, as opposed to the two we have drawn.

A summary of the project benefits compared to existing is shown below:

Benefits	NPV $ million
Accident benefit	+3.8
Delay	
Vehicle operating costs	-3.0
Travel time costs	-3.8
Travel reductions	
Vehicle operating costs	0.0
Travel time costs	0.0
Pedestrian benefits	0.0
Total	-3.0

Conclusions

The Montgomery Watson review concluded that the fully signalised option had limited spare capacity, a likelihood of serious queuing problems in Dufferin Street, and limited separation of local and arterial traffic.

The large disbenefit of 3 million dollars suggests the option is far from viable. It is also clearly an interim option.

We have estimated construction costs to be in the order of $1 Million.

Option D – Tunnel between Adelaide Road and Kent / Cambridge Terraces
Benefits for Option D would likely by similar to that of Option H. In both options, the Paterson – Buckle Street traffic is completely separated from the Kent/Cambridge – Adelaide traffic. There are no traffic signals or any other major intersections in either option. Therefore it is possible to estimate the benefits for this option as being similar to Option H.

The construction costs will be significantly higher than any other option, and so Option D will not produce a comparatively favourable benefit-cost ratio. Given this assumption, full analysis of benefits is not justified.

Constructions costs have been calculated as $16 Million, with land costs at no net gain. These are used with the benefits obtained from analysis of Option H to derive a conservative BCR = 3.3.

Option K – Tunnel between Paterson Street and Buckle Street
The same assumptions made in evaluating Option D are valid for Option K.

Construction costs for Option K have been estimated as $19.3 Million. These are compared with the benefits derived from Option H. The resultant BCR is in the order of 2.8.

12.0 Recommendation

We recommend that Option H Paterson Street – Buckle Link with Twin Overpass is progressed through designation and design. This option has a BCR of 4.6 and an incremental BCR of 4.2 over Option E, BCR = 4.8.

This Option is one of the long term options and it's early construction will provide certainty to this area. It will avoid unnecessary disruption to traffic with a series of interim projects and will provide significant travel time, vehicle operating and crash reduction benefits. Of the long-term options it has least impact on the current network away from SH 1 because the Basin Reserve continues to operate in a rotary fashion for north south movements.

13.0 Preferred Option

The key issues identified with Option H are considered below.

13.1 Sensitivity Analysis

Sensitivity analysis has been performed for the preferred option.

Tested Variable	Minimum Value			Maximum Value		
	Change (%)	Resulting B/C	Change in B/C	Change (%)	Resulting B/C	Change in B/C
Best Estimate		4.6			4.6	
Traffic Growth Rate	-25	4.4	-0.2	+25	4.8	+0.2
Capital Cost	-20	5.7	+1.1	+20	3.8	-0.8
TT & VOC Savings	-20	3.9	-0.7	+20	5.2	+0.6
Accident Savings	-50	4.4	-0.2	+50	4.8	+0.2

Figure 13.1: Sensitivity analysis of Option H

13.2 Risks and Mitigation Measures

The main risks and mitigation measures identified as applicable to Option H are listed below.

Risks	Mitigation measures
Unidentified and unknown services uncovered during excavation. Especially during excavation of trenches.	All services to be consulted and services located before construction commences.
Pavement failure of Ellice and Tasman Streets when large volumes of traffic are diverted along them during construction.	Analysis of pavement strength during final design. Additional strengthening to be carried out on these Streets if required, e.g., AC topping, stabilisation.
Potential failure of building foundations due to adjacent excavation. Particularly the Museum Stand on Sussex Street.	Foundation and geotechnical investigation of buildings during final design. Strengthening or protection if required.
Damage to adjacent buildings during construction.	Protection of building exteriors.
Pedestrian safety during construction. Particularly school children.	Ensuring adequate temporary footpaths, especially outside adjacent schools.
Performance of temporary traffic facilities during construction.	Detailed design of temporary roads and intersections during final design phase.
Suitability of the foundation material below the embankment and bridge structures.	Thorough geotechnical investigation during final design stage.
Relocation of 33kV power cables.	Detailed consultation with United Networks.

Figure 13.2: Risks and mitigation measures

13.3 Construction

Staging the construction over any great length of time is not considered a viable option. Factors that would make staging difficult include:

- Construction on one side of the intersection has a large affect on other sides. New temporary intersections and roads would need to be constructed to accommodate new traffic movements and road locations. These works would be quite substantial and expensive, and would significantly increase costs.

- Temporary intersections or sections of road would likely result in further traffic disruptions and delays. If the grade separation work of Option H were staged, traffic signals would need to be installed while only one grade-separated intersection was operating. Without further analysis, it can be deduced that temporary signals would likely create extra congestion.

- The public reaction to staging the construction would most likely not be favourable. Staging would result in inconvenience and increased delay to motorists. Having temporary facilities as a result of staging for any great length of time would likely result in public outcry.

- The public would also likely object to substantial additional funds being spent on temporary work, only for it to be removed a couple of years later and rebuilt in the final state.

- Services would be disrupted by staging, in particular trolley-bus lines. Any temporary roads and intersections would need to have overhead lines installed, which is a significant cost. It is possible that the service provided by temporary lines would be less than that of a permanent line.

Possible Construction Sequence

The following is a broad outline of the stages of construction to demonstrate the impact on the traffic flows:

Stage 1

(i) Construction of new alignment at the northeast corner between Paterson Street and Kent Terrace.

(ii) Construction of temporary control and intersection at Dufferin/Ellice Streets

Traffic around the Basin Reserve unaffected at this stage. Entrances to Hania and Ellice Streets disrupted during construction.

Stage 2

(i) Construction of the underpass, bridge and slip lane at the Paterson/Dufferin Street intersection. Also, construction of the pedestrian and cycle underpass. This work involves significant service relocations.

The underpass would be completed to a level such that it is ready for use by traffic. This means overhead trolley bus lines are installed, and a temporary surface is constructed at the south end for traffic to divert back onto Dufferin Street.

A temporary intersection is installed at Ellice and Dufferin. Traffic travelling to and from the tunnel now uses Ellice Street to get onto Paterson Street. Two lanes are provided for circulation along Dufferin Street.

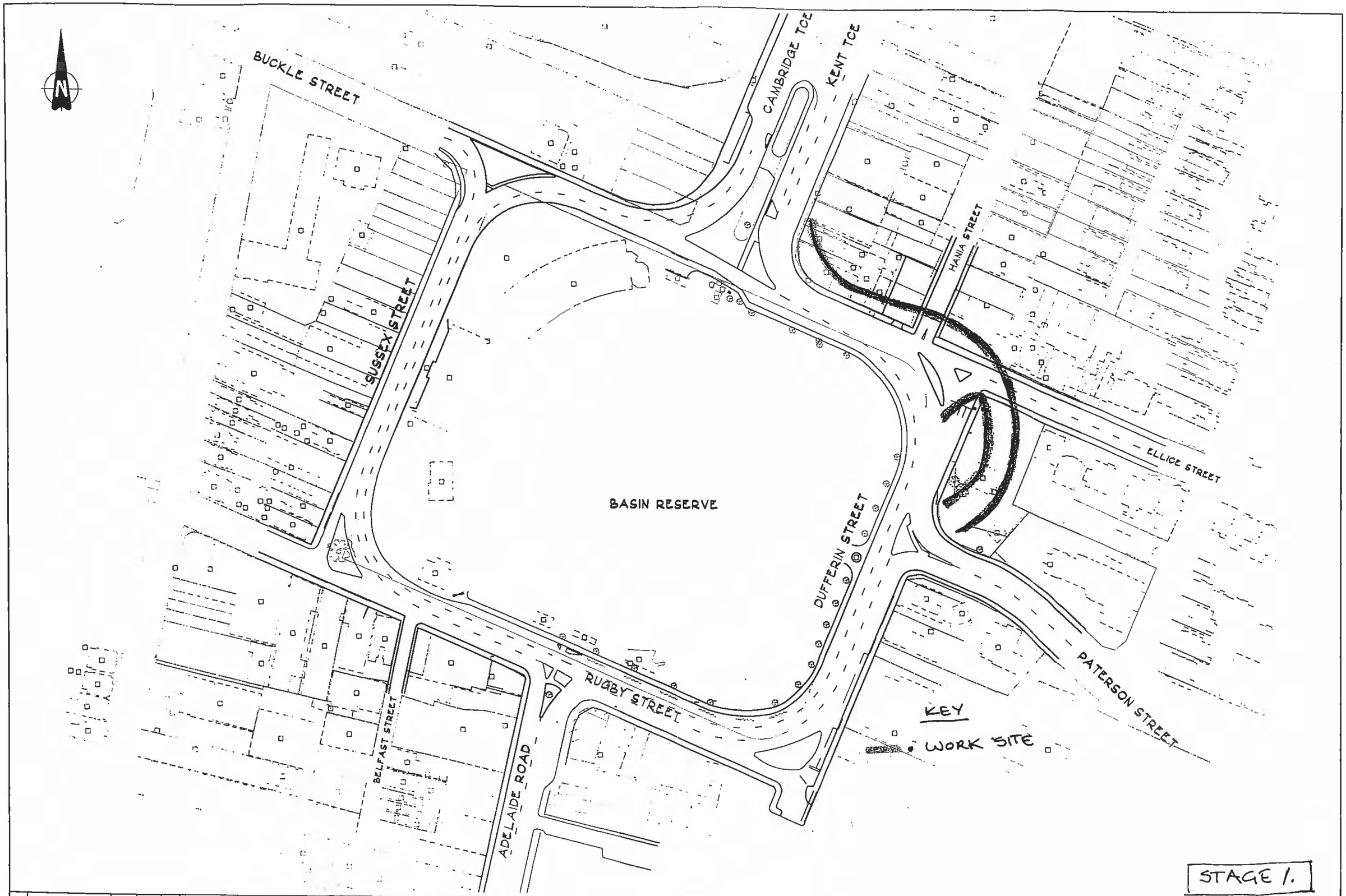
(ii) Construction of the new roadway on the northwest corner begins. This includes the cycle and pedestrian lane, and the slip lane. This work has no affect on current traffic movements in the vicinity.

Stage 3

Completion of the road between Paterson and Buckle Streets. Construction of the underpass and slip lane at northwest corner. Completion of the slip lane at the end of Cambridge Terrace. All services installed and minor works completed.

Tunnel traffic continues to use Ellice Street. Now, all circulating traffic uses the new underpass on Dufferin Street.

Sussex Street is closed for through traffic, and so vehicles are diverted along Tasman Street. They must continue along Tory Street towards town, as Buckle Street cannot be used. If trolley buses are to be used during this stage, temporary overhead lines will need to be installed.



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PROJECT: BASIN RESERVE UPGRADE

SHEET TITLE: PROPERTY PLAN EXISTING BASIN RESERVE LAYOUT

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ORIGINAL SCALE 1:750 (A1)

DRAWING No PP01

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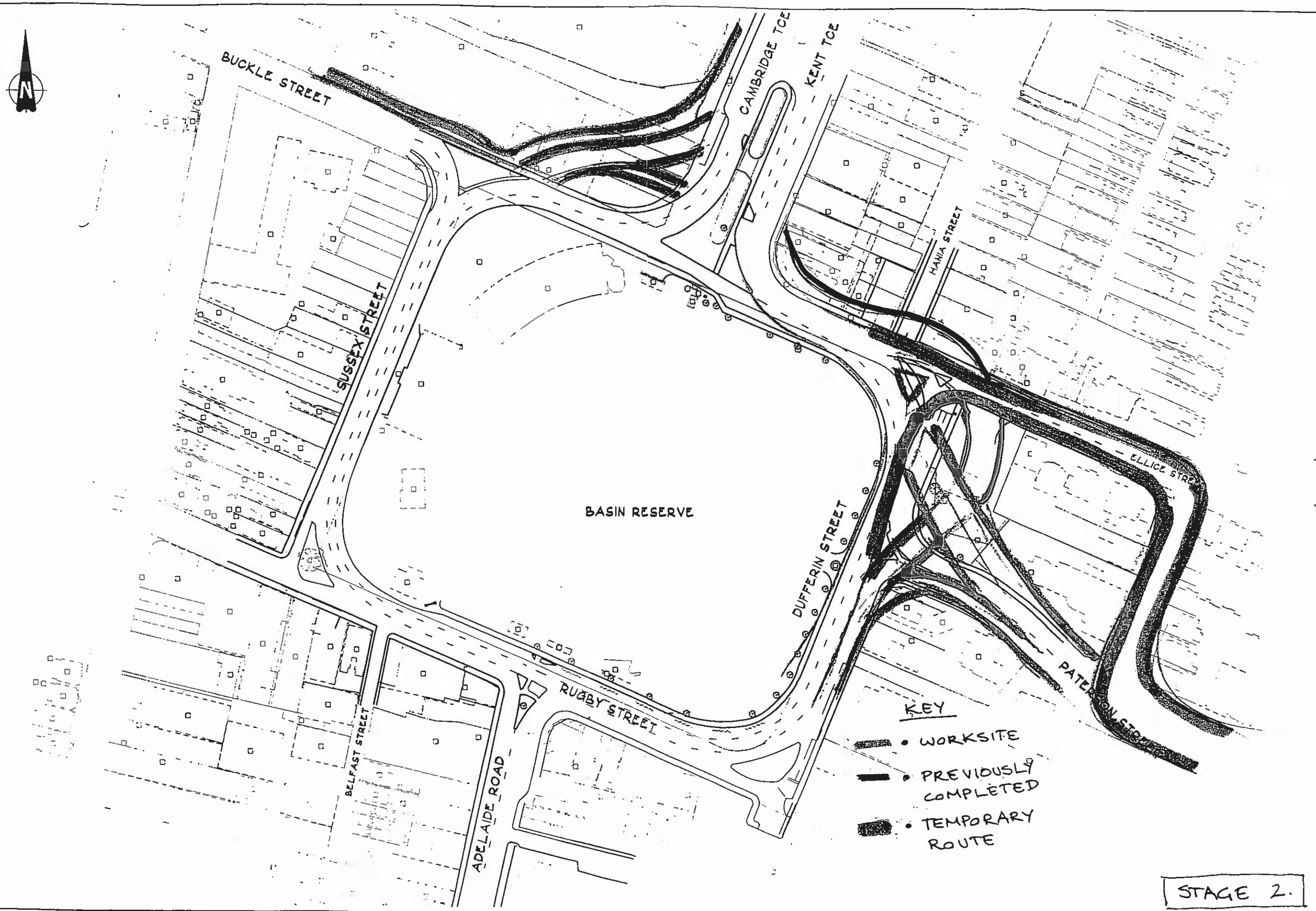

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SHEET TITLE: PROPERTY PLAN EXISTING BASIN RESERVE LAYOUT

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SHEET No

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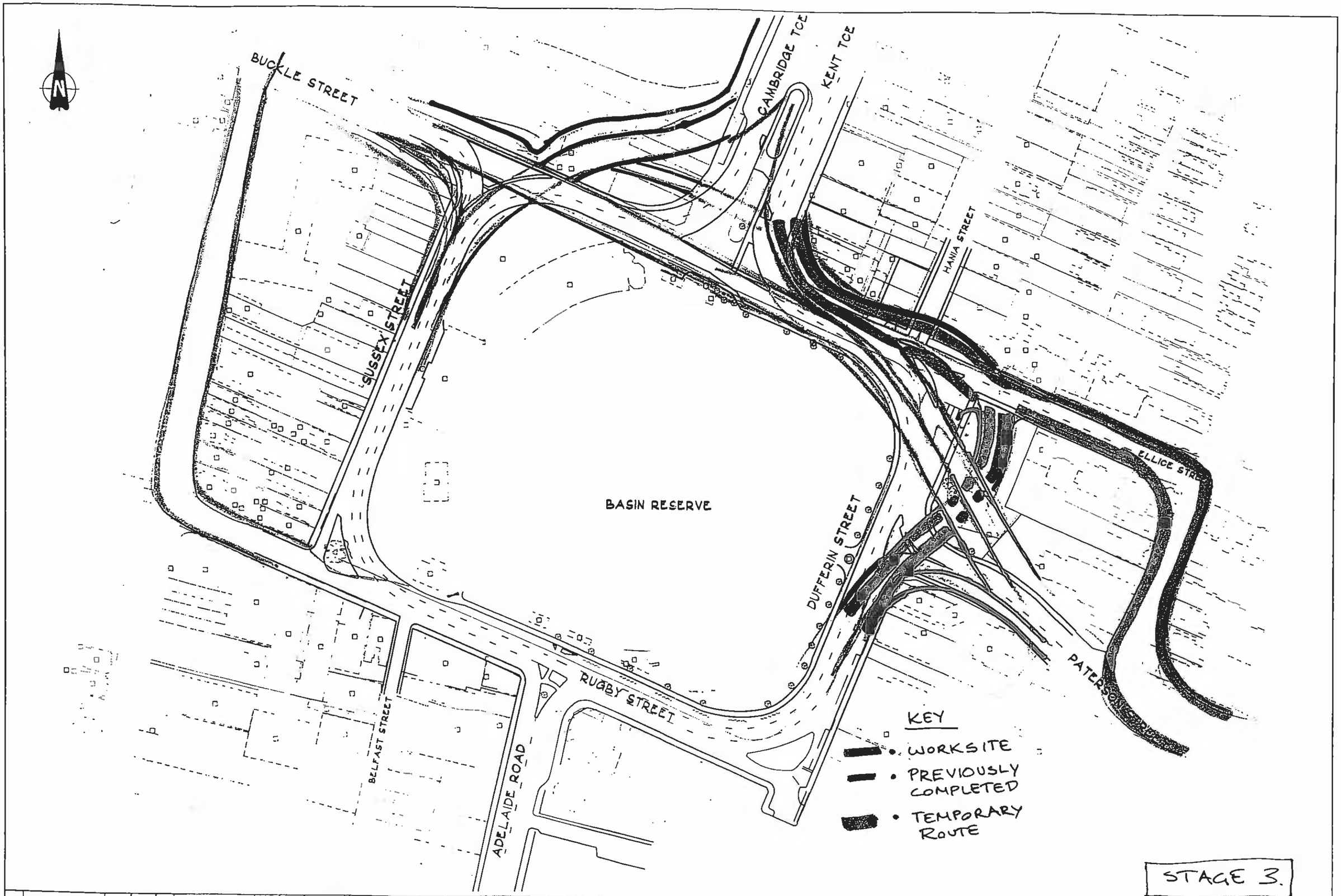

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PROJECT
BASIN RESERVE UPGRADE

SHEET TITLE
PROPERTY PLAN
EXISTING BASIN
RESERVE LAYOUT

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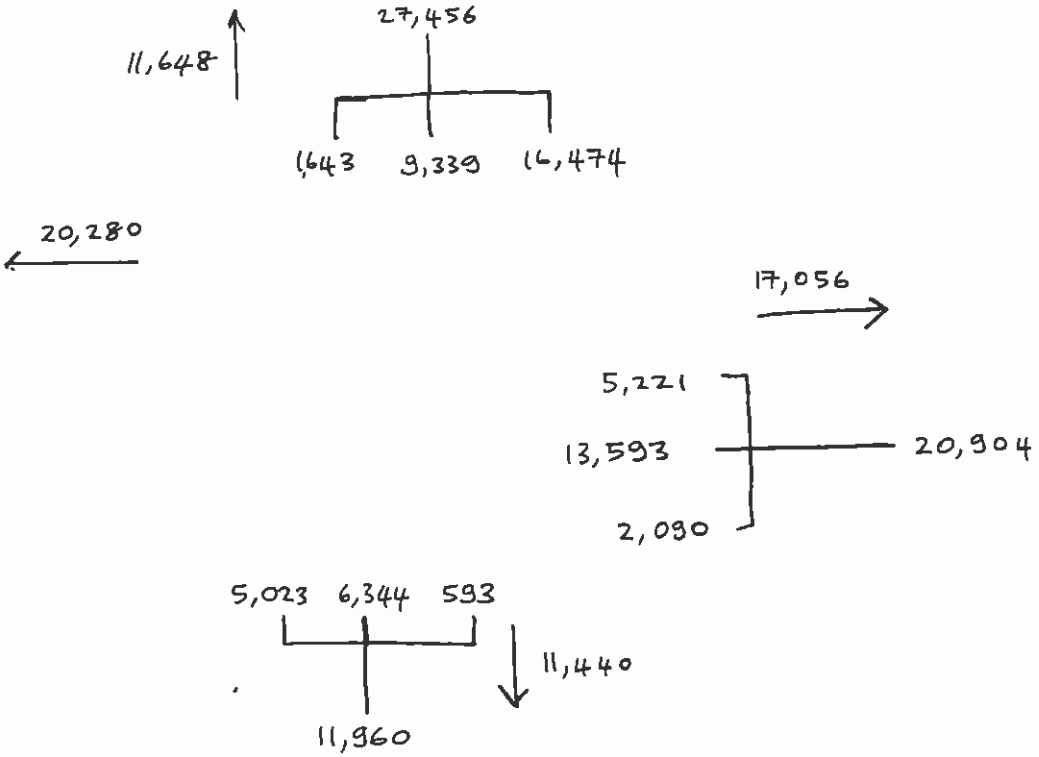
ORIGINAL SCALE 1:750 (A1)
DRAWING No PP01

Appendix A
Traffic Surveys & Data

AADT

1. FROM MW 1998 COUNTS
2. UPDATED TO 2000 AT 2% GROWTH



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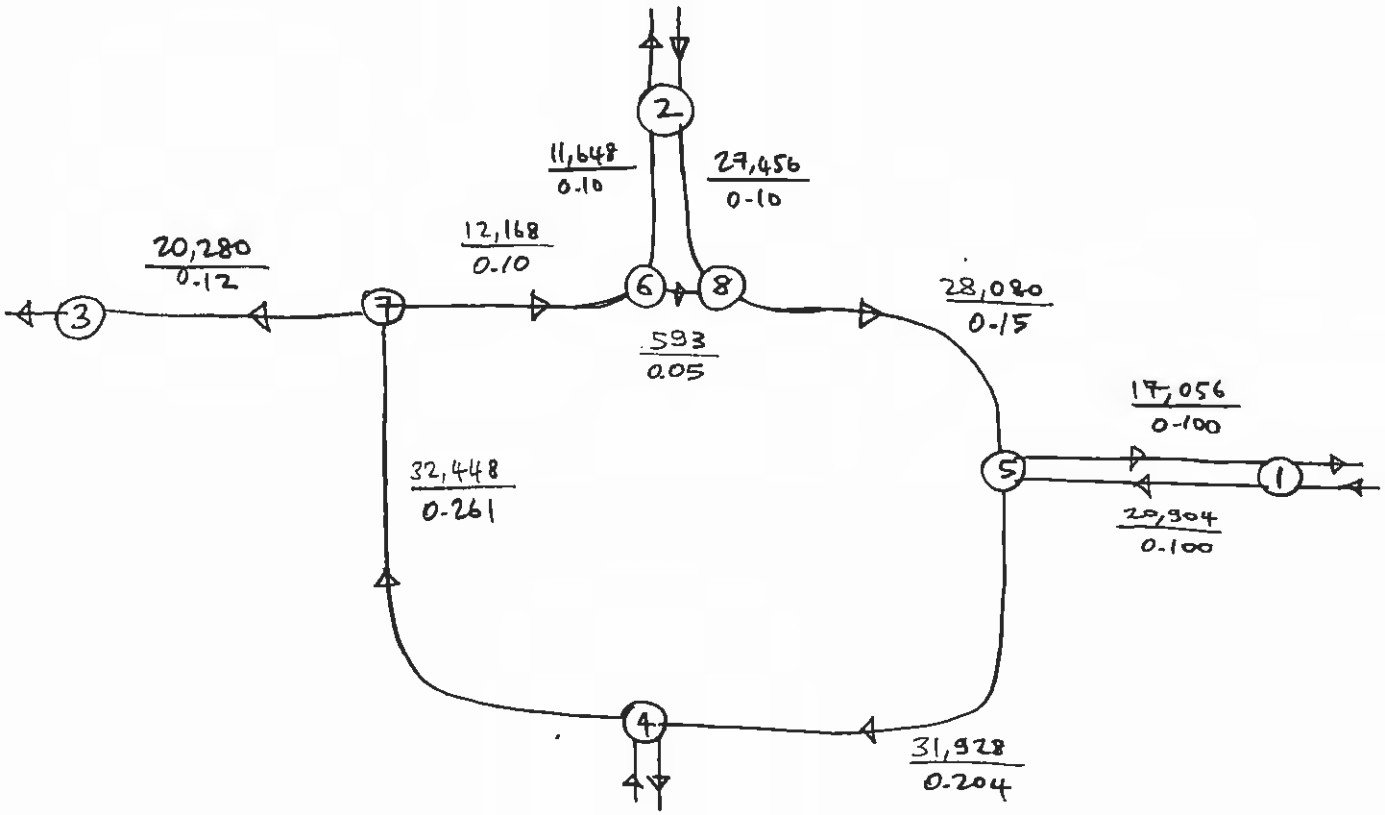
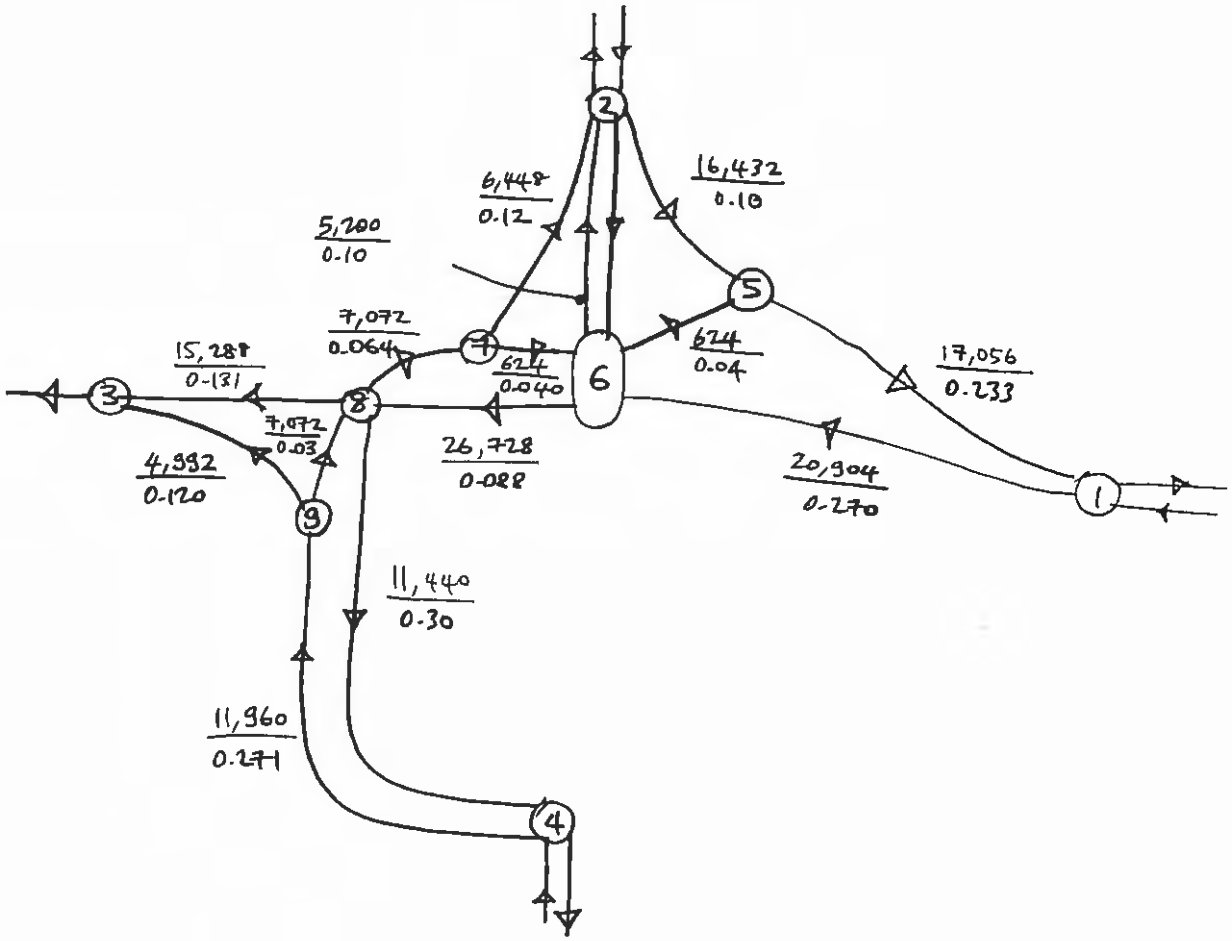


1. 2000 AADT VALUES
   UPDATED AT 2% GROWTH FROM 1998 VALUES

OPTION E



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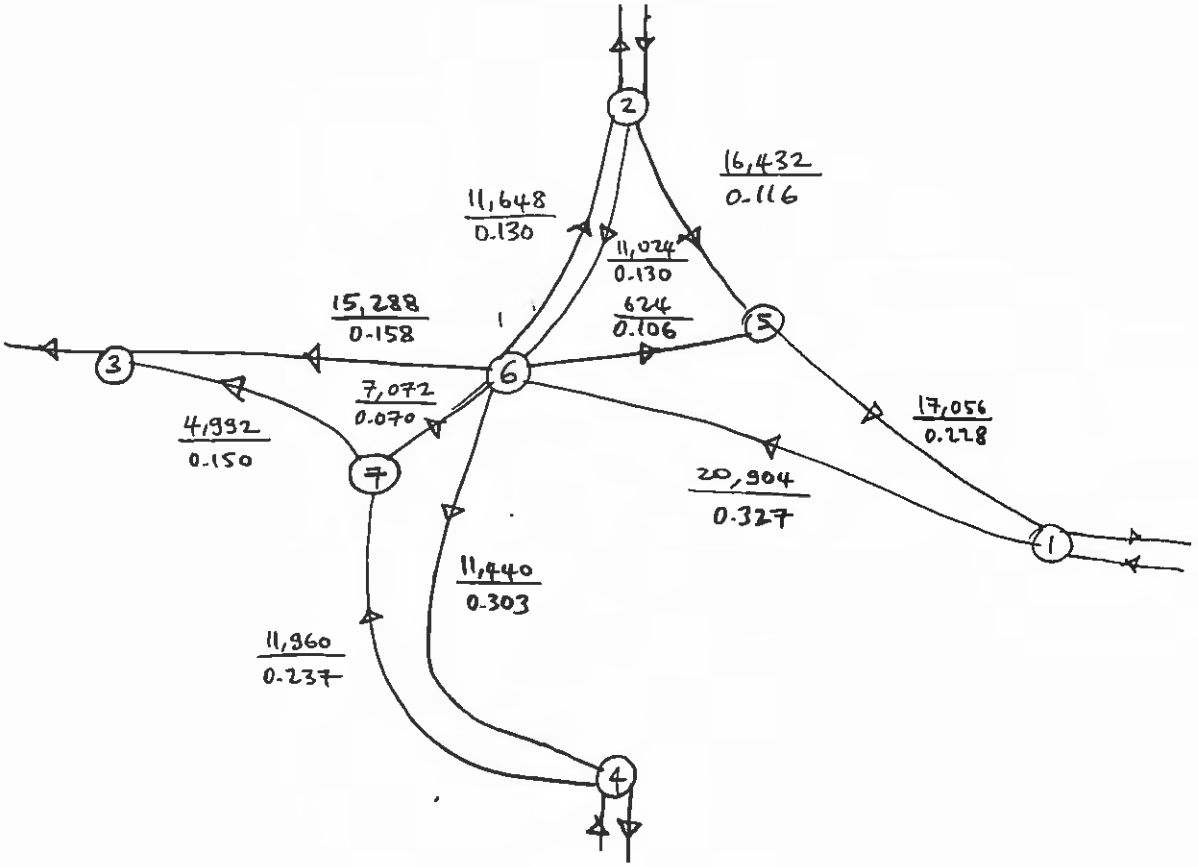
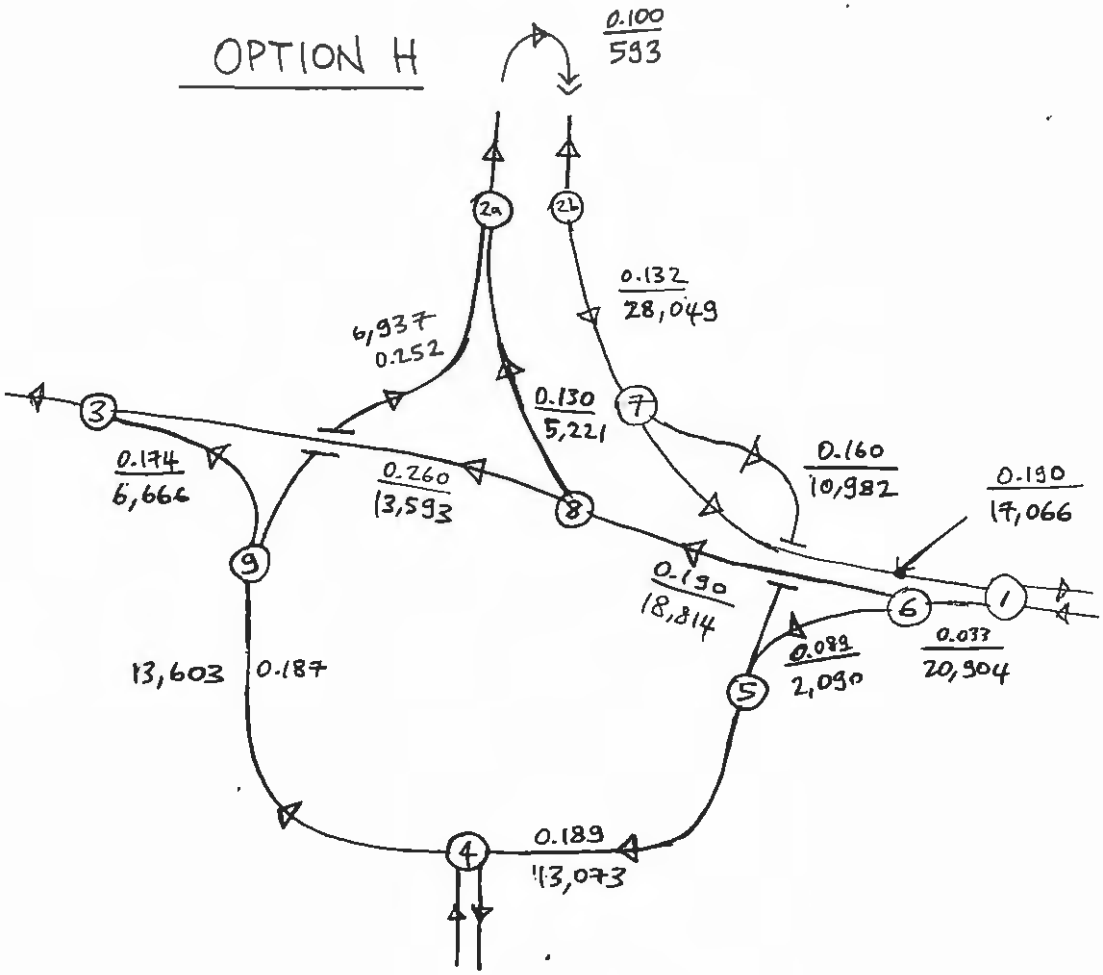
OPTION F



1. 2000 AADT VALUES
   UPDATED AT 2% GROWTH FROM 1998 VALUES

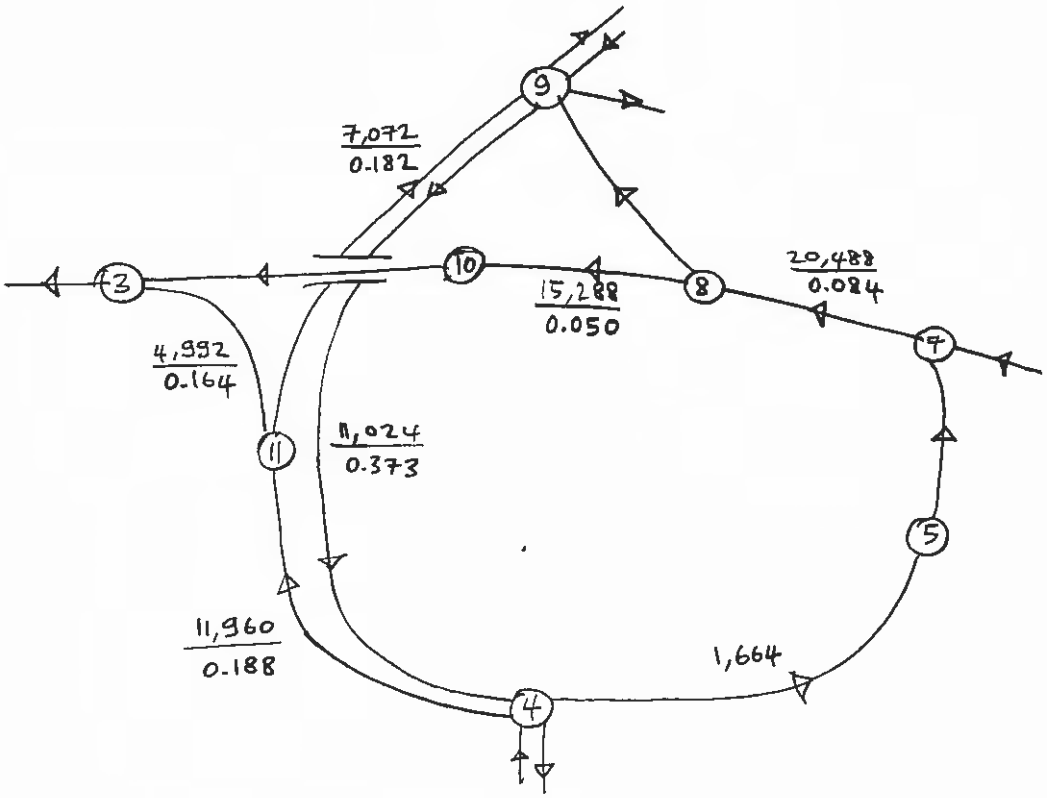
OPTION H



1. 2000 AADT VOLUMES
   UPDATED AT 2% FROM 1998 VALUES

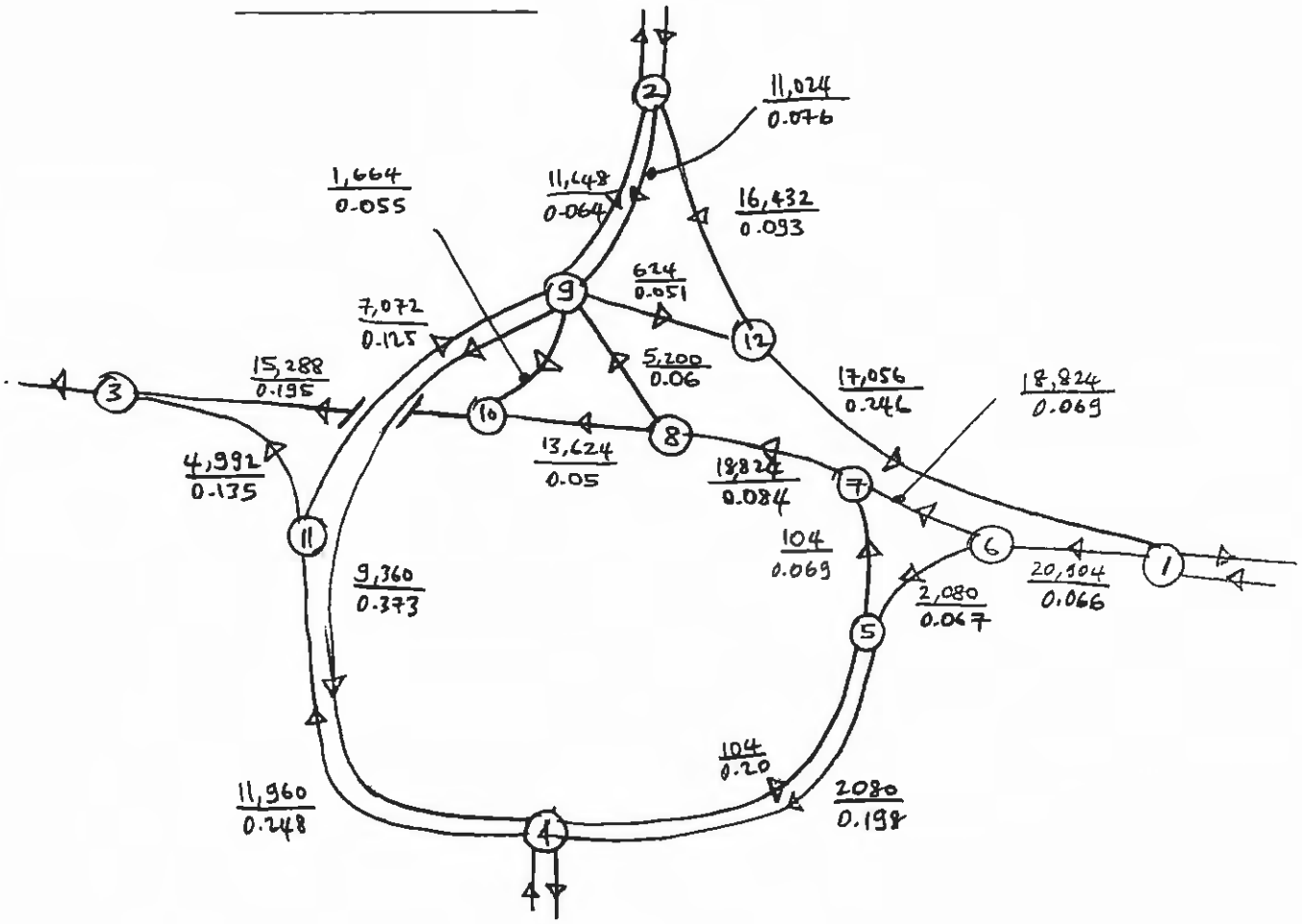
OPTION I

Similar to Option J except



1. 2000 AADT VALUES
   UPDATED AT 2% GROWTH FROM 1998 VALUES

OPTION J



1. 2000 VALUES. UPDATED FROM 1998 COUNTS USING 2% GROWTH

Traffic Volume				
location	1A			
time period	lane 1	lane 2	lane 3	lane 4
5 mins beginning:	vehs/5min	vehs/5min	vehs/5min	vehs/5min
08:35	33	56	43	12
08:40	36	66	48	15
08:45	59	59	63	20
08:50	34	74	60	20
08:55	26	78	51	26
09:00	20	72	55	15
	208	405	320	108
11:35	28	60	40	7
11:40	16	70	47	16
11:45	17	56	62	18
11:50	15	60	50	5
11:55	16	71	50	13
12:00	15	83	61	15
	107	400	310	74
05:30	65	88	72	17
05:35	47	81	55	18
05:40	41	101	48	24
05:45	45	92	64	15
05:50	39	105	62	17
05:55	40	100	64	17
	277	567	365	108
location	1B			
08:35	62	60		
08:40	70	70		
08:45	78	66		
08:50	71	62		
08:55	75	45		
09:00	51	51		
	407	354		
11:00	53	50		
11:05	52	51		
11:10	62	43		
11:15	60	48		
11:20	50	33		
11:25	38	40		
	315	265		
05:30	62	56		
05:35	58	55		
05:40	55	61		
05:45	52	43		
05:50	62	54		
05:55	57	49		
	346	318		
location	2			
08:00	69	17		
08:05	84	22		
08:10	84	25		
08:15	60	30		
08:20	75	37		
08:25	75	38		
	447	169		
11:35	37	32		
11:40	35	29		
11:45	45	27		
11:50	50	31		
11:55	48	35		
12:00	43	35		
	258	189		
05:15	59	34		
05:20	57	38		
05:25	50	31		
05:30	43	16		
05:35	45	27		
05:40	43	34		
	297	180		
location	3			
08:00	100	90		
08:05	82	65		
08:10	89	58		
08:15	100	48		
08:20	113	75		
08:25	89	60		
	573	396		
11:00	54	46		
11:05	75	39		
11:10	69	52		
11:15	68	55		
11:20	81	47		
11:25	70	46		
	417	285		
05:50	145	70		
05:55	145	85		
06:00	117	86		
06:05	125	85		
06:10	130	75		
06:15	127	65		
	789	466		

	Buses			
location	1A			
time period	lane 1	lane 2	lane 3	lane 4
5 mins beginning:	vehs/5min	vehs/5min	vehs/5min	vehs/5min
08:35	1	1	10	1
08:40	1	1	5	
08:45			3	
08:50			2	
08:55	1	1	3	1
09:00		2	1	1
	3	5	24	3
11:35				
11:40			1	
11:45			2	
11:50			1	
11:55			4	
12:00		1		
	0	1	8	0
05:30			2	
05:35			1	
05:40				
05:45			6	
05:50			4	
05:55			5	
	0	0	18	0
location	1B			
08:35				
08:40				
08:45				
08:50				
08:55				
09:00				
	0	0		
11:00				
11:05				
11:10				
11:15				
11:20				
11:25				
	0	0		
05:30	1	1		
05:35				
05:40				
05:45				
05:50				
05:55				
	1	1		
location	2			
08:00	3			
08:05	4			
08:10	4			
08:15	2			
08:20	3			
08:25	4			
	20	0		
11:35				
11:40	1			
11:45	1			
11:50	2			
11:55	1			
12:00	1			
	6	0		
05:15	3			
05:20	2			
05:25	4			
05:30	2			
05:35	2			
05:40	1			
	14	0		
location	3			
08:00		1		
08:05	3	1		
08:10	1	1		
08:15	1			
08:20	4	1		
08:25	4	3		
	13	7		
11:00	1			
11:05	1			
11:10	1	1		
11:15		2		
11:20	2			
11:25	1			
	6	3		
05:50		1		
05:55	3	2		
06:00	2	1		
06:05	2	1		
06:10	1	1		
06:15	1	1		
	9	7		

Queue lengths (avg for 5mins)				
location	1A			
time period	lane 1	lane 2	lane 3	lane 4
5 mins beginning:	vehs	vehs	vehs	vehs
08:35	0	0	10+	0
08:40	4	4	10+	0
08:45	3	5	10+	0
08:50	1	4	10+	3
08:55	0	0	10+	2
09:00	0	0	8	0
	8	13	58+	5
11:35	0	3	6	0
11:40	0	3	6	0
11:45	0	2	6	0
11:50	0	3	6	0
11:55	0	3	6	0
12:00	0	3	6	0
	0	17	36	0
05:30	5	6	10+	0
05:35	0	5	10+	0
05:40	0	6	10+	0
05:45	0	6	10+	0
05:50	4	5	10+	0
05:55	0	6	10+	0
	9	34	60+	0
location	1B			
08:35	10+	10+	0	0
08:40	10+	10+	0	0
08:45	10+	10+	0	0
08:50	7	7	0	0
08:55	7	7	0	0
09:00	5	6	0	0
	49+	50+		
11:00	8	8	0	0
11:05	4	4	0	0
11:10	8	2	0	0
11:15	6	7	0	0
11:20	3	3	0	0
11:25	3	3	0	0
	32	27		
05:30	8	8	0	0
05:35	6	6	0	0
05:40	10+	10+	0	0
05:45	4	4	0	0
05:50	7	7	0	0
05:55	6	5	0	0
	41+	40+		
location	2			
08:00	4	3	0	0
08:05	10	2	0	0
08:10	6	7	0	0
08:15	10+	3	0	0
08:20	10+	10+	0	0
08:25	10+	10+	0	0
	50+	35+		
11:35	0	0	0	0
11:40	0	2	0	0
11:45	0	2	0	0
11:50	0	2	0	0
11:55	0	3	0	0
12:00	2	3	0	0
	2	12		
05:15	5	10+	0	0
05:20	0	8	0	0
05:25	0	4	0	0
05:30	0	2	0	0
05:35	0	3	0	0
05:40	0	4	0	0
	5	31+		
location	3			
08:00	0	2	0	0
08:05	6	6	0	0
08:10	4	4	0	0
08:15	3	1	0	0
08:20	8	8	0	0
08:25	10+	10+	0	0
	31+	31+		
11:00	0	0	0	0
11:05	0	0	0	0
11:10	0	0	0	0
11:15	0	0	0	0
11:20	0	0	0	0
11:25	0	0	0	0
	0	0		
05:50	10+	10+	0	0
05:55	10+	10+	0	0
06:00	10+	10+	0	0
06:05	10+	0	0	0
06:10	10+	0	0	0
06:15	10+	0	0	0
	60+	30+		

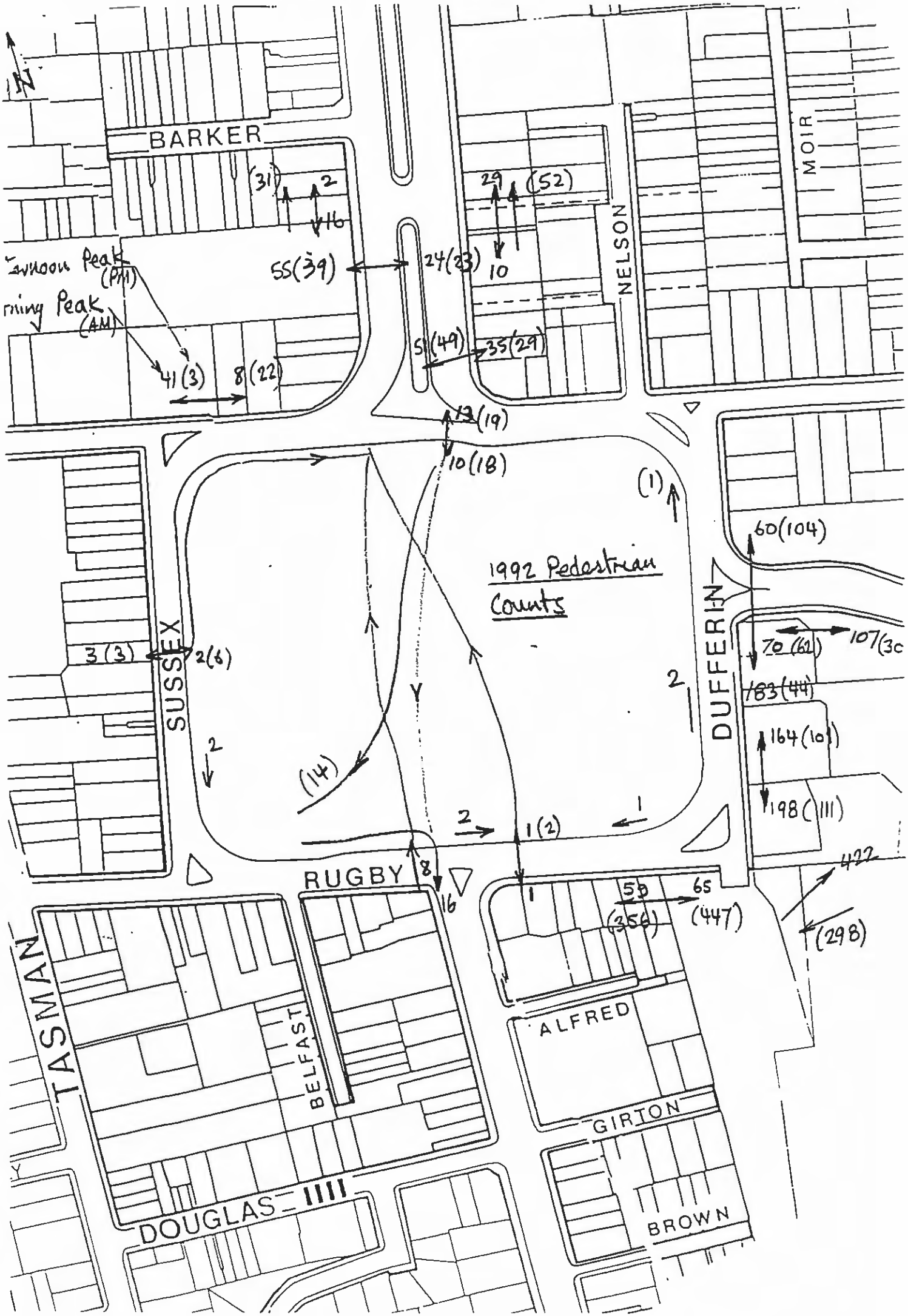
Basin Reserve Travel Time Surveys 29 June 2000

IN	OUT (mins:secs)			
	Mt Vic	Adelaide	Buckle	Kent
AM peak 8:00-9:00				
Run 1 8:00-8:50				
Mt Vic		01:10	02:33	01:52
Adelaide	02:47		00:54	01:48
Kent	00:47	02:52	02:46	
Run 2 8:50-9:20				
Mt Vic		02:09	01:53	01:32
Adelaide	01:55		01:24	00:53
Kent	00:37	01:25	01:32	
Interpeak 10:30-11:30				
Run 1 10:30-10:50				
Mt Vic		01:20	01:20	01:18
Adelaide	01:22		00:53	00:51
Kent	00:39	01:28	01:35	
Run 2 10:50-11:25				
Mt Vic		01:30	01:37	01:32
Adelaide	01:29		01:08	01:06
Kent	00:38	01:25	01:27	
Run 3 11:25-11:55				
Mt Vic		00:56	01:31	02:25
Adelaide	01:58		01:17	01:20
Kent	00:40	01:31	01:28	
PM peak 5:00-6:00				
Run 1 5:00-5:40				
Mt Vic		01:17	02:36	02:35
Adelaide	03:55		02:26	01:17
Kent	00:43	01:46	04:01	
Run 2 5:40-6:15				
Mt Vic		01:05	01:49	01:20
Adelaide	02:58		01:17	01:07
Kent	01:24	01:51	02:02	

Basin Reserve Travel Time Surveys 29 June 2000

IN	OUT (Distance m)			
	Mt Vic	Adelaide	Buckle	Kent
Mt Vic		480	760	860
Adelaide	800		570	650
Kent	420	600	870	

IN	OUT (Average velocity m/s)			
	Mt Vic	Adelaide	Buckle	Kent
AM peak 8:00-9:00				
Run 1 8:00-8:50				
Mt Vic		6.86	4.97	7.68
Adelaide	4.79		10.56	6.02
Kent	8.94	3.49	5.24	
Run 2 8:50-9:20				
Mt Vic		3.72	6.73	9.35
Adelaide	6.96		6.79	12.26
Kent	11.35	7.06	9.46	
Interpeak 10:30-11:30				
Run 1 10:30-10:50				
Mt Vic		6.00	9.50	11.03
Adelaide	9.76		10.75	12.75
Kent	10.77	6.82	9.16	
Run 2 10:50-11:25				
Mt Vic		5.33	7.84	9.35
Adelaide	8.99		8.38	9.85
Kent	11.05	7.06	10.00	
Run 3 11:25-11:55				
Mt Vic		8.57	8.35	5.93
Adelaide	6.78		7.40	8.13
Kent	10.50	6.59	9.89	
PM peak 5:00-6:00				
Run 1 5:00-5:40				
Mt Vic		6.23	4.87	5.55
Adelaide	3.40		3.90	8.44
Kent	9.77	5.66	3.61	
Run 2 5:40-6:15				
Mt Vic		7.38	6.97	10.75
Adelaide	4.49		7.40	9.70
Kent	4.77	5.41	7.13	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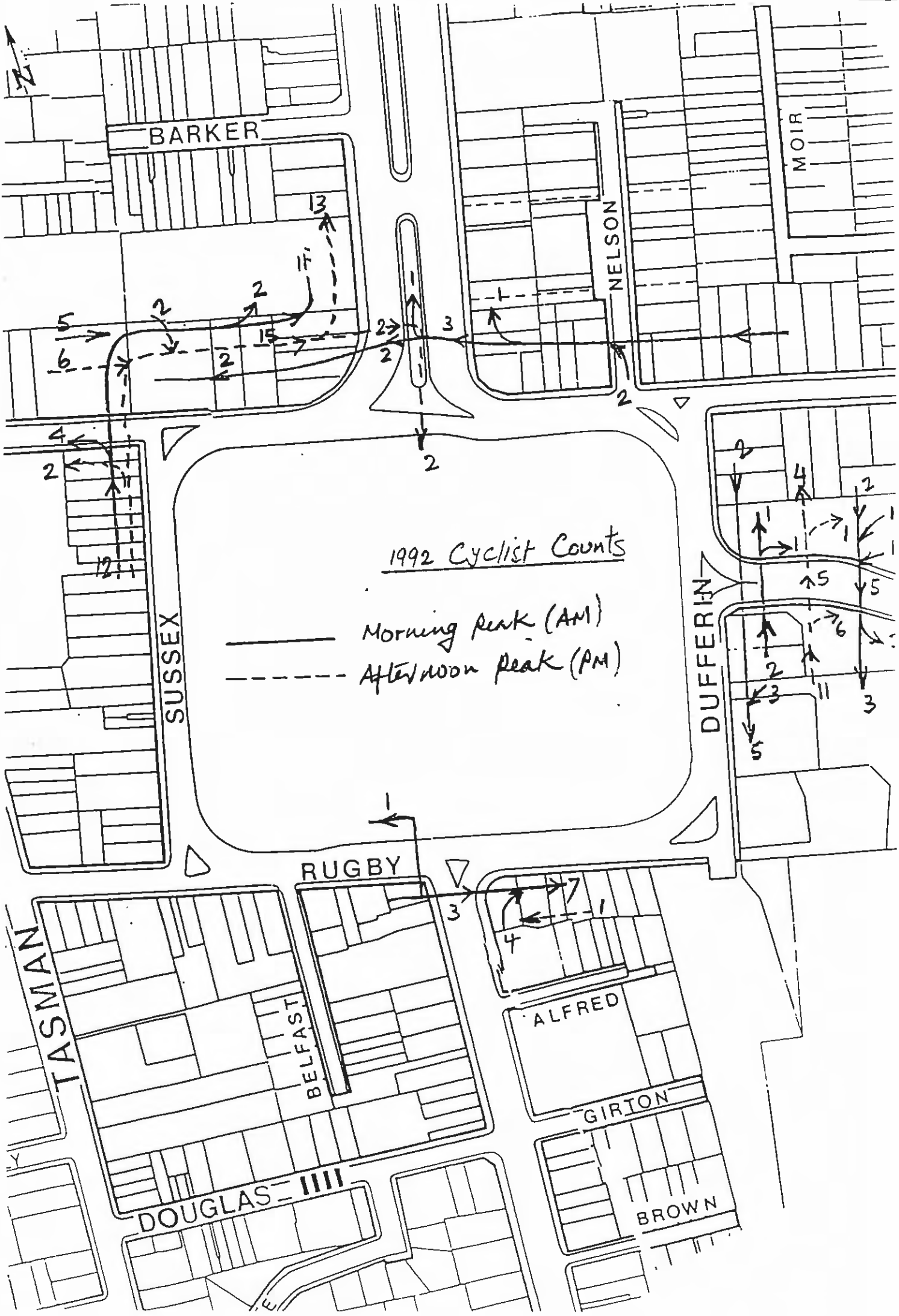
BARKER
MOIR
NELSON
SUSSEX
DUFFERIN
RUGBY
TASMAN
BELFAST
ALFRED
GIRTON
DOUGLAS
BROWN
1992 Pedestrian Counts
(31)
2
16
29
(52)
10
55(39)
24(23)
Afternoon Peak (PM)
Morning Peak (AM)
41(3)
8(22)
51(49)
35(29)
13(19)
10(18)
(1)
60(104)
3(3)
2(6)
2
2
(14)
70(62)
107(30
183(44)
164(10
198(111
2
1(2)
1
8
16
1
59
(356)
65
(447)
422
(298)


BARKER
MOIR
NELSON
SUSSEX
DUFFERIN
RUGBY
TASMAN
BELFAST
ALFRED
GIRTON
DOUGLAS
BROWN
1992 Cyclist Counts
Morning Peak (AM)
Afternoon Peak (PM)

WCC Surveys at Mt Victoria Tunnel Entrance

SITE REFERENCE 00000013 ANALYSIS FOR WEEK ENDING SUN 4 SEPTEMBER 1994

MOUNT VICTORIA TUNNEL W ESTERN END CHANNEL 2 East Bound VEHICLES

INT	PERIOD ENDING	MON 29	TUES 30	WED 31	THURS 1	FRI 2	SAT 3	SUN 4	5/DAY (AV)	7/DAY (AV)
1	1.00	-1	133	190	169	265	331	331	189	230
1	2.00	-1	55	72	91	110	285	239	82	133
1	3.00	-1	38	65	58	91	192	164	63	96
1	4.00	-1	34	33	39	73	134	145	45	72
1	5.00	-1	42	51	48	76	138	102	54	73
1	6.00	-1	197	133	185	172	141	109	172	158
1	7.00	-1	502	467	525	476	275	178	493	417
1	8.00	-1	885	899	863	790	367	259	859	703
1	9.00	-1	929	940	924	823	523	340	904	769
1	10.00	-1	846	938	960	884	680	552	907	824
1	11.00	-1	879	895	920	956	944	703	913	887
1	12.00	-1	1006	889	1005	1017	1077	851	979	975
1	13.00	-1	1061	1031	1138	1197	1171	1050	1107	1108
1	14.00	-1	1111	1084	1135	1208	1358	1107	1135	1163
1	15.00	-1	1071	997	1056	1208	1189	1088	1083	1099
1	16.00	-1	1102	1192	1133	1261	1058	1165	1172	1155
1	17.00	1329	1409	1408	1343	1479	981	1198	1394	1307
1	18.00	1614	1636	1597	1123	1557	956	966	1505	1350
1	19.00	1150	1209	1382	1371	1339	855	983	1290	1184
1	20.00	877	857	894	947	1060	897	766	927	900
1	21.00	659	616	700	737	842	567	682	711	686
1	22.00	504	551	532	599	584	388	515	554	525
1	23.00	420	541	553	514	527	535	365	511	494
1	24.00	278	309	368	344	467	423	233	353	346
12	19.00	-1	13144	13252	12971	13719	11159	10262	13272	12540
16	22.00	-1	15670	15845	15779	16681	13286	12403	15994	15094
18	24.00	-1	16520	16766	16637	17675	14244	13001	16900	15963
24	24.00	-1	17019	17310	17227	18462	15465	14091	17505	16726
0.15	7.00	-1	148	131	142	124	64	39	136	112
0.15	7.15	-1	157	139	160	126	78	46	146	122
0.15	7.30	-1	204	208	170	184	70	43	192	153
0.15	7.45	-1	266	275	267	251	91	66	265	212
0.15	8.00	-1	258	277	266	229	128	104	258	217
0.15	8.15	-1	195	188	232	180	126	57	199	168
0.15	8.30	-1	230	252	211	240	118	73	233	194
0.15	8.45	-1	256	257	258	189	137	93	240	204
0.15	9.00	-1	248	243	223	214	142	117	232	203
0.15	16.00	307	286	379	314	341	277	322	325	318
0.15	16.15	302	325	336	282	359	267	275	321	307
0.15	16.30	319	319	348	329	341	223	292	331	310
0.15	16.45	333	324	354	372	363	243	307	349	328
0.15	17.00	375	441	370	360	416	248	324	392	362
0.15	17.15	386	418	400	310	412	218	264	385	344
0.15	17.30	457	476	413	244	431	268	217	404	358
0.15	17.45	410	390	388	287	382	257	244	371	337
0.15	18.00	361	352	396	282	332	213	241	345	311
AM PEAK HR		-	12.00	9.15	12.00	12.00	12.00	12.00		
PEAK FLOW		-1	1006	1006	1005	1017	1077	851	1009	996
PM PEAK HR		-	17.45	18.00	19.15	17.45	14.30	16.30		
PEAK FLOW		-1	1725	1597	1408	1641	1403	1223	1593	1513

SITE REFERENCE 00000013 ANALYSIS FOR WEEK ENDING SUN 3 SEPTEMBER 1995

MOUNT VICTORIA TUNNEL W ESTERN END CHANNEL 1 West Bound VEHICLES

INT	PERIOD ENDING	MON 28	TUES 29	WED 30	THURS 31	FRI 1	SAT 2	SUN 3	5/DAY (AV)	7/DAY (AV)
1	1.00	-1	-1	-1	183	131	266	293	157	192
1	2.00	-1	-1	-1	55	86	175	179	71	101
1	3.00	-1	-1	-1	50	64	145	137	57	81
1	4.00	-1	-1	-1	42	41	106	112	42	61
1	5.00	-1	-1	-1	64	70	96	80	67	73
1	6.00	-1	-1	-1	153	161	124	89	157	143
1	7.00	-1	-1	-1	481	538	231	127	510	415
1	8.00	-1	-1	-1	1387	1389	395	205	1388	1077
1	9.00	-1	-1	-1	1638	1544	789	427	1591	1310
1	10.00	-1	-1	-1	1237	1271	1111	757	1254	1163
1	11.00	-1	-1	-1	1097	1062	1283	976	1080	1094
1	12.00	-1	-1	-1	1211	1178	1349	1079	1195	1200
1	13.00	-1	-1	-1	1113	1195	1202	1182	1154	1165
1	14.00	-1	-1	-1	1153	1291	1274	1210	1222	1228
1	15.00	-1	-1	-1	1135	1285	1157	1213	1210	1203
	16.00	-1	-1	1170	1226	1269	1196	1229	1222	1219
1	17.00	-1	-1	1398	1349	1363	1178	1294	1370	1332
1	18.00	-1	-1	1169	1193	1206	962	1139	1189	1150
1	19.00	-1	-1	1056	1128	1156	894	952	1113	1059
1	20.00	-1	-1	1037	996	1055	878	819	1029	978
1	21.00	-1	-1	591	716	781	566	595	696	663
1	22.00	-1	-1	500	622	601	455	543	574	553
1	23.00	-1	-1	472	375	490	409	520	446	451
1	24.00	-1	-1	218	229	414	510	156	287	300
12	19.00	-1	-1	-1	14867	15209	12790	11663	15038	14235
16	22.00	-1	-1	-1	17682	18184	14920	13747	17933	16905
18	24.00	-1	-1	-1	18286	19088	15839	14423	18687	17671
24	24.00	-1	-1	-1	18833	19641	16751	15313	19237	18321
0.15	7.00	-1	-1	-1	195	227	95	39	211	170
0.15	7.15	-1	-1	-1	208	221	79	35	215	170
0.15	7.30	-1	-1	-1	300	295	80	41	298	230
0.15	7.45	-1	-1	-1	402	383	90	49	393	300
0.	8.00	-1	-1	-1	477	490	146	80	484	378
0.15	8.15	-1	-1	-1	436	430	147	67	433	340
0.15	8.30	-1	-1	-1	460	433	206	115	447	365
0.15	8.45	-1	-1	-1	313	327	203	111	320	273
0.15	9.00	-1	-1	-1	429	354	233	134	392	332
0.15	16.00	-1	-1	304	288	384	263	315	325	315
0.15	16.15	-1	-1	369	335	372	268	363	359	346
0.15	16.30	-1	-1	351	319	319	302	323	330	325
0.15	16.45	-1	-1	343	360	345	314	298	349	337
0.15	17.00	-1	-1	335	335	327	294	310	332	324
0.15	17.15	-1	-1	359	357	305	261	315	340	325
0.15	17.30	-1	-1	288	308	293	243	302	296	290
0.15	17.45	-1	-1	257	233	320	228	267	270	264
0.15	18.00	-1	-1	265	295	288	230	255	283	271
4	PEAK HR	-	-	-	8.30	8.30	11.45	12.00		
EAK	FLOW	-1	-1	-1	1775	1736	1349	1079	1756	1601
4	PEAK HR	-	-	-	17.15	16.45	13.45	16.30		
EAK	FLOW	-1	-1	-1	1371	1420	1316	1331	1396	1375

E REFERENCE 00000013 ANALYSIS FOR WEEK ENDING SUN 3 SEPTEMBER 1995

MOUNT VICTORIA TUNNEL W ESTERN END CHANNEL 2 East Bound VEHICLES

INT	PERIOD ENDING	MON 28	TUES 29	WED 30	THURS 31	FRI 1	SAT 2	SUN 3	5/DAY (AV)	7/DAY (AV)
1	1.00	-1	-1	-1	178	208	329	334	193	233
1	2.00	-1	-1	-1	94	144	271	245	119	159
1	3.00	-1	-1	-1	83	75	190	189	79	111
1	4.00	-1	-1	-1	36	59	139	157	48	76
1	5.00	-1	-1	-1	65	66	108	134	66	81
1	6.00	-1	-1	-1	159	233	139	113	196	176
1	7.00	-1	-1	-1	495	461	247	113	478	393
1	8.00	-1	-1	-1	907	823	380	223	865	704
1	9.00	-1	-1	-1	900	858	478	301	879	739
1	10.00	-1	-1	-1	937	889	848	591	913	858
1	11.00	-1	-1	-1	930	891	934	667	911	879
1	12.00	-1	-1	-1	1029	1000	1031	958	1015	1009
1	13.00	-1	-1	-1	1167	1165	1264	1148	1166	1177
1	14.00	-1	-1	-1	1051	1212	1218	1143	1132	1146
1	15.00	-1	-1	-1	1163	1272	1355	1393	1218	1262
	16.00	-1	-1	1174	1201	1253	1160	1212	1209	1203
1	17.00	-1	-1	1352	1476	1464	1191	1183	1431	1361
1	18.00	-1	-1	1663	1694	1543	1037	1001	1633	1458
1	19.00	-1	-1	1304	1389	1387	890	960	1360	1236
1	20.00	-1	-1	1012	1009	1116	850	823	1046	986
1	21.00	-1	-1	716	764	811	543	712	764	725
1	22.00	-1	-1	613	642	726	391	681	660	625
1	23.00	-1	-1	503	535	550	432	495	529	511
1	24.00	-1	-1	349	351	511	498	247	404	395
12	19.00	-1	-1	-1	13844	13757	11786	10780	13801	13081
16	22.00	-1	-1	-1	16754	16871	13817	13109	16813	15856
18	24.00	-1	-1	-1	17640	17932	14747	13851	17786	16790
24	24.00	-1	-1	-1	18255	18717	15923	15023	18486	17625
0.15	7.00	-1	-1	-1	158	136	89	28	147	122
0.15	7.15	-1	-1	-1	160	154	63	36	157	126
0.15	7.30	-1	-1	-1	219	223	73	36	221	173
0.15	7.45	-1	-1	-1	266	239	113	55	253	204
0.15	8.00	-1	-1	-1	262	207	131	96	235	200
0.15	8.15	-1	-1	-1	205	192	107	59	199	166
0.15	8.30	-1	-1	-1	213	194	100	63	204	169
0.15	8.45	-1	-1	-1	242	229	128	91	236	200
0.15	9.00	-1	-1	-1	240	243	143	88	242	206
0.15	16.00	-1	-1	298	306	312	321	329	305	311
0.15	16.15	-1	-1	317	354	305	300	296	325	318
0.15	16.30	-1	-1	324	350	389	301	324	354	342
0.15	16.45	-1	-1	351	401	369	284	306	374	351
0.15	17.00	-1	-1	360	371	401	306	257	377	350
0.15	17.15	-1	-1	368	448	372	299	292	396	367
0.15	17.30	-1	-1	432	439	409	253	251	427	377
0.15	17.45	-1	-1	434	420	396	242	222	417	364
0.15	18.00	-1	-1	429	387	366	243	236	394	350
	PEAK HR	-	-	-	12.00	11.45	11.45	12.00		
AK	FLOW	-1	-1	-1	1029	1006	1042	958	1018	1013
	PEAK HR	-	-	-	18.00	17.45	14.30	15.00		
AK	FLOW	-1	-1	-1	1694	1578	1401	1393	1636	1568

REPARED BY PEEK TRAFFIC HONG KONG

REFERENCE 00000013 ANALYSIS FOR WEEK ENDING SUN 25 AUGUST 1996

VICTORIA TUNNEL W ESTERN END CHANNEL 1 West Bound VEHICLES

ERIOD DING	MON 19	TUES 20	WED 21	THURS 22	FRI 23	SAT 24	SUN 25	5/DAY (AV)	7/DAY (AV)
1.00	-1	-1	-1	115	112	252	347	114	167
2.00	-1	-1	-1	52	188	173	217	120	141
3.00	-1	-1	-1	42	52	141	177	47	79
4.00	-1	-1	-1	48	49	125	282	49	93
5.00	-1	-1	-1	66	61	99	144	64	80
6.00	-1	-1	-1	158	152	112	98	155	141
7.00	-1	-1	-1	548	510	242	134	529	432
8.00	-1	-1	-1	1460	1413	402	244	1437	1118
9.00	-1	-1	-1	1390	1428	890	490	1409	1204
10.00	-1	-1	-1	1269	1245	1392	744	1257	1203
11.00	-1	-1	-1	1020	1030	1605	1009	1025	1106
12.00	-1	-1	-1	1054	1089	1732	1117	1072	1172
13.00	-1	-1	-1	1031	1120	1470	1126	1076	1139
14.00	-1	-1	-1	1129	1256	1550	1166	1193	1240
5.00	-1	-1	1117	1051	1186	1465	1197	1118	1179
16.00	-1	-1	1241	1212	1475	1391	1275	1309	1316
17.00	-1	-1	1391	1424	1542	1266	1259	1452	1398
18.00	-1	-1	1227	1175	1307	1072	1182	1236	1205
19.00	-1	-1	1181	1195	1378	1013	968	1251	1177
20.00	-1	-1	1137	1144	1182	933	795	1154	1071
21.00	-1	-1	678	701	757	556	796	712	689
22.00	-1	-1	550	536	593	525	509	560	547
23.00	-1	-1	354	510	567	424	444	477	465
24.00	-1	-1	252	200	361	387	176	271	274
19.00	-1	-1	-1	14410	15469	15248	11777	14940	14532
22.00	-1	-1	-1	17339	18511	17504	13921	17925	17293
24.00	-1	-1	-1	18049	19439	18315	14541	18744	18082
24.00	-1	-1	-1	18530	20053	19217	15806	19292	18783
7.00	-1	-1	-1	219	207	91	52	213	173
7.15	-1	-1	-1	248	238	86	45	243	192
7.30	-1	-1	-1	334	314	78	51	324	250
7.45	-1	-1	-1	437	407	94	72	422	325
8.00	-1	-1	-1	441	454	144	76	448	351
8.15	-1	-1	-1	423	398	161	71	411	326
8.30	-1	-1	-1	334	381	198	113	358	300
8.45	-1	-1	-1	243	284	231	135	264	241
9.00	-1	-1	-1	390	365	300	171	378	337
16.00	-1	-1	302	265	364	326	305	310	312
16.15	-1	-1	316	327	397	342	314	347	341
16.30	-1	-1	349	367	383	287	312	366	347
16.45	-1	-1	340	363	381	342	285	361	348
17.00	-1	-1	386	367	381	295	348	378	362
17.15	-1	-1	330	357	358	281	314	348	334
17.30	-1	-1	313	257	308	291	302	293	294
17.45	-1	-1	292	276	318	275	267	295	288
18.00	-1	-1	292	285	323	225	299	300	289
K HR	-	-	-	8.15	8.30	12.00	12.00		
FLOW	-1	-1	-1	1635	1640	1732	1117	1638	1577
K HR	-	-	-	17.15	16.30	12.15	16.00		
LOW	-1	-1	-1	1454	1596	1651	1275	1525	1507

FERENCE 00000013 ANALYSIS FOR WEEK ENDING SUN 25 AUGUST 1996

T VICTORIA TUNNEL W ESTERN END CHANNEL 2 East Bound VEHICLES

PERIOD ENDING	MON 19	TUES 20	WED 21	THURS 22	FRI 23	SAT 24	SUN 25	5/DAY (AV)	7/DAY (AV)
1.00	-1	-1	-1	173	242	346	445	208	261
2.00	-1	-1	-1	92	107	257	285	100	149
3.00	-1	-1	-1	59	72	192	222	66	106
4.00	-1	-1	-1	37	69	168	311	53	106
5.00	-1	-1	-1	48	43	114	154	46	71
6.00	-1	-1	-1	239	172	142	111	206	183
7.00	-1	-1	-1	531	464	276	147	498	416
8.00	-1	-1	-1	992	950	413	226	971	785
9.00	-1	-1	-1	949	932	747	301	941	822
10.00	-1	-1	-1	943	913	1226	461	928	904
11.00	-1	-1	-1	908	900	1266	687	904	925
12.00	-1	-1	-1	886	1006	1337	992	946	1008
13.00	-1	-1	-1	1037	1177	1450	1121	1107	1158
14.00	-1	-1	-1	1054	1135	1353	998	1095	1118
15.00	-1	-1	1139	1126	1239	1545	1148	1168	1219
16.00	-1	-1	1278	1287	1491	1262	1215	1352	1320
17.00	-1	-1	1450	1442	1421	1218	1344	1438	1393
18.00	-1	-1	1732	1759	1714	1037	1191	1735	1558
19.00	-1	-1	1448	1451	1469	932	958	1456	1310
20.00	-1	-1	1077	1085	1110	729	786	1091	995
21.00	-1	-1	676	791	897	654	657	788	750
22.00	-1	-1	646	693	721	517	608	687	651
23.00	-1	-1	588	515	612	521	472	572	550
24.00	-1	-1	311	354	540	554	211	402	396
19.00	-1	-1	-1	13834	14347	13786	10642	14091	13554
22.00	-1	-1	-1	16934	17539	15962	12840	17237	16426
24.00	-1	-1	-1	17803	18691	17037	13523	18247	17399
24.00	-1	-1	-1	18451	19396	18256	15051	18924	18275
7.00	-1	-1	-1	143	142	91	50	143	122
7.15	-1	-1	-1	186	174	69	38	180	144
7.30	-1	-1	-1	273	259	80	38	266	207
7.45	-1	-1	-1	278	267	106	53	273	217
8.00	-1	-1	-1	255	250	158	97	253	217
8.15	-1	-1	-1	213	209	190	68	211	188
8.30	-1	-1	-1	237	225	165	78	231	200
8.45	-1	-1	-1	244	247	160	67	246	208
9.00	-1	-1	-1	255	251	232	88	253	226
16.00	-1	-1	311	347	365	271	327	341	329
16.15	-1	-1	344	338	335	306	329	339	333
16.30	-1	-1	343	347	350	297	356	347	341
16.45	-1	-1	390	375	364	291	366	376	363
17.00	-1	-1	373	382	372	324	293	376	356
17.15	-1	-1	435	438	450	284	342	441	404
17.30	-1	-1	413	462	444	254	257	440	387
17.45	-1	-1	447	424	425	245	315	432	389
18.00	-1	-1	437	435	395	254	277	422	378
EAK HR	-	-	-	9.30	9.30	12.00	12.00		
FLOW	-1	-1	-1	1052	1012	1337	992	1032	1070
EAK HR	-	-	-	18.00	18.00	14.45	16.45		
FLOW	-1	-1	-1	1759	1714	1545	1378	1737	1658

FERENCE 00000013 ANALYSIS FOR WEEK ENDING SUN 7 SEPTEMBER 1997

VICTORIA TUNNEL W ESTERN END CHANNEL 1 West Bound VEHICLES

PERIOD NDING	MON 1	TUES 2	WED 3	THURS 4	FRI 5	SAT 6	SUN 7	5/DAY (AV)	7/DAY (AV)
1.00	-1	105	129	123	147	328	420	126	197
2.00	-1	75	82	124	110	212	233	98	133
3.00	-1	30	37	45	55	132	169	42	73
4.00	-1	33	33	45	52	139	133	41	68
5.00	-1	69	58	69	102	94	89	75	79
6.00	-1	166	152	165	184	161	85	167	154
7.00	-1	585	571	556	597	270	115	577	467
8.00	-1	1546	1419	1522	1434	439	207	1480	1150
9.00	-1	1423	1407	1431	1368	879	487	1407	1200
10.00	-1	1202	1327	1227	1312	1205	784	1267	1189
11.00	-1	1037	923	975	1071	1608	1036	1002	1093
12.00	-1	1057	1044	1075	1172	1583	1127	1087	1164
13.00	-1	983	1045	1014	1186	1467	1227	1057	1140
14.00	-1	1078	1100	1145	1164	1477	1273	1122	1194
15.00	1053	1107	1089	1165	1313	1405	1259	1145	1199
16.00	1230	1166	1295	1291	1435	1362	1242	1283	1289
17.00	1292	1424	1377	1451	1497	1414	1192	1408	1378
18.00	1047	1127	1185	1205	1345	1071	1142	1182	1160
19.00	1039	1081	1290	1173	1284	955	1083	1173	1129
20.00	873	1070	1086	1137	1171	846	833	1067	1002
21.00	552	579	701	819	844	476	600	699	653
22.00	534	464	509	562	570	463	488	528	513
23.00	318	360	407	446	512	378	379	409	400
24.00	181	143	175	212	409	368	185	224	239
19.00	-1	14231	14501	14674	15581	14865	12059	14747	14380
22.00	-1	16929	17368	17748	18763	16920	14095	17702	17075
24.00	-1	17432	17950	18406	19684	17666	14659	18368	17738
24.00	-1	17910	18441	18977	20334	18732	15708	18916	18443
7.00	-1	238	246	228	250	109	34	241	192
7.15	-1	227	228	254	258	79	33	242	189
7.30	-1	377	349	374	316	105	38	354	273
7.45	-1	448	417	433	420	113	62	430	332
8.00	-1	494	425	461	440	142	74	455	356
8.15	-1	416	415	435	419	169	76	421	336
8.30	-1	316	340	345	320	209	121	330	283
8.45	-1	296	261	270	263	218	143	273	246
9.00	-1	395	391	381	366	283	147	383	335
16.00	269	302	317	308	387	313	290	317	312
16.15	357	355	335	371	375	425	315	359	362
16.30	282	361	366	355	360	369	288	345	340
16.45	304	343	376	359	398	289	297	356	338
17.00	349	365	300	366	364	331	292	349	338
17.15	307	302	295	314	347	316	326	313	315
17.30	237	252	274	292	324	262	273	276	273
17.45	247	273	297	280	285	270	271	276	275
18.00	256	300	319	319	389	223	272	317	297
K HR	-	8.15	8.15	8.15	8.30	11.00	11.45		
FLOW	-1	1735	1606	1703	1599	1608	1133	1661	1578
K HR	-	17.00	16.45	17.00	16.45	12.15	14.45		
FLOW	-1	1424	1394	1451	1520	1564	1336	1447	1448

RED BY PEEK TRAFFIC HONG KONG from 013T0052.MOD

FERENCE 00000013 ANALYSIS FOR WEEK ENDING SUN 7 SEPTEMBER 1997

VICTORIA TUNNEL W ESTERN END CHANNEL 2 East Bound VEHICLES

ERIOD NDING	MON 1	TUES 2	WED 3	THURS 4	FRI 5	SAT 6	SUN 7	5/DAY (AV)	7/DAY (AV)
1.00	-1	110	128	183	193	349	380	154	214
2.00	-1	47	72	80	91	234	260	73	122
3.00	-1	34	39	47	68	187	174	47	85
4.00	-1	30	32	32	69	162	170	41	77
5.00	-1	76	48	46	108	156	121	70	89
6.00	-1	234	200	223	230	179	83	222	196
7.00	-1	521	486	512	510	253	135	507	418
8.00	-1	994	966	1006	934	430	237	975	792
9.00	-1	1020	1010	1093	981	653	333	1026	874
10.00	-1	899	986	899	931	1094	549	929	898
11.00	-1	886	955	945	916	1170	680	926	925
12.00	-1	957	927	995	1083	1399	837	991	1027
13.00	-1	985	936	982	1090	1411	1150	998	1079
14.00	-1	997	1033	1085	1139	1459	1178	1064	1136
15.00	1116	1072	1208	1222	1373	1450	1501	1198	1277
16.00	1180	1259	1321	1331	1607	1291	1289	1340	1325
17.00	1536	1437	1398	1674	1516	1366	1292	1512	1460
18.00	1867	1511	1702	1723	1681	1114	1206	1697	1543
19.00	1268	1321	1465	1348	1573	959	1072	1395	1287
20.00	895	936	1004	1121	1207	725	833	1033	960
21.00	690	678	721	771	809	603	707	734	711
22.00	646	657	709	721	717	464	573	690	641
23.00	424	466	534	577	596	493	413	519	500
24.00	242	277	345	354	544	463	227	352	350
19.00	-1	13338	13907	14303	14824	13796	11324	14093	13655
22.00	-1	16130	16827	17428	18067	15841	13572	17113	16425
24.00	-1	16873	17706	18359	19207	16797	14212	18036	17313
24.00	-1	17404	18225	18970	19966	18064	15400	18641	18096
7.00	-1	137	140	172	149	76	43	150	124
7.15	-1	176	194	201	171	82	31	186	149
7.30	-1	254	248	252	255	92	39	252	199
7.45	-1	277	250	279	240	111	64	262	212
8.00	-1	287	274	274	268	145	103	276	232
8.15	-1	225	206	237	209	111	66	219	182
8.30	-1	284	267	295	246	134	58	273	222
8.45	-1	258	265	271	271	172	86	266	227
9.00	-1	253	272	290	255	236	123	268	242
16.00	270	336	355	355	399	308	370	343	342
16.15	254	345	318	345	380	323	291	328	322
16.30	336	350	312	403	364	371	328	353	352
16.45	433	353	354	507	402	318	326	410	385
17.00	513	389	414	419	370	354	347	421	401
17.15	496	269	414	413	399	303	307	398	372
17.30	524	418	427	446	425	286	310	448	405
17.45	440	413	431	443	422	246	294	430	384
18.00	407	411	430	421	435	279	295	421	383
K HR	-	8.30	9.15	9.15	12.00	11.45	12.00		
FLOW	-1	1073	1091	1133	1083	1413	837	1095	1104
K HR	-	18.15	18.15	17.30	18.30	14.45	14.45		
FLOW	-1	1652	1723	1785	1700	1487	1541	1715	1658

TE REFERENCE 00000013 ANALYSIS FOR WEEK ENDING SUN 6 SEPTEMBER 1998

NT VICTORIA TUNNEL W ESTERN END CHANNEL 1 West Bound VEHICLES

PERIOD ENDING	MON 31	TUES 1	WED 2	THURS 3	FRI 4	SAT 5	SUN 6	5/DAY (AV)	7/DAY (AV)
1.00	-1	92	189	198	201	312	307	170	210
2.00	-1	113	60	56	135	308	252	91	145
3.00	-1	33	37	45	44	162	178	40	77
4.00	-1	24	36	44	45	132	143	37	66
5.00	-1	69	61	84	80	107	114	74	84
6.00	-1	215	175	185	207	171	112	196	180
7.00	-1	550	538	564	531	276	175	546	454
8.00	-1	1371	1469	1436	1417	479	220	1423	1116
9.00	-1	1408	1459	1456	1299	815	481	1406	1189
10.00	-1	1163	1150	1338	1390	1346	847	1260	1213
11.00	-1	970	986	1035	1032	1476	1095	1006	1086
12.00	-1	1053	1093	1095	1158	1600	1195	1100	1185
13.00	-1	1018	1030	1192	1219	1449	1254	1115	1182
14.00	-1	1085	1121	1023	1138	1412	1330	1092	1172
15.00	1122	1091	1222	1210	1413	1456	1221	1212	1248
16.00	1338	1374	1366	1351	1444	1327	1261	1375	1352
17.00	1321	1304	1367	1330	1481	1361	1256	1361	1346
18.00	1114	1211	1231	1086	1287	1123	1206	1186	1180
19.00	971	1085	1203	1216	1346	1069	1045	1164	1134
20.00	867	978	1089	1085	1180	899	762	1040	980
21.00	628	670	766	735	750	680	608	710	691
22.00	424	570	598	607	597	475	495	559	538
23.00	312	296	482	416	526	454	402	406	413
24.00	167	159	231	173	362	401	157	218	236
19.00	-1	14133	14697	14768	15624	14913	12411	14806	14479
22.00	-1	16901	17688	17759	18682	17243	14451	17758	17212
24.00	-1	17356	18401	18348	19570	18098	15010	18419	17886
24.00	-1	17902	18959	18960	20282	19290	16116	19026	18648
5 7.00	-1	226	206	220	195	92	64	212	174
5 7.15	-1	258	268	247	255	95	40	257	203
5 7.30	-1	304	348	302	299	115	56	313	248
5 7.45	-1	395	424	444	395	113	63	415	321
5 8.00	-1	414	429	443	468	156	61	439	344
5 8.15	-1	406	433	421	409	153	81	417	331
5 8.30	-1	382	373	393	304	190	139	363	306
5 8.45	-1	257	276	253	234	231	111	255	231
5 9.00	-1	363	377	389	352	241	150	370	320
5 16.00	326	358	372	351	404	344	313	362	353
5 16.15	349	347	371	345	410	419	313	364	365
5 16.30	309	312	317	341	357	327	273	327	319
5 16.45	327	316	351	342	366	285	310	340	328
5 17.00	336	329	328	302	348	330	360	329	333
5 17.15	309	361	358	295	321	303	323	329	324
5 17.30	276	303	307	258	300	285	297	289	289
5 17.45	277	291	279	249	330	259	258	285	278
5 18.00	252	256	287	284	336	276	328	283	288
AK HR	-	8.30	8.30	8.30	8.30	12.00	11.45		
FLOW	-1	1597	1659	1701	1576	1600	1197	1633	1566
AK HR	-	16.15	16.15	16.30	16.45	12.15	13.45		
FLOW	-1	1410	1425	1398	1537	1562	1366	1443	1449

ARED BY PEEK TRAFFIC HONG KONG from 013T0061.MOD

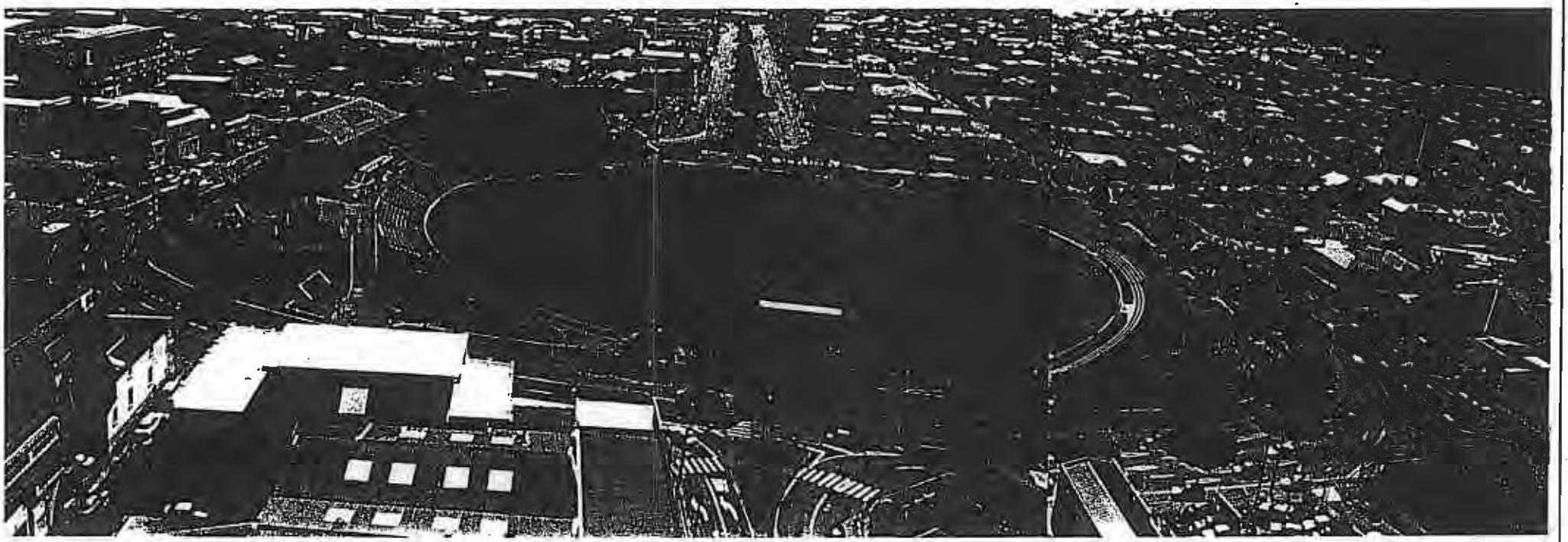
E REFERENCE 00000013 ANALYSIS FOR WEEK ENDING SUN 6 SEPTEMBER 1998

NT VICTORIA TUNNEL W ESTERN END CHANNEL 2 EastBound VEHICLES

PERIOD ENDING	MON 31	TUES 1	WED 2	THURS 3	FRI 4	SAT 5	SUN 6	5/DAY (AV)	7/DAY (AV)
1.00	-1	141	170	179	211	433	413	175	246
2.00	-1	60	61	75	96	268	272	73	129
3.00	-1	32	33	50	52	204	219	42	90
4.00	-1	26	40	55	60	142	183	45	79
5.00	-1	103	91	81	125	137	144	100	112
6.00	-1	241	212	236	252	195	177	235	221
7.00	-1	548	533	580	501	276	179	541	451
8.00	-1	961	919	1028	1013	460	250	980	802
9.00	-1	1114	1091	1095	1117	780	369	1104	953
10.00	-1	916	959	982	925	1022	546	946	899
11.00	-1	864	962	936	898	1164	789	915	933
12.00	-1	961	970	994	1139	1331	891	1016	1043
13.00	-1	1095	1000	1047	1442	1335	1200	1146	1181
14.00	-1	1134	1083	1105	1175	1457	1262	1124	1191
15.00	1270	1318	1235	1272	1360	1553	1359	1291	1338
16.00	1240	1323	1534	1356	1454	1942	1267	1381	1445
17.00	1555	1372	1575	1433	1586	1558	1271	1504	1479
18.00	1667	1698	1707	1579	1625	1078	1163	1655	1502
19.00	1267	1281	1419	1444	1472	1007	1065	1377	1279
20.00	870	993	1149	1065	1169	829	750	1049	975
21.00	590	713	827	743	827	605	682	740	712
22.00	531	642	682	678	695	504	610	646	620
23.00	430	458	549	530	613	565	375	516	503
24.00	275	359	327	352	530	536	238	369	374
19.00	-1	14037	14454	14271	15206	14687	11432	14492	14083
22.00	-1	16933	17645	17337	18398	16901	13653	17578	16921
24.00	-1	17750	18521	18219	19541	18002	14266	18508	17830
24.00	-1	18353	19128	18895	20337	19381	15674	19178	18707
7.00	-1	167	173	170	152	91	59	166	140
7.15	-1	190	204	204	203	79	41	200	160
7.30	-1	266	232	270	268	93	51	259	206
7.45	-1	261	236	273	260	119	81	258	213
8.00	-1	244	247	281	282	169	77	264	223
8.15	-1	253	250	235	241	238	62	245	218
8.30	-1	272	265	235	283	132	79	264	219
8.45	-1	280	287	317	296	167	111	295	250
9.00	-1	309	289	308	297	243	117	301	266
16.00	299	329	451	307	337	465	298	345	355
16.15	293	308	469	331	370	482	309	354	366
16.30	340	320	382	354	380	461	347	355	369
16.45	536	361	341	359	356	309	289	391	364
17.00	386	383	383	389	480	306	326	404	379
17.15	445	394	449	388	405	335	312	416	390
17.30	425	453	430	403	431	263	319	428	389
17.45	426	431	414	393	424	228	245	418	366
18.00	371	420	414	395	365	252	287	393	358
AK HR	-	9.15	9.15	9.30	12.00	12.00	11.45		
FLOW	-1	1122	1107	1154	1139	1331	903	1131	1127
AK HR	-	18.00	16.30	18.15	17.45	16.15	14.45		
FLOW	-1	1698	1725	1597	1740	1987	1373	1690	1687

ARED BY PEEK TRAFFIC HONG KONG from 013T0061.MOD

Appendix B
Photographs



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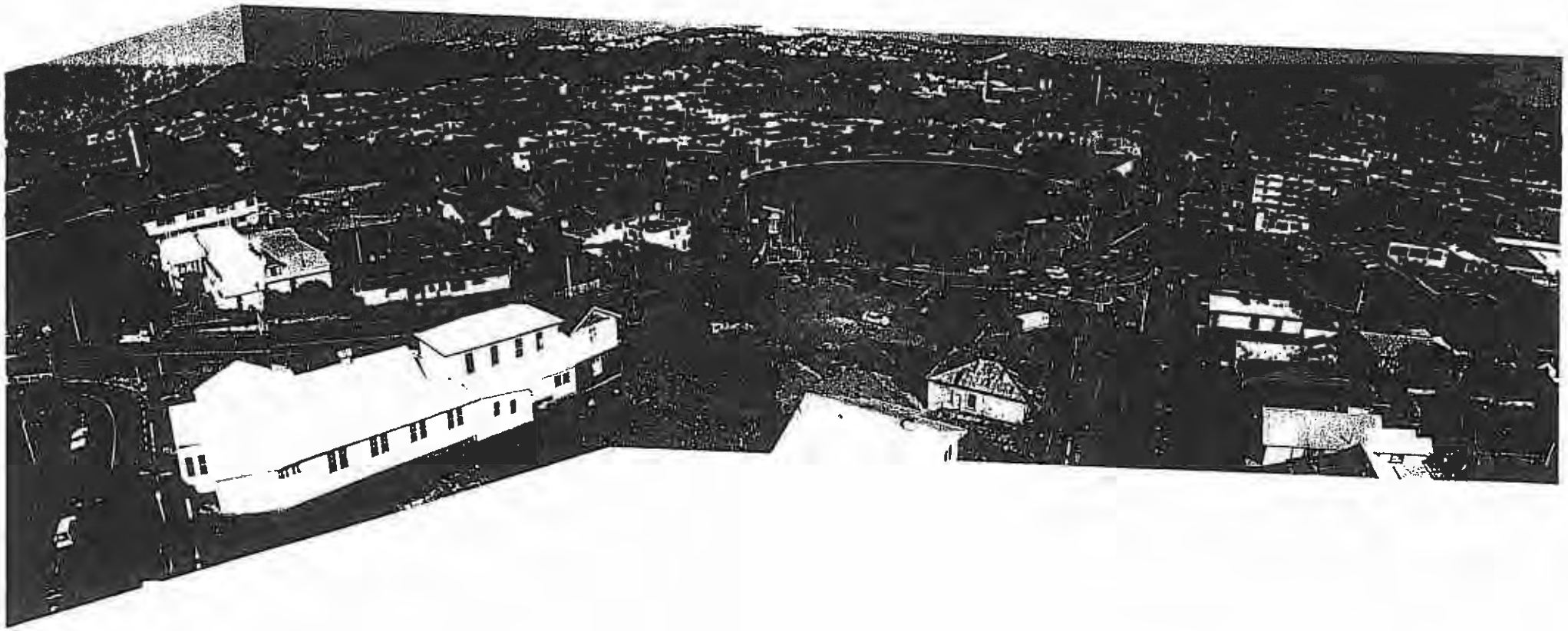

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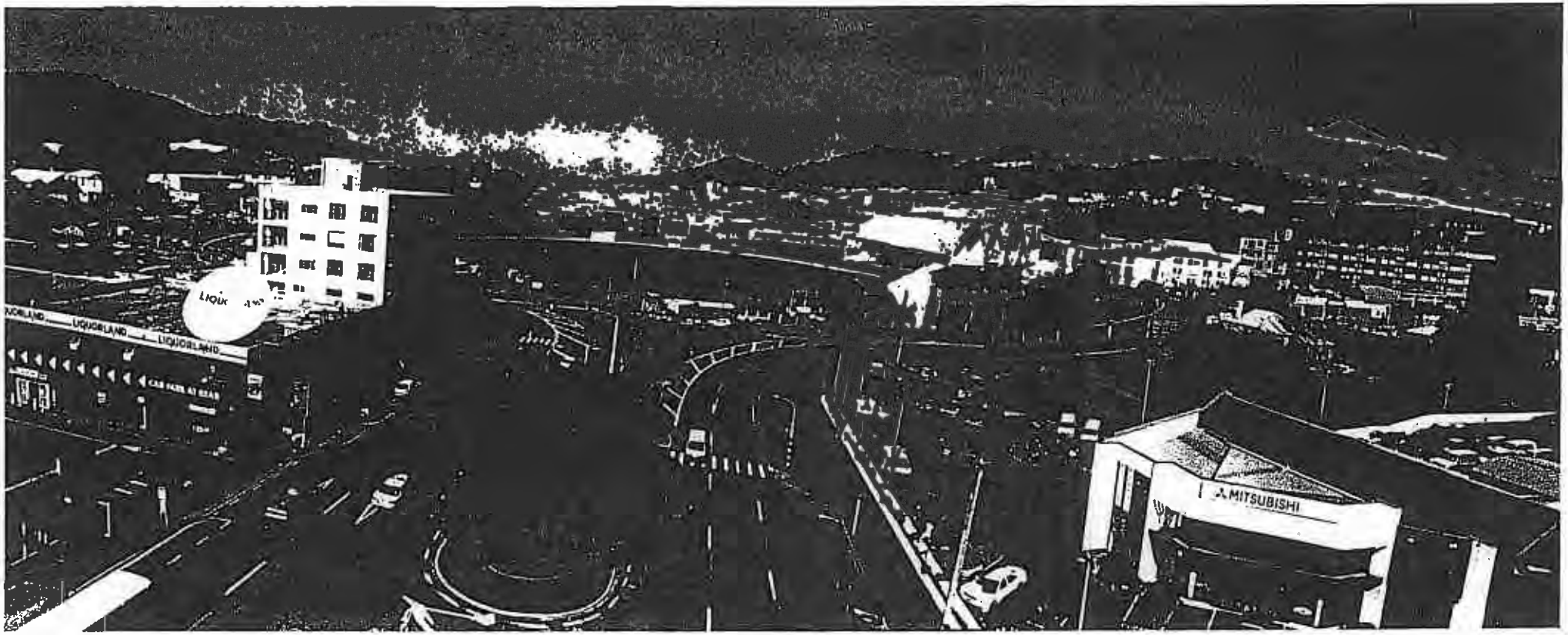

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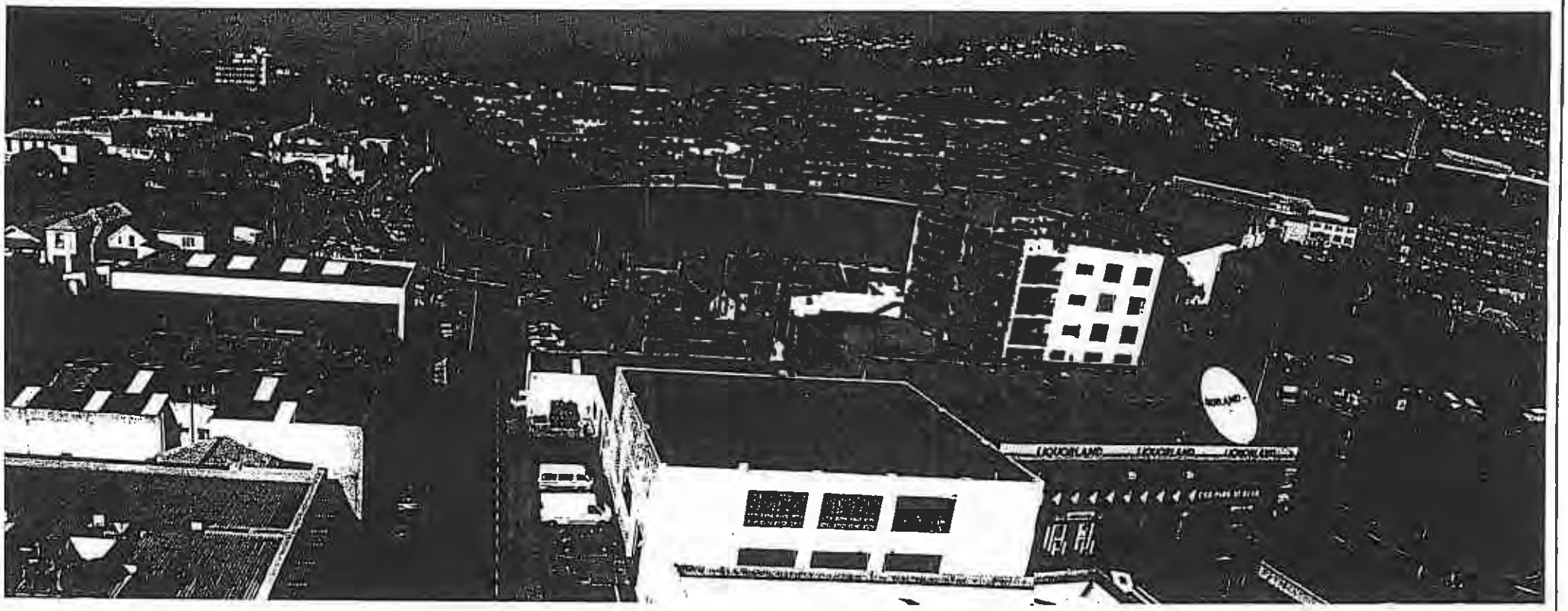
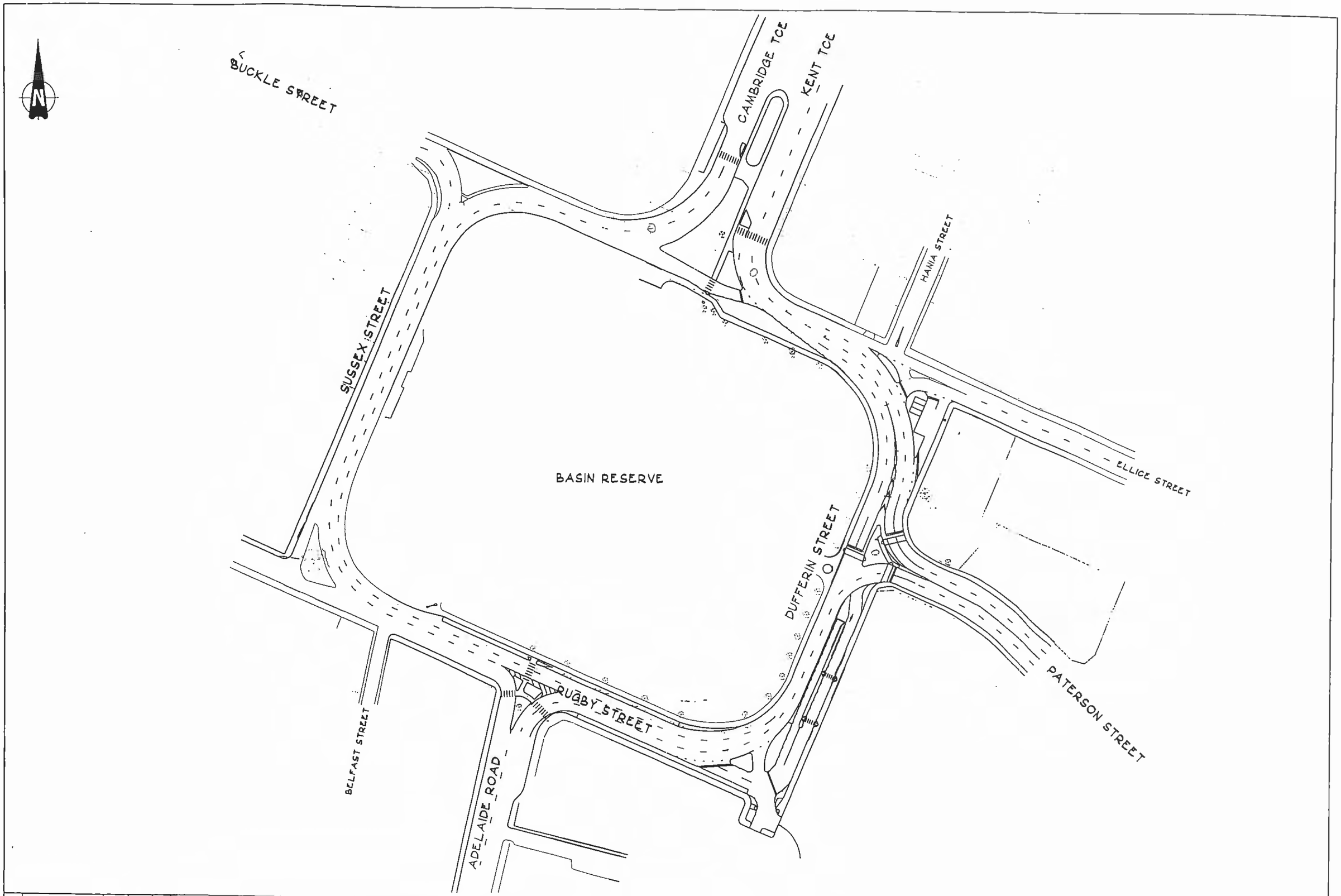


Meritec

Appendix C
Detailed Plans Used for Full Analysis



CONTRACTOR MUST VERIFY ALL DIMENSIONS ON THE JOB BEFORE COMMENCING WORK

No	DESCRIPTION	DATE	CH'KD	No	DESCRIPTION	DATE	CH'KD

REVISIONS

DESIGN
DRAWN M.A.P. DATE 6/10/00
CHECKED
APPROVED
DATE PRINTED 06/10/00 10:18
FILE No sk01.dwg

PHONE 3822999
FAX 3822668

Meritec

CLIENT: TRANSIT NEW ZEALAND ARARAU AOTEAROA

PROJECT: BASIN RESERVE LONG TERM TRANSPORT SOLUTIONS

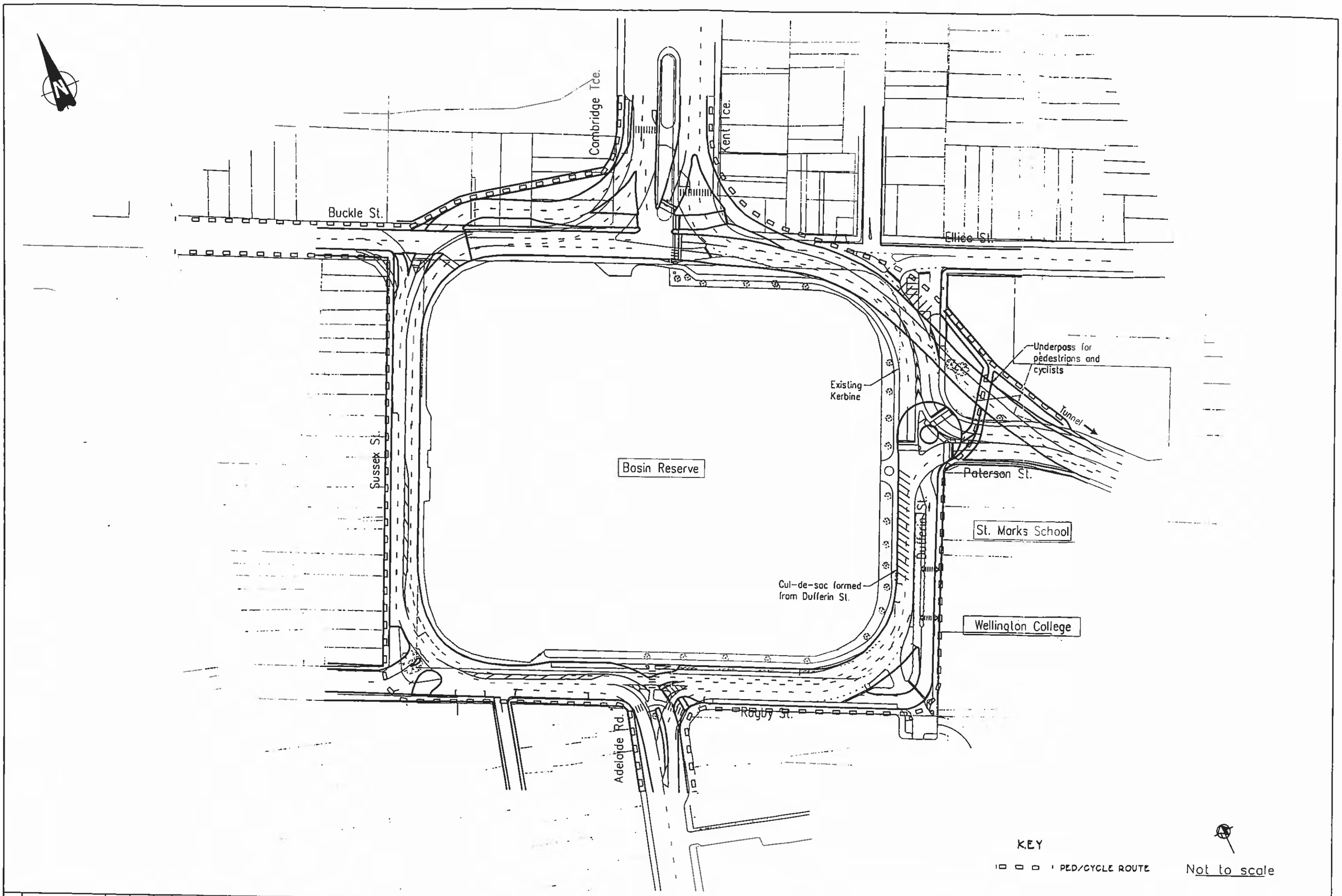
SHEET TITLE: BASE PLAN

0 10 20 30 40 50mm

ORIGINAL SCALE 1. 750

DRAWING No SK01

5981713



CONTRACTOR MUST VERIFY ALL DIMENSIONS ON THE JOB BEFORE COMMENCING WORK

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REVISIONS

DESIGN	DATE	
DRAWN		
CHECKED		
APPROVED		
DATE PRINTED	PHONE	3822999
FILE No Plan-opt1.dwg	FAX	3822998

CLIENT: TRANSIT NEW ZEALAND ARARAU AOTEAROA

PROJECT: BASIN RESERVE UPGRADE SCHEME PLAN

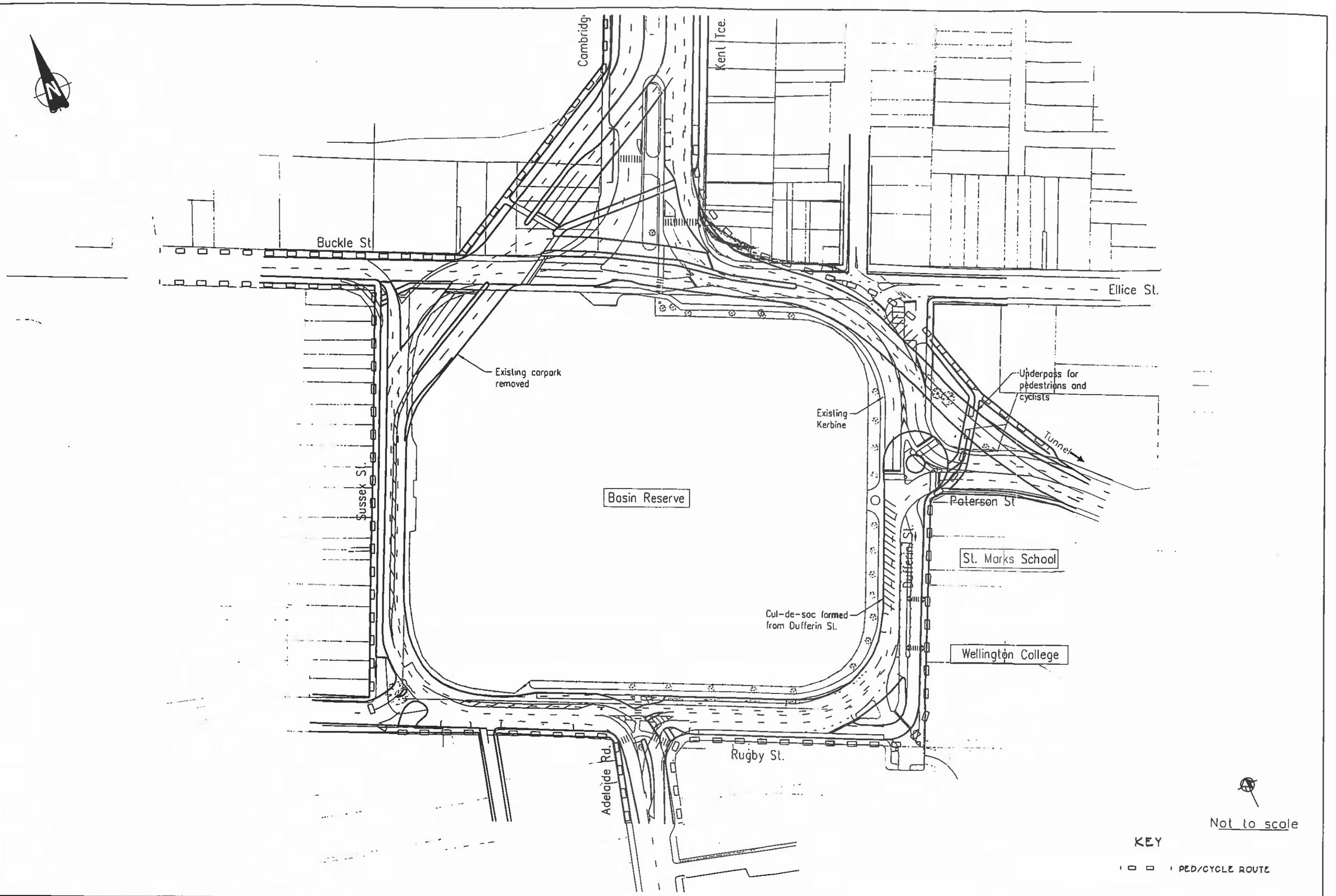
SHEET TITLE: OPTION E PATERSON BUCKLE LINK SUSSEX ROUTE DOUBLE INTERSECTION

0 10 20 30 40 50mm

ORIGINAL SCALE N.T.S.

DRAWING No PL01

JOB No 5981713 SHEET No REV



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REVISIONS

CONTRACTOR MUST VERIFY ALL DIMENSIONS ON THE JOB BEFORE COMMENCING WORK

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DRAWN		
CHECKED		
APPROVED		
DATE PRINTED	PHONE	3822999
FILE No Plan-pat2.dwg	FAX	3822988

CLIENT:

TRANSIT NEW ZEALAND ARATAKI AOTEAROA

PROJECT:

BASIN RESERVE UPGRADE
SCHEME PLAN

SHEET TITLE:

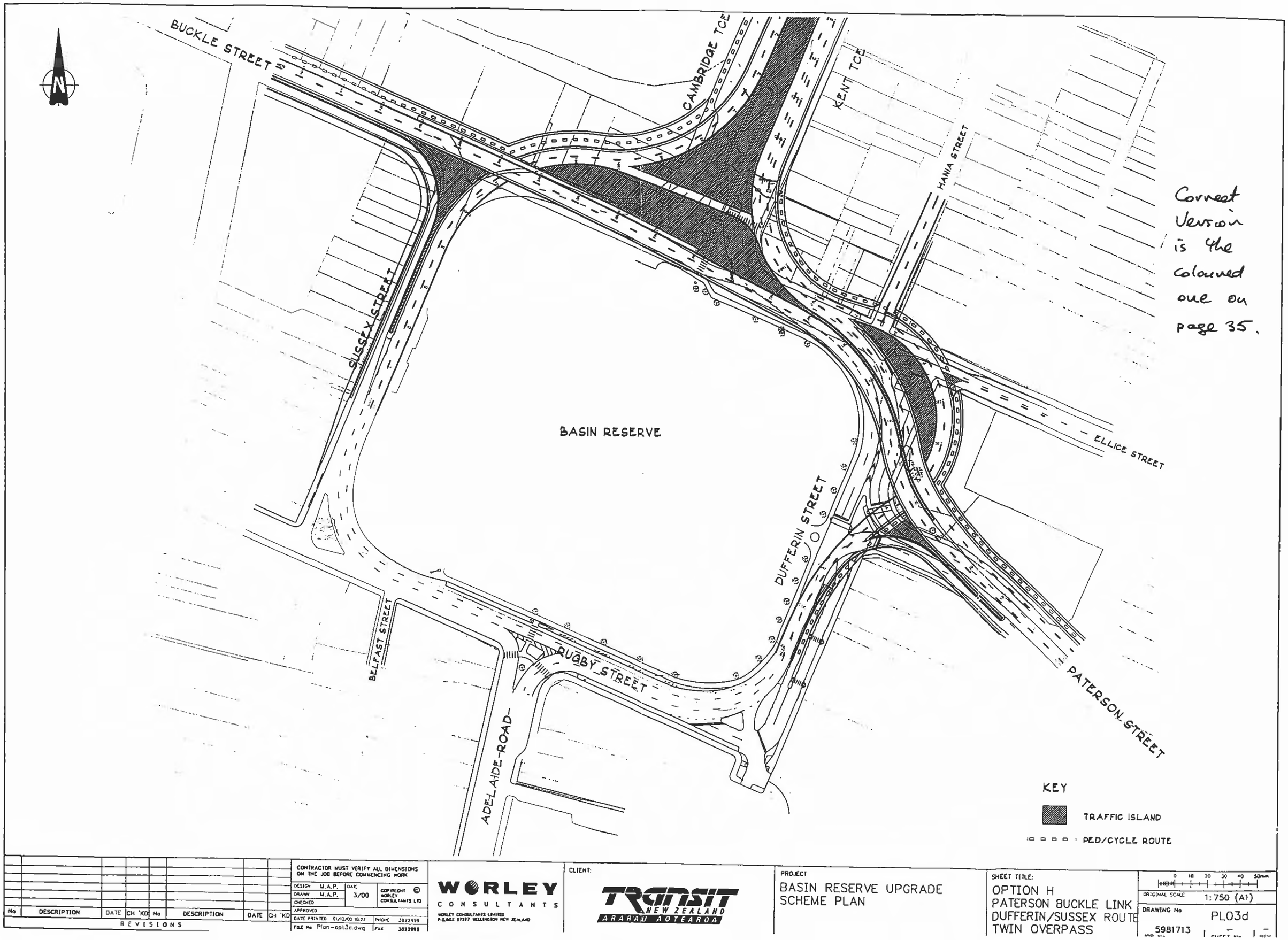
OPTION F
PATERSON BUCKLE LINK
SUSSEX ROUTE
COMBINED INTERSECTION

0 10 20 30 40 50mm

ORIGINAL SCALE N.T.S.

DRAWING No PL02

JOB No 5981713 | SHEET No | REV



Correct Version is the coloured one on page 35.

No	DESCRIPTION	DATE	CH 'KD	No	DESCRIPTION	DATE	CH 'KD

REVISIONS

CONTRACTOR MUST VERIFY ALL DIMENSIONS ON THE JOB BEFORE COMMENCING WORK

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APPROVED			
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FILE No	Plan-opt3d.dwg	FAX	3822998

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P.O.BOX 27277 WELLINGTON NEW ZEALAND

CLIENT: TRANSIT NEW ZEALAND ARARAU AOTEAROA

PROJECT
BASIN RESERVE UPGRADE
SCHEME PLAN

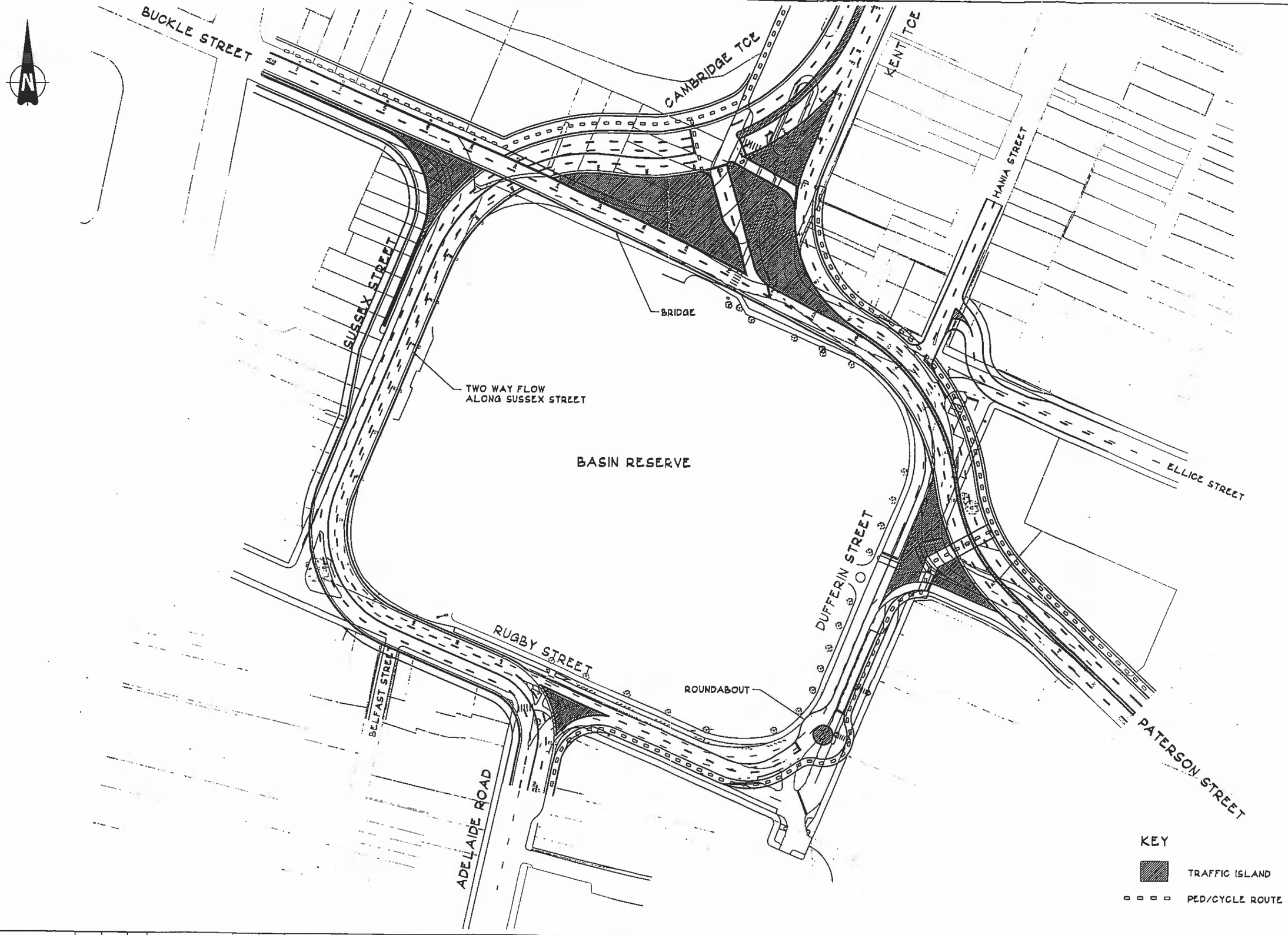
SHEET TITLE:
OPTION H
PATERSON BUCKLE LINK
DUFFERIN/SUSSEX ROUTE
TWIN OVERPASS

0 10 20 30 40 50mm

ORIGINAL SCALE 1:750 (A1)

DRAWING No PL03d

5981713



No	DESCRIPTION	DATE	CH 'KD	No	DESCRIPTION	DATE	CH 'KD

REVISIONS

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APPROVED			
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FILE No	Plan-opl4a.dwg	FAX	3822998

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P.O.BOX 27277 WELLINGTON NEW ZEALAND

CLIENT: TRANSIT NEW ZEALAND ARARAU AOTEAROA

PROJECT: BASIN RESERVE UPGRADE SCHEME PLAN

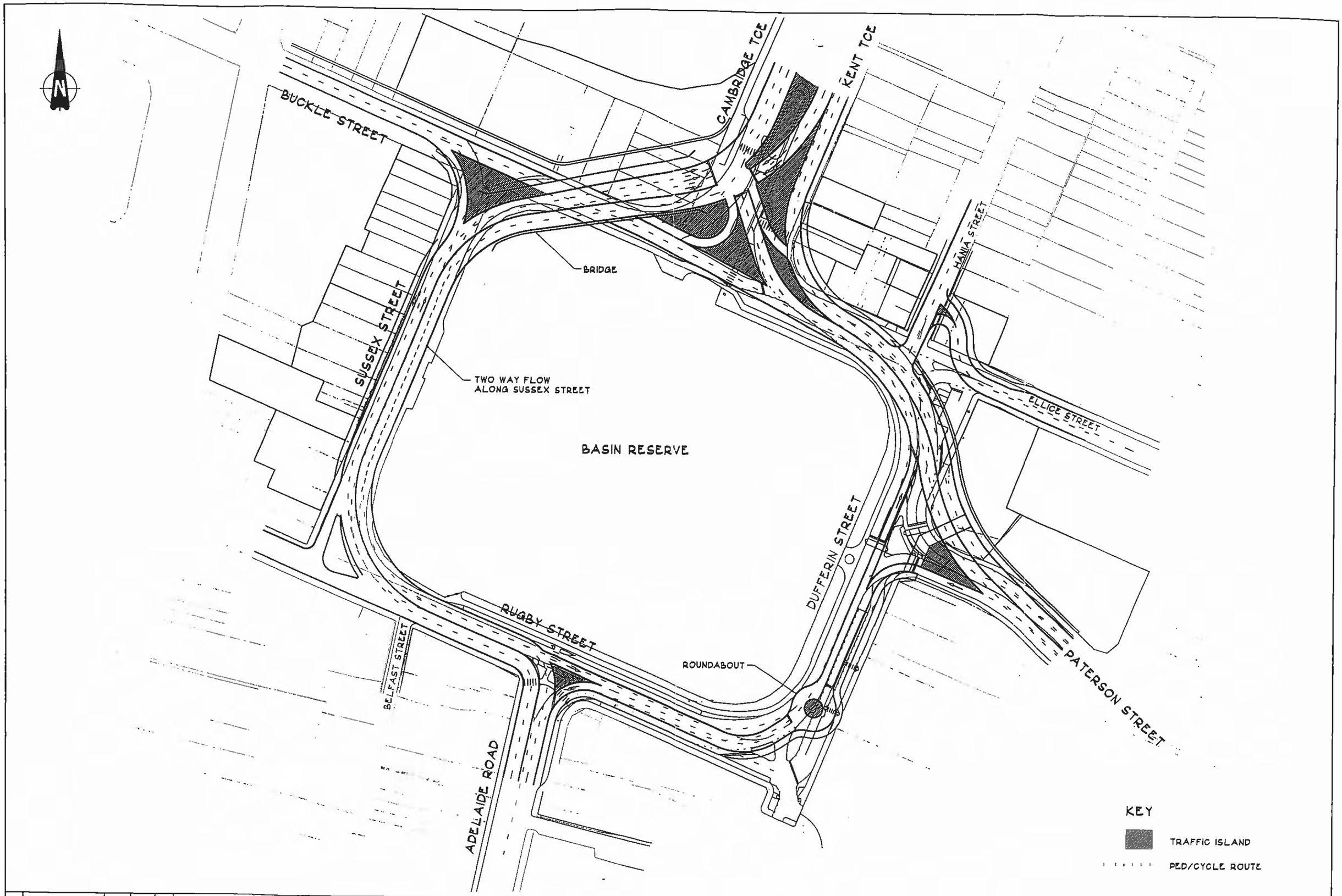
SHEET TITLE: OPTION I PATERSON BUCKLE LINK SUSSEX ROUTE OVERPASS AND INTERSECTION

0 10 20 30 40 50mm

ORIGINAL SCALE 1:750 (A1)

DRAWING No PL04a

WORK No 5981713 | SHEET No – | REV –



No	DESCRIPTION	DATE	CH 'KD	No	DESCRIPTION	DATE	CH 'KD

REVISIONS

CONTRACTOR MUST VERIFY ALL DIMENSIONS ON THE JOB BEFORE COMMENCING WORK

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P.O.BOX 27277 WELLINGTON NEW ZEALAND

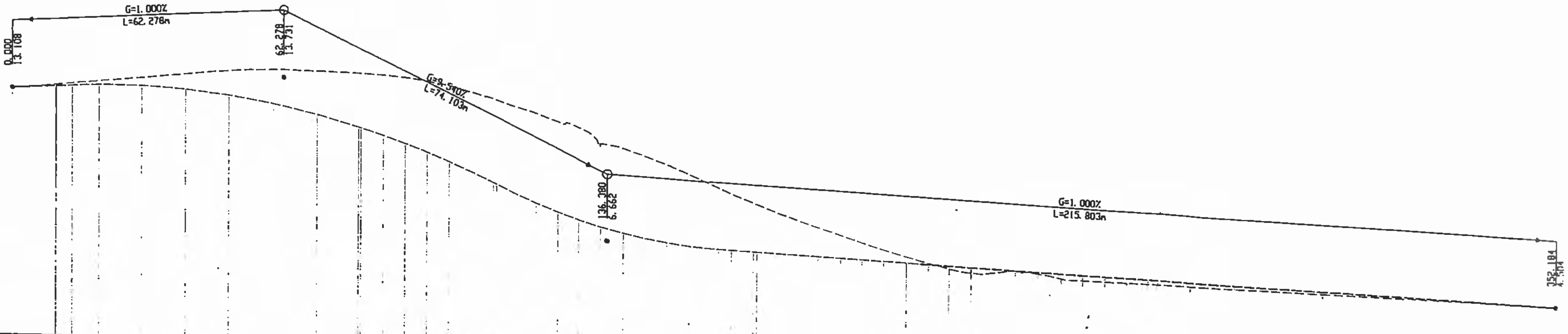
CLIENT.
TRANSIT NEW ZEALAND
ARARAU AOTEAROA

PROJECT
BASIN RESERVE UPGRADE

SHEET TITLE:
OPTION J
PATERSON – BUCKLE
LINK SUSSEX ROUTE
U/PASS & INTERSECT

0 10 20 30 40 50mm
ORIGINAL SCALE 1:750 (A1)
DRAWING No PL05
5981713

Appendix D
Preferred Option Cross Sections & Long Sections

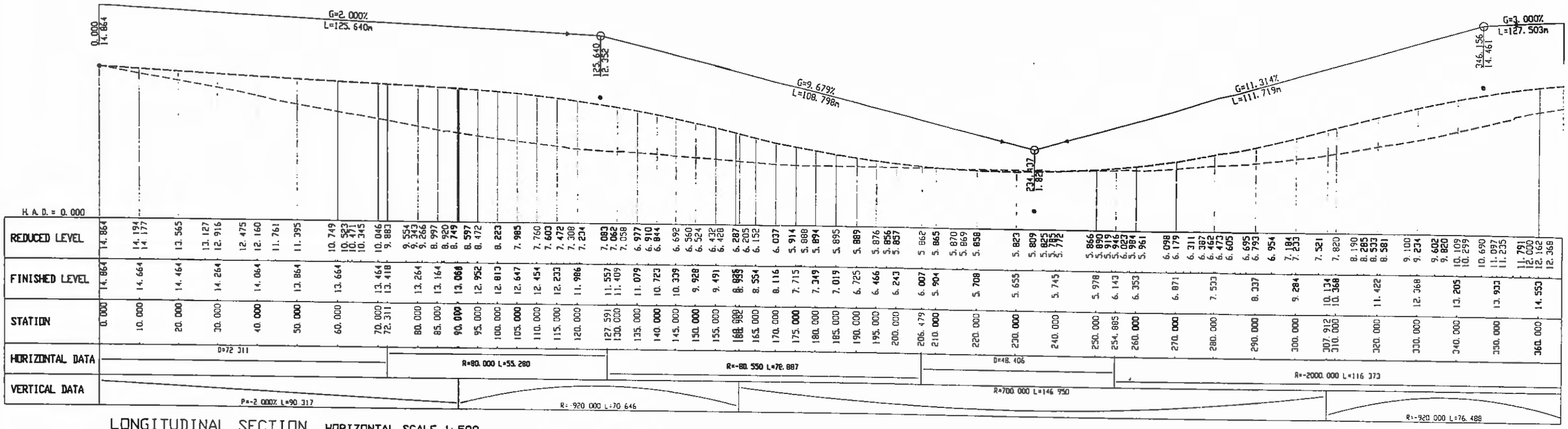


H. A. D. = 2.000

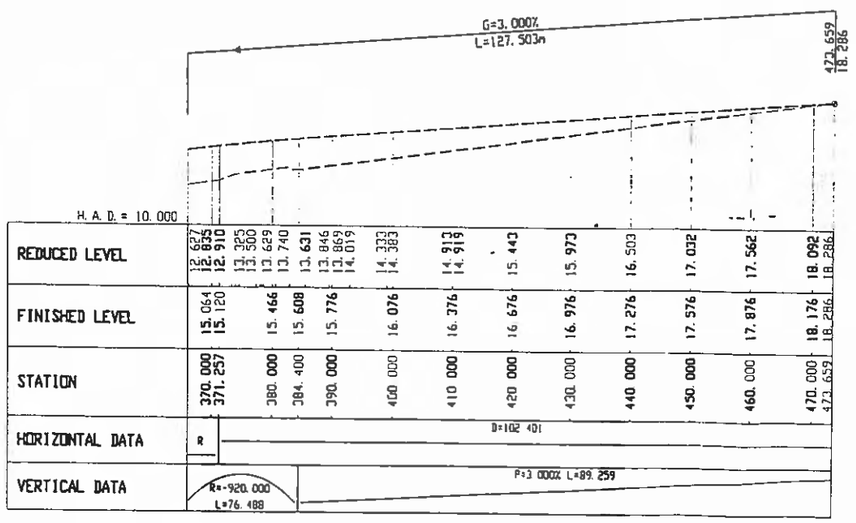
REDUCED LEVEL	13.108, 13.279, 13.449, 13.620, 13.633, 13.753, 13.813, 13.826, 13.923, 13.929, 13.990, 14.045, 14.071, 14.076, 14.041, 14.030, 13.999, 13.992, 13.966, 13.916, 13.905, 13.804, 13.748, 13.655, 13.476, 13.467, 13.202, 13.030, 12.924, 12.650, 12.600, 12.369, 12.141, 11.834, 11.935, 11.578, 11.206, 10.988, 10.823, 10.494, 10.143, 10.110, 9.751, 9.334, 8.945, 8.901, 8.516, 8.453, 8.136, 8.102, 7.797, 7.472, 7.310, 7.148, 6.830, 6.529, 6.247, 5.993, 5.985, 5.747, 5.629, 5.590, 5.545, 5.617, 5.715, 5.619, 5.627, 5.569, 5.416, 5.370, 5.343, 5.307, 5.270, 5.232, 5.214, 5.155, 5.122, 5.076, 4.997, 4.918, 4.838, 4.759, 4.680, 4.600, 4.521, [illegible]
FINISHED LEVEL	13.108, 13.208, 13.246, 13.287, 13.266, 13.135, 12.896, 12.548, 12.092, 11.561, 11.526, 11.203, 10.852, 10.475, 10.070, 9.637, 9.188, 8.717, 8.296, 7.917, 7.579, 7.283, 7.029, 6.817, 6.646, 6.517, 6.429, 6.406, 6.376, 6.326, [illegible], 6.318, 6.272, 6.226, 6.176, 6.126, 6.076, 6.026, 5.976, 5.926, 5.876, 5.826, 5.776, 5.726, 5.676, 5.626, 5.576, 5.526, 5.476, 5.426, 5.402, 5.326, 5.226, 5.126, 5.026, 4.926, 4.826, 4.726, 4.626, 4.526, [illegible]
STATION	0.000, 10.000, 13.794, 20.000, 30.000, 40.000, 50.000, 60.000, 70.000, 79.431, 80.000, 85.000, 90.000, 95.000, 100.000, 105.000, 110.000, [illegible], 115.000, 120.000, 125.000, 130.000, 135.000, 140.000, 145.000, 150.000, 155.000, 160.000, 162.000, 165.000, 170.000, [illegible], 170.799, 175.399, 180.000, 185.000, 190.000, 195.000, 200.000, 205.000, 210.000, 215.000, 220.000, 225.000, 230.000, 235.000, 240.000, 245.000, 250.000, 255.000, 260.000, 262.368, 270.000, 280.000, 290.000, 300.000, 310.000, 320.000, 330.000, 340.000, 350.000, 352.184
HORIZONTAL DATA	D=79.431; R=70.000 L=91.368; R=-70.000 L=91.569; D=89.815
VERTICAL DATA	P=1.000% L=13.794; R=-920.000 L=96.967; R=600.000 L=51.239; P=-1.000% L=190.124

LONGITUDINAL SECTION HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

BASIN RESERVE OPTION 3C
SUSSEX ST TO CAMBRIDGE TCE MC00
DESIGN LONG SECTION

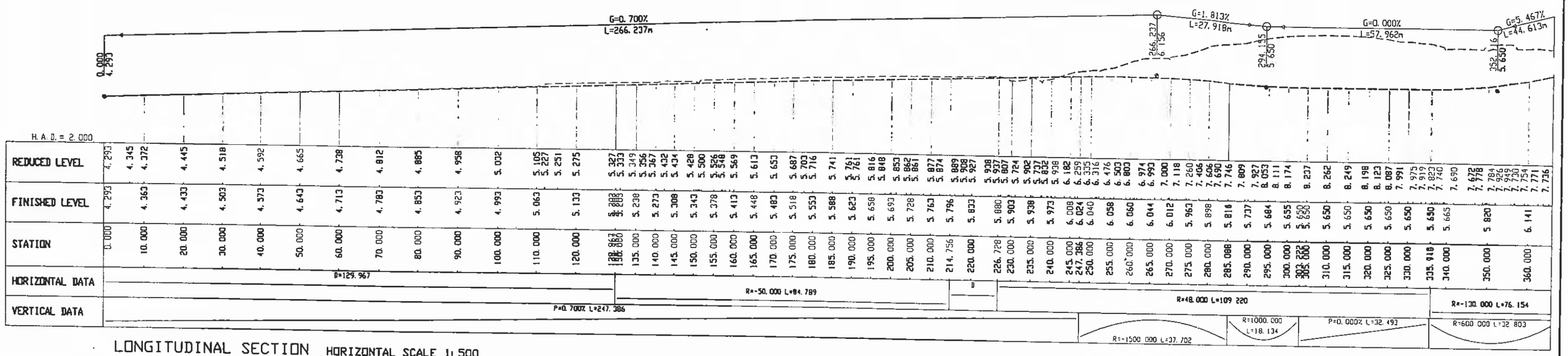


LONGITUDINAL SECTION HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:200

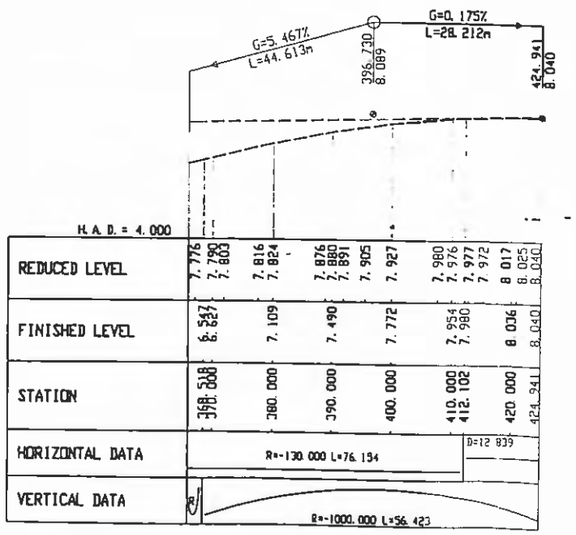


LONGITUDINAL SECTION HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:200

BASIN RESERVE S.H. 1 - OPTION 3C
MT VIC TUNNEL TO BUCKLE ST - MC10
DESIGN LONG SECTION



LONGITUDINAL SECTION HORIZONTAL SCALE 1: 500
VERTICAL SCALE 1: 100



LONGITUDINAL SECTION HORIZONTAL SCALE 1: 500
VERTICAL SCALE 1: 100

BASIN RESERVE S.H. 1 OPTION 3C
KENT TCE TO MT VIC TUNNEL - MC20
DESIGN LONG SECTION

Appendix E
PEM "Checklist for Project Evaluations"

CHECKLIST FOR PROJECT EVALUATIONS

Project Name: BASIN RESERVE LONG TERM TRAFFIC SOLUTIONS

Preferred Option: H

Procedure		Information Provided: S = satisfactory U = unsatisfactory N = not required	Comments
1. Capital Cost Calculations	Do-min	S	
	Option	S	
2. Maintenance Cost Calculations	Do-min	S	
	Option	S	
3. Travel Time Calculations	Do-min	S	
	Option	S	
4. VOC Calculations	Do-min	S	
	Option	S	
5. Accident Cost Calculations	Do-min	S	
	Option	S	
6. Seal Extension Benefit Calculations		N	
7. Intangible Effects Calculations		N	
8. Time Stream of Costs & Benefits		S	
9. Discounting Calculations	Benefits	S	
	Costs	S	
10. B/C Calculations		S	
11. Incremental Analysis		S	
12. First Year Rate of Return (FYRR)		S	
13. Transport Model Validation		S	
14. Sensitivity Analysis		S	

Comments by Analyst Completing the Checklist:

General .....

.....

Recommendation.....

.....

Signed .....

Date 30/11/00

Appendix F
Cost Estimates

SHI BASIN RESERVE LONG TERM TRAFFIC IMPROVEMENTS

PRELIMINARY ROUGH ORDER COSTS FOR GRADE SEPARATION AND RFT OPTIONS

ITEM	UNIT	RATE	QUANTITY							AMOUNT (000's)						
OPTION			D	E	F	H	I	J	K	D	E	F	H	I	J	K
bridge	m^2	1300				850	400	2870			0	0	1105	520	3731	
cut to waste	m^3	20				9264	14880	3140			0	0	185	298	63	
imported fill	m^3	24				12825	3000	1120			0	0	308	72	27	
new pavement	m^2	43.5	4880	2010	2760	9222	8720	8720	7360	212	87	120	401	379	379	320
ex. Pavement	m^2	34		8470	9750	1580	10740	10740			288	332	54	365	365	
footpaths	m^2	38		2085	2724	2634	1900	3276			79	104	100	72	124	
retaining walls	m^2	166				4560	2560	1005			0	0	757	425	167	
signals	LS	150000		2	2		1	1			300	300	0	150	150	
retaining wall fndt	m	13		30	30	25	30	30			0.4	0.4	0.3	0.4	0.4	
landscaping	m^2	40		1800	2300	3500	3000	2500			72	92	140	120	100	
service relocation	LS	1		460000	460000	965100	884000	959000			460	460	965	884	959	
prop. Purchase	LS										-2282	-1569	-623	-7367	-5537	
underpasses	m	15000		40	40	40	40	40			600	600	600	600	600	
k&c	m	30	880	1100	1600	2600	2900	2900	1720	26	33	48	78	87	87	52
traffic signs	LS									10	50	50	50	50	50	10
drainage	LS									90	93	103	181	252	252	110
roadmarking	LS									10	20	20	20	20	20	10
Cut & cover tunnel (includes pumping system)	m	50000	300						360	15000						18000
								sub-total		15348.68	-199.61	660.39	5467.325	11651.39	12611.39	18501.76
								5% P&G		767	-10	33	273	583	631	925
								sub-total		16116	-210	693	5741	12234	13242	19427
								20% contingency		3223	-42	139	1148	2447	2648	3885
								TOTAL (000's)		**19339**	**-252**	**832**	**6889**	**14681**	**15890**	**23312**
								TOTAL Discounted		**15982**	**-208**	**688**	**5693**	**12132**	**13132**	**19265**

Additional land purchase and construction to four-lane Rugby and Sussex Sts in 2002 (2)

Additional cost(000's)	10000	10000
Additional discounted	1500	1500
TOTAL Discounted	**1292**	**2188**

Note

1 Construction assumed to be in 2002, one lump sum payment

2 Additional lanes required to provide adequate capacity for these two options

Annual Maintenance Costs

	Do min	E	F	H	I	J
Specific	$10,000	$3,000	$3,000	$3,000	$3,000	$3,000
Routine	$1,400	$1,400	$1,400	$1,400	$1,400	$1,400
Line Marking	$2,400	$5,000	$5,000	$2,400	$2,400	$2,400
Traffic Lights	$8,500	$17,000	$8,500	$0	$8,500	$8,500
Bridge Structure	$0	$0	$0	$2,000	$1,000	$3,500
Landscaping	$0	$2,000	$4,000	$8,000	$8,000	$8,000
Total	$22,300	$28,400	$21,900	$16,800	$24,300	$26,800

10 Year Reseal Costs

1. Rate of $15/sq.m. This price given by Transit's Network Maintenance Consultant for the Basin Reserve.

Option	Area	Cost
Existing	11000	$165,000
1	15480	$232,200
2	17510	$262,650
3	15802	$237,030
4	19460	$291,900
5	19460	$291,900

year beg 1 July	time	disc factor	Do min	E	F	H	I	J
Year 2000 cost			$22,300	$28,400	$21,900	$16,800	$24,300	$26,800
2000	0	1	$22,300	$22,300	$22,300	$22,300	$22,300	$22,300
2001	1	0.90909091	$20,273	$20,273	$20,273	$20,273	$20,273	$20,273
2002	2	0.82644628	$18,430	$23,471	$18,099	$13,884	$20,083	$22,149
2003	3	0.7513148	$16,754	$21,337	$16,454	$12,622	$18,257	$20,135
2004	4	0.68301346	$15,231	$19,398	$14,958	$11,475	$16,597	$18,305
2005	5	0.62092132	$13,847	$17,634	$13,598	$10,431	$15,088	$16,641
2006	6	0.56447393	$12,588	$16,031	$12,362	$9,483	$13,717	$15,128
2007	7	0.51315812	$11,443	$14,574	$11,238	$8,621	$12,470	$13,753
2008	8	0.46650738	$10,403	$13,249	$10,217	$7,837	$11,336	$12,502
2009	9	0.42409762	$9,457	$12,044	$9,288	$7,125	$10,306	$11,366
2010	10	0.38554329	$8,598	$10,949	$8,443	$6,477	$9,369	$10,333
2011	11	0.3504939	$7,816	$9,954	$7,676	$5,888	$8,517	$9,393
2012	12	0.31863082	$7,105	$9,049	$6,978	$5,353	$7,743	$8,539
2013	13	0.28966438	$6,460	$8,226	$6,344	$4,866	$7,039	$7,763
2014	14	0.26333125	$5,872	$7,479	$5,767	$4,424	$6,399	$7,057
2015	15	0.23939205	$5,338	$6,799	$5,243	$4,022	$5,817	$6,416
2016	16	0.21762914	$4,853	$6,181	$4,766	$3,656	$5,288	$5,832
2017	17	0.19784467	$4,412	$5,619	$4,333	$3,324	$4,808	$5,302
2018	18	0.17985879	$4,011	$5,108	$3,939	$3,022	$4,371	$4,820
2019	19	0.16350799	$3,646	$4,644	$3,581	$2,747	$3,973	$4,382
2020	20	0.14864363	$3,315	$4,221	$3,255	$2,497	$3,612	$3,984
2021	21	0.13513057	$3,013	$3,838	$2,959	$2,270	$3,284	$3,621
2022	22	0.12284597	$2,739	$3,489	$2,690	$2,064	$2,985	$3,292
2023	23	0.11167816	$2,490	$3,172	$2,446	$1,876	$2,714	$2,993
2024	24	0.1015256	$2,264	$2,883	$2,223	$1,706	$2,467	$2,721
2025	25	0.092296	$2,058	$2,621	$2,021	$1,551	$2,243	$2,474
Total annual maintenance costs			$224,718	$274,543	$221,451	$179,795	$241,054	$261,474

10 Year Reseal Costs			Existing	Option 1	Option 2	Option 3	Option 4	Option 5
Year 2000 cost			$165,000	$232,200	$262,650	$237,030	$291,900	$291,900
2012	12	0.31863082	$52,574	$73,986	$83,688	$75,525	$93,008	$93,008
2022	22	0.12284597	$20,270	$28,525	$32,265	$29,118	$35,859	$35,859
Total 10 year reseal costs			$72,844	$102,511	$115,954	$104,643	$128,867	$128,867
Total maintenance costs			$297,562	$377,054	$337,405	$284,438	$369,921	$390,341

Values in row above inputed in Final BCR Spreadsheet

Service Relocation Costs

		Option 1			
Trolley line		Kent to Ade	500	350	175000
Trolley line		Ade to Cam	500	350	175000
New lights	10m	throughout	30	3000	90000
Relocate existing		South, part of East side	10	2000	20000
					460000

		Option 2			
Trolley line		Kent to Ade	500	350	175000
Trolley line		Ade to Cam	500	350	175000
New lights	10m	throughout	30	3000	90000
Relocate existing		South, part of East side	10	2000	20000
					460000

		Option 3			
Service	Size	Location	Qty	Unit Rate	Cost
SW	1800	Cam/Buck	30	1300	39000
SW	1200	Ellice	30	900	27000
SW	1000	Ellice	30	800	24000
S	150	Duff	240	140	33600
W	100	Duff	150	100	15000
W	100	Ellice	100	100	10000
Power	11 kV	Duff	80	LS	see below
Power	33 kV	Duff/Pat	90	LS	see below
					0
S	900	Suss	100	700	70000
S	150	Suss	100	140	14000
W	300	Suss/Buck	50	300	15000
W	100	Suss/Buck	50	100	5000
W	150	Suss/Buck	50	150	7500
Telecom	fibre optic	Suss/Buck	110		150000
Power	33 kV	Suss/Buck	30	LS	260000
					0
Trolley line		Kent to Duff	300	350	105000
Trolley line		Suss to Cam	300	350	105000
New lights	10m	throughout	25	3000	75000
Relocate existing		SE corner	5	2000	10000
					965100

		Option 4			
Service	Size	Location	Qty	Unit Rate	Cost
SW	1800	Cam/Buck	30	1300	39000
SW	1200	Ellice	30	900	27000
SW	1000	Ellice	30	800	24000
W	300	Buck	160	300	48000
W	100	Buck	160	100	16000
W	150	Buck	160	150	24000
S	200	Buck	50	170	8500
Telecom	fibre optic	Buck	180	LS	150000
Power	33 kV	Buck	80	LS	95000
Trolley line		Kent to Ade	450	350	157500
Trolley line		Ade to Cam	500	350	175000
New lights	10m	throughout	30	3000	90000
Relocate existing	10m	West, South, part of East sides	15	2000	30000
					884000

Option 5 - Identical to 4 except:					
Telecom	fibre optic	Buck	180	LS	150000
Power	33 kV	Buck	80	LS	170000
					959000

Appendix G
Basin Reserve Land Investigation

BASIN RESERVE PROPOSED ROADING OPTIONS

	Block owner	TPG Ref No	Bldngs affected (Y/N)	Before work (CV) Cap Val	Before work (LV) Land val	Before work Improvts Val (IV)	Existing area m2	Land Reqd	Reqd Land m2	Basis' Rate per m2	Remaining bldngs (Y/N)	After work Impct on buildings Small	Moderate	Severe	(RLV) Reqd land val (unadjusted)	Val land consmed by Road (unadjusted)	Residual Value	Value of Land consmed by Rd	Value of Bldg Demolished	Net Disptl Val of (ARLV)	Disturbance & Compensatn	Bldg Cost Compensation	TPD, LINZ, Legal Fees	Total Cost to Prof (Net) K	Total Cost incl Land Disposal
Option E/1																									
Dufferin																									
	TNZ	1	N	$ 890,000	$ 890,000.00	$ -	1988	1015	973	$448	N	n/a	n/a	n/a	435,999	$ 454,401	$ 500,000	$ 390,000	$ -	$ 460,000	$ -	$ -	$ 5,000	$ 435,000	($455,000.00)
	Roman Catholic Archbishop	2	N	$ 1,050,000	$ 967,000.00	$ 83,000.00	2161	1080.5	1080.5	$447	N			x	483,500	$ 483,500	$ 483,500	$ 483,500	$ 83,000	$ -	$ -	$ 923,000	$ 40,000	$1,446,500	$1,446,500.00
Effice																									
	TNZ	53	Y	$ 365,000	$ 210,000.00	$ 155,000.00	303	59	244	$693	N			x	$ 169,109	$ 40,891	$ 169,109	$ 40,891	$ 155,000	$ 159,000	$ -	$ -	$ 5,000	$ 211,000	($154,000.00)
	P Brothers	54	Y	$ 590,000	$ 185,000.00	$ 405,000.00	256	209	47	$723	N			x	$ 33,963	$ 151,035	$ 33,963	$ 151,035	$ 405,000	$ 33,000	$ 50,000	$ -	$ 30,000	$ 638,000	$638,000.00
	TNZ	55-58	Y	$ 759,000	$ 462,000.00	$ 297,000.00	795	57	738	$581	N			x	$ 428,875	$ 33,125	$ 428,875	$ 33,125	$ 297,000	$ 395,000	$ -	$ -	$ 7,000	$ 371,000	($388,000.00)
Buckle																									
	TNZ	44-52	N	$ 4,567,500	$ 4,358,500.00	$ 209,000.00	5180	560	4740	$829	Y			x	$ 3,897,979	$ 460,521	$ 3,897,979	$ 460,521	$ -	$ 3,714,000	$ 75,000	$ 250,000	$ 20,000	$ 1,196,500	($3,369,000.00)
Sussex																									
TOTAL				$ 8,221,500.00	$ 7,072,500.00	$ 1,149,000.00		3,981							$ 5,449,827.66	$ 1,623,472.34	$ 5,813,426.47	$ 1,259,074.53	$ 940,000.00	$ 4,760,000.00	$ 125,000.00	$ 1,173,000	$ 107,000	$ 4,300,000	($2,231,500.00)
Option F/2																									
Dufferin																									
	TNZ	1	N	$ 890,000	$ 890,000.00	$ -	1988	1015	973	$448	N	n/a	n/a	n/a	$ 435,998.59	$ 454,401.41	$ 500,000	$ 390,000		$ 460,000	$ -	$ -	$ 5,000	$ 435,000	($455,000.00)
	Roman Catholic Archbishop	2	N	$ 1,050,000	$ 967,000.00	$ 83,000.00	2161	1080.5	1080.5	$447	N			x	$ 483,500.00	$ 483,500.00	$ 483,500	$ 483,500	$ 83,000	$ -	$ -	$ 923,000	$ 40,000	$ 1,446,500	$1,446,500.00
Effice																									
	TNZ	53	Y	$ 365,000	$ 210,000.00	$ 155,000.00	303	59	244	$693	N			x	$ 169,108.91	$ 40,891.09	$ 169,109	$ 40,891	$ 155,000	$ 159,000	$ -	$ -	$ 5,000	$ 211,000	($154,000.00)
	P Brothers	54	Y	$ 590,000	$ 185,000.00	$ 405,000.00	256	209	47	$723	N			x	$ 33,963.84	$ 151,035.16	$ 33,963	$ 151,035	$ 405,000	$ 33,000	$ 50,000	$ -	$ 30,000	$ 638,000	$638,000.00
	TNZ	55-58	Y	$ 759,000	$ 462,000.00	$ 297,000.00	795	57	738	$581	N			x	$ 428,874.47	$ 33,125.53	$ 428,875	$ 33,125	$ 297,000	$ 395,000	$ -	$ -	$ 7,000	$ 371,000	($388,000.00)
Buckle																									
	TNZ	44-52	N	$ 4,567,500	$ 4,358,500.00	$ 209,000.00	10542	1425	8917	$413	Y		x		$ 3,646,657.61	$ 671,842.39	$ 3,646,658	$ 671,842	$ -	$ 3,318,000	$ 75,000	$ -	$ 20,000	$ 1,344,500	($3,283,000.00)
Sussex																									
	Basin Reserve		N					893		$551	N	n/a	n/a	n/a		$ 491,963.11		$ 491,963	$ -	$ -	$ 30,000	$ 25,000	$ 30,000	$ 566,963	$566,963.11
TOTAL				$ 8,221,500.00	$ 7,072,500.00	$ 1,149,000.00		4,939							$ 5,237,705.43	$ 1,834,794.57	$ 5,302,106.83	$ 2,262,356.28	$ 940,000.00	$ 4,364,000.00	$ 155,000.00	$ 948,000	$ 127,000	$ 5,812,963	($1,548,536.89)
Option H/3																									
Dufferin																									
	TNZ	1	N	$ 890,000	$ 890,000.00	$ -	1988	1418	570	$448	N	n/a	n/a	n/a	$ 255,181.09	$ 634,818.91	$ 340,000	$ 640,000	$ -	$ 223,000	$ -	$ -	$ 5,000	$ 672,000	($218,000.00)
	Roman Catholic Archbishop	2	N	$ 1,050,000	$ 967,000.00	$ 83,000.00	2161	1080.5	1080.5	$447	N			x	$ 483,500.00	$ 483,500.00	$ 483,500	$ 483,500	$ 83,000	$ -	$ -	$ 923,000	$ 40,000	$1,446,500	$1,446,500.00
Effice																				$ -					
	TNZ	53	Y	$ 365,000	$ 210,000.00	$ 155,000.00	303	110	193	$693	N			x	$ 133,762.38	$ 76,237.62	$ 133,762	$ 76,238	$ 155,000	$ 126,000	$ -	$ -	$ 5,000	$ 244,000	($121,000.00)
	P Brothers	54	Y	$ 590,000	$ 185,000.00	$ 405,000.00	256	256	0	$723	N			x	$ -	$ 185,000.00	$ -	$ 185,000	$ 405,000	$ -	$ 50,000	$ -	$ 30,000	$ 670,000	$670,000.00
	TNZ	55-58	Y	$ 759,000	$ 462,000.00	$ 297,000.00	795	268	507	$581	N			x	$ 294,633.96	$ 167,366.04	$ 294,634	$ 167,366	$ 297,000	$ 271,000	$ -	$ -	$ 7,000	$ 495,000	($264,000.00)
	Tawaki Properties Ltd	60-61	Y	$ 405,000	$ 335,000.00	$ 70,000.00	630	126	504	$532	Y		x		$ 268,000.00	$ 67,000.00	$ 268,000	$ 67,000	$ -	$ 322,000	$ 100,000	$ -	$ 30,000	$ 213,000	$213,000.00
Buckle																									
	TNZ	44-52	N	$ 4,567,500	$ 4,358,500.00	$ 209,000.00	10542	1498	9044	$413	N		x		$ 3,739,164.67	$ 619,335.33	$ 3,739,165	$ 619,335	$ -	$ 3,365,000	$ 75,000	$ 250,000	$ 20,000	$ 1,347,500	($3,020,000.00)
Sussex																									
	Valentines Basin Reserve Ltd	35-42	N	$ 1,160,000	$ 850,000.00	$ 310,000.00	1954	233	1721	$435	Y			x	$ 748,643.81	$ 101,356.19	$ 748,644	$ 101,356	$ 310,000	$ 675,000	$ 250,000	$ -	$ 35,000	$ 770,000	$770,000.00
	TNZ	43	N	$ 5,000	$ 5,000.00	$ -	211	185	26	$36	Y	n/a	n/a	n/a	$ 663.51	$ 4,336.49	$ 664	$ 4,336	$ -	$ -	$ -	$ -	$ 1,000	$ 6,000	$1,000.00
TOTAL				$ 9,791,500	$ 8,263,500	$ 1,529,000		5,393							$ 5,923,549	$ 2,339,951	$ 5,988,368	$ 2,332,132	$ 1,258,000	$ 4,982,000	$ 475,000	$ 1,173,000	$ 173,000	$ 6,864,000	($532,500.00)
Option I/4																									
Dufferin																									
	TNZ	1	N	$ 890,000	$ 890,000.00	$ -	1988	814	1174	$448	N	n/a	n/a	n/a	$ 525,543.50	$ 364,456.50	$ 604,000	$ 286,000	$ -	$ 556,000	n/a	$0	$ 5,000	$ 339,000	($551,000.00)
	Roman Catholic Archbishop	2	N	$ 1,050,000	$ 967,000.00	$ 83,000.00	2161	1080.5	1080.5	$447	N			x	$ 483,500.00	$ 483,500.00	$ 483,500	$ 483,500	$ 83,000	$ -	$ -	$ 923,000	$ 40,000	$ 1,446,500	$1,446,500.00
Effice																									
	TNZ	53	Y	$ 365,000	$ 210,000.00	$ 155,000.00	303	83	220	$693	N			x	$ 152,475.25	$ 57,524.75	$ 152,475	$ 57,525	$ 155,000	$ 143,000	$ -	$ -	$ 5,000	$ 227,000	($130,000.00)
	P Brothers	54	Y	$ 590,000	$ 185,000.00	$ 405,000.00	256	233	23	$723	N			x	$ 16,631.89	$ 168,368.11	$ 16,631	$ 168,369	$ 405,000	$ 9,000	$ 50,000	$ -	$ 30,000	$ 660,000	$660,000.00
	TNZ	55-58	Y	$ 759,000	$ 462,000.00	$ 297,000.00	795	104	691	$581	N			x	$ 401,562.26	$ 60,437.74	$ 401,562	$ 60,438	$ 297,000	$ 370,000	$ -	$ -	$ 7,000	$ 366,000	($363,000.00)
	Tawaki Properties Ltd	60-61	Y	$ 405,000	$ 335,000.00	$ 70,000.00	630	313	317	$532	Y			x	$ 168,563.49	$ 166,436.51	$ 168,563	$ 166,437	$ 70,000	$ 155,000	$ 100,000	$ -	$30,000	$ 380,000	$380,000.00
Buckle																									
	TNZ	44-52	N	$ 4,567,500	$ 4,358,500.00	$ 209,000.00	10542	2188	8354	$413	N		x		$ 3,453,890.06	$ 904,609.94	$ 3,453,890	$ 904,610	$ -	$ 3,109,500	$ 75,000	$ 250,000	$20,000	$ 1,804,000	($2,763,500.00)
Adelaide Road																									
	Blackwood Properties Ltd	19	Y	$ 1,270,000	$ 650,000.00	$ 620,000.00	1479	20	1459	$439	Y	x			$ 641,210.28	$ 8,789.72	$ 641,210	$ 8,790	$ -	$ -	$ -	$ 25,000	$ 80,000	$20,000	$ 133,790	$133,789.72
Rugby Street																									
	Chaos	20	Y	$ 345,000	$ 105,000.00	$ 240,000.00	167	95	72	$629	N			x	$ 45,269.46	$ 59,730.54	$ 45,269	$ 59,731	$ 240,000	$ 42,000	$ 25,000	$ -	$13,000	$ 383,000	$383,000.00
	National Distributors	21-22	Y	$ 3,580,000	$ 420,000.00	$ 3,160,000.00	797	164	633	$540	Y			x	$ 341,518.19	$ 88,481.81	$ 341,518	$ 88,482	$ -	$ 314,000	$ 100,000	$ -	$25,000	$ 1,401,000	$1,401,000.00
	Richard Norton	24-25	Y	$ 705,000	$ 160,000.00	$ 545,000.00	325	51	274	$497	N			x	$ 133,415.38	$ 26,584.62	$ 133,415	$ 26,585	$ 545,000	$ 123,000	$ 15,000	$ -	$25,000	$ 623,000	$622,000.00
Sussex																									
	GA & JL Rankings & Markamus	27, 28	Y	$ 1,300,000	$ 470,000.00	$ 830,000.00	1068	128	940	$440	Y				$ 413,670.41	$ 56,329.59	$ 413,670	$ 56,330	$ -	$ -	$ 25,000	$ -	$ 25,000	$ 106,330	$106,329.59
	Australasian Conference Assn Ltd	29	Y	$ 1,080,000	$ 520,000.00	$ 560,000.00	1264	57	1227	$405	Y				$ 496,915.89	$ 23,084.11	$ 496,916	$ 23,084	$ -	$ -	$ 5,000	$ -	$ 20,000	$ 48,084	$48,084.11
	TS Emanuel	30	Y	$ 136,000	$ 72,000.00	$ 64,000.00	100	46	54	$720	N			x	$ 38,880.00	$ 33,120.00	$ 38,880	$ 33,120	$ 64,000	$ 36,000	$ 5,000	$ -	$ 15,000	$ 120,000	$120,000.00
	Various (Townscape)	31-34	Y	$ 3,675,000	$ 1,575,000.00	$ 2,100,000.00		341	0	$535.88	N			x	$ -	$ 1,575,000.00	$ -	$ 1,575,000	$ 1,680,000	$ -	$ 280,000	$ 500,000	$ 120,000	$ 4,495,000	$4,495,000.00
	Valentines Basin Reserve Ltd	35-42	Y	$ 1,160,000	$ 850,000.00	$ 310,000.00	1954	304	1650	$435	N				$ 543,756.40	$ 306,243.60	$ 543,756	$ 306,244	$ 310,000	$ 480,000	$ 500,000	$ -	$ 35,000	$ 1,295,000	$1,295,000.00
	TNZ	43	N	$ 5,000	$ 5,000.00	$ -	211	203	8	$24	Y	n/a	n/a	n/a	$ 189.57	$ 4,810.43	$ 190	$ 4,810	$ -	$ -	$ -	$ -	$ -	$ 6,000	$1,000.00
	Various Owners	A	N					271		$535.88					$ -	$ 145,224.64	$ -	$ 145,224	$ -	$ -	$ 5,000	$ -	$ 20,000	$170,224	$170,223.64
TOTAL				$ 19,931,500.00	$ 12,244,500.00	$ 7,686,000.00		$ 6,894.50							$ 7,857,031.24	$ 4,533,792.39	$ 7,935,137.74	$ 4,454,285.90	$ 3,809,000.00	$ 5,547,106.00	$ 1,130,000.00	$ 1,753,000.00	$ 458,000.00	$ 13,943,327.00	$7,358,827.06
Option J/5																									
Dufferin																									
	TNZ	1	N	$ 890,000	$ 890,000.00	$ -	1988	627	1361	$448	N	n/a	n/a	n/a	$ 609,320.80	$ 280,679.20	$ 640,000	$ 250,000	$ -	$ 589,000	$ -	$0	$ 5,000	$ 306,000	($584,000.00)
	Roman Catholic Archbishop	2	N	$ 1,050,000	$ 967,000.00	$ 83,000.00	2161	1080.5	1080.5	$447	N			x	$ 483,500.00	$ 483,500.00	$ 483,500	$ 483,500	$ 83,000		$ -	$ 923,000	$ 40,000	$ 1,446,500	$1,446,500.00
Effice																									
	TNZ	53	Y	$ 365,000	$ 210,000.00	$ 155,000.00	303	48	255	$693	N			x	$ 176,732.67	$ 33,267.33	$ 176,733	$ 33,267	$ 155,000	$ 166,000	$ -	$ -	$ 5,000	$ 204,000	($161,000.00)

BASIN RESERVE PROPOSED ROADING OPTIONS

	P Borderie	54	Y	$ 590,000	$ 189,000.00	$ 401,000.00	256	173	83	$723	N			x	$ 59,980.47	$ 129,019.53	$ 59,980	$ 125,020	$ -	$ 56,000	$ 50,000	$ -	$30,000	$ 614,000	$614,000.00
	TNZ	55-58	Y	$ 759,000	$ 462,000.00	$ 297,000.00	795	104	691	$581	N			x	$ 401,562.56	$ 60,437.74	$ 401,562	$ 60,438	$ 297,000	$ 369,000	$ -	$ -	$7,000	$ 297,000	($363,000.00)
	Tanushi Properties Ltd	60-61	Y	$ 405,000	$ 335,000.00	$ 70,000.00	630	309	321	$553	N			x	$ 170,690.48	$ 164,309.52	$ 170,690	$ 164,310	$ 335,000	$ 157,000	$ 100,000	$ -	$30,000	$ 378,000	$378,000.00
Buckle																													
	TNZ	44-52	N	$ 4,567,500	$ 4,358,500.00	$ 209,000.00	10542	919	9623	$413	N	x			$ 3,978,547.29	$ 379,952.71	$ 3,978,547	$ 379,953	$ -	$ 3,588,700	$ 75,000	$ -	$20,000	$ 1,081,800	($3,483,700.00)
Adelaide Road																													
	Blackwood Properties Ltd	19	Y	$ 1,270,000	$ 650,000.00	$ 620,000.00	1479	20	1459	$439	Y	x			$ 641,210.28	$ 8,789.72	$ 641,210	$ 8,790	$ -	$ -	$ 25,000	$ 80,000	$30,000	$ 133,790	$133,789.72
Rugby Soccer																													
	Chase	20	Y	$ 385,000	$ 105,000.00	$ 280,000.00	167	95	72	$629	N			x	$ 45,269.46	$ 59,730.54	$ 45,269	$ 59,731	$ 280,000	$ 42,000	$ 25,000	$ -	$15,000	$ 383,000	$383,000.00
	National Distributors	21-22	Y	$ 1,590,000	$ 450,000.00	$ 1,140,000.00	797	164	633	$540	Y			x	$ 341,518.19	$ 88,481.81	$ 341,518	$ 88,482	$ -	$ 314,000	$ 100,000	$ -	$25,000	$ 1,401,000	$1,401,000.00
	Richard Keenan	24-25	Y	$ 705,000	$ 160,000.00	$ 545,000.00	325	54	271	$492	N			x	$ 133,415.34	$ 26,584.62	$ 133,415	$ 26,585	$ 545,000	$ 123,000	$ 15,000	$ -	$25,000	$ 622,000	$622,000.00
Sussex																													
	GA & JL Rushbrge & Markeman	28	Y	$ 1,300,000	$ 470,000.00	$ 830,000.00	1068	128	940	$440	Y				$ 413,670.41	$ 56,329.59	$ 413,670	$ 56,330	$ -	$ -	$ 25,000	$ -	$ 25,000	$ 106,330	$106,329.59
	Australasian Conference Assn Ltd	29	Y	$ 1,080,000	$ 520,000.00	$ 560,000.00	1284	57	1227	$405	Y				$ 496,915.89	$ 23,084.11	$ 496,916	$ 23,084	$ -	$ -	$ 5,000	$ -	$ 20,000	$ 48,084	$48,084.11
	TS Emanuel	30	Y	$ 136,000	$ 72,000.00	$ 64,000.00	100	46	54	$720	N			x	$ 30,000.00	$ 33,120.00	$ 30,880	$ 33,120	$ 64,000	$ 34,000	$ 5,000	$ -	$ 15,000	$ 120,000	$120,000.00
	Various (Tawanaga)	31-34	Y	$ 2,940,000	$ 1,260,000.00	$ 1,680,000.00		196	0	$555.88	N			x	$ -	$ 1,260,000.00	$ -	$ 1,260,000	$ 1,680,000	$ -	$ 200,000	$ 500,000	$ 100,000	$ 3,740,000	$3,740,000.00
	Valentines Basin Reserve Ltd	35-42	Y	$ 1,160,000	$ 850,000.00	$ 310,000.00	1954	306	1648	$155	N			x	$ 716,888.43	$ 133,111.57	$ 716,888	$ 133,112	$ 310,000	$ 645,000	$ 100,000	$ -	$ 35,000	$ 450,000	$450,000.00
	TNZ	43	N	$ 5,000	$ 5,000.00	$ -	216	116	95	$26	n/a	n/a	n/a	n/a	$ -	$ 5,000.00	$ -	$ 5,000	$ -	$ -	$ -	$ -	$ 1,000	$ 8,749	$3,749.00
	Basin Reserve		N	$ -		$ -	0	705	0	$551	N	n/a	n/a	n/a	0	$ 388,455.00	$ -	$ 388,455	$ -	$ -	$ -	$ 30,000	$ 25,000	$ 463,455	$463,455.00
TOTAL				10,187,500.00	11,029,500.00	7,268,000.00		5,147.00							$ 8,708,082.02	3,689,872.98	8,730,781.53	3,678,173.78	3,749,000.00	6,874,661.00	785,000.00	1,838,600.00	448,000.00	12,153,707.43	16,837,207.43
Option "Do nothing, apart from sell TNZ land"																								Disposal Value					
Dufferin																													
	TNZ	1	N	$ 890,000	$ 890,000.00	$ -	1948	0	1948	$448	N				$ -	$ -	$ -	$ -	$ -	$ 890,000	$ -	0	71,200	-$ 818,800	($818,800.00)
Effco																													
	TNZ	53	Y	$ 365,000	$ 210,000.00	$ 155,000.00	303	0	303	$693	Y				$ -	$ -	$ -	$ -	$ -	$ 365,000	$ -	$ -	29,200	-$ 335,800	($335,800.00)
	TNZ	55-58	Y	$ 759,000	$ 462,000.00	$ 297,000.00	795	0	795	$581	Y				$ -	$ -	$ -	$ -	$ -	$ 759,000	$ -	$ -	60,720	-$ 698,280	($698,280.00)
Buckle																													
	TNZ	44-52	N	$ 4,567,500	$ 4,358,500.00	$ 209,000.00	10542	0	10542	$413	Y				$ -	$ -	$ -	$ -	$ -	$ 4,567,500	$ -	$ -	365,400	-$ 4,202,100	($4,202,100.00)
Sussex																													
	TNZ	43	N	$ 5,000	$ 5,000.00	$ -	211	0	211	$24	n/a				$ -	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ -	5,000	$ -	$0.00
TOTAL				6,586,500.00	5,926,500.00	661,000.00		0.00							$ -	0.00	0.00	0.00	0.00	6,586,500.00	0.00	0.00	531,320.00	-6,054,980.00	(16,054,980.00)

KEY REFERENCES:

(RLV) Residual Land Value (unadjusted) Is made up of residual land multiplied by the basic m2 rate which has not been adjusted to take into account other valuation factors ie location, size, shape and access etc.

(VL) Value of Land consumed by Road The value of land required, which is obtained by multiplying the basic m2 rate by the land requirement area which has not been adjusted to take into account other valuation factors ie location, size, shape and access etc.

(RV) Residual Value This equals the RLV or VL adjusted, which has not been adjusted to take into account other valuation factors ie location, size, shape and access etc.

Value of Land Consumed by Road Generally this equates to the Value of land Consumed by Road (unadjusted) although in some situations this may equate to RV or a subjective percentage adjustment is applied to take into account the nature and type of landand property involved - eg.Heritage Building.

Value of Building Demolished Equal to Building or improvement value on land.

Net Disposal Value Residual Value less all costs associated with disposal

Disturbance Compensation Associated with compensatory entitlements in terms of the Public Works Act 198

Building Cost Compensation This is another compensatory item associated with the replacement / relocation / alteration of any improvements

Option E/1
Summary of TNZ 1

A vacant site currently zoned residential & owned by Transit

Current Market Value		$890,000
Land Value	A	$890,000
Improvements		$0
Existing Land Area		1988
Land Requirement		**1015**
Residual Land Area		973
Unadjusted LV rate per square metre		$448
Unadjusted residual land value (962 m^2)		$435,599
Unadjusted value of land to be consumed by road (1015m^2)		$454,401

Potential Affect of Works to the residual site
The above anaylsis is 'basic' & does not take account of a number of valuation factors such as size, shape,location, frontage, demand, development costs & likelihood of gaining consents. Taking these factors into account the residual land area in our opinion has a greater value than the land that will be consumed by the new road.Therefore we have made a subjective increase to the residual land & reduced the value of the land to be consumed by road.
We have assumed the sites highest and best use will be residential development.
Access to the site will be provided from Ellice Street.
The protected Elm tree will not be relocated to the residual site.
The residual site will be surveyed early for immediate disposal.
No construction costs needed to enhance site for disposal. Site will be sold vacant.

In our opinion the superior shape, location & road access of the residual site warrants a subjective increase of 15% on the unadjusted rate of $448

Adjusted residual land value (962 m^2)

$448	15%	$515	$514.84	x	973		$500,938
					say		**$500,000**

Adjusted value of land to be consumed by road (1015m^2)

$890,000	less	$500,938		$389,062
			say	**$390,000**

Adjusted square metre rate of land to be consumed by the road is therefore
$383 compared to $515 per square for the residual land

Adjusted residual land value (962 m^2)		(962 m2)	$500,938
Less likely disposal costs and fees @ 8% (agent fees, TPG, LINZ & Legal)			$40,075
Net disposal value		B	**$460,863**
Other fees, strategy, general		C	$5,000
A - B + C = Total Cost to Project			$434,136.69
		say	**$435,000**

*Note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project.The actual cost would be its purchase price + any holdings costs

over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Summary of Roman Catholic Church

An improved site currently used as a Church

Current Market Value		$	1,050,000
Land Value		$	967,000
Improvements		$	83,000
Existing Land Area			2161
Land Requirement			1081
Residual Land Area			1081
Unadjusted LV rate per square metre		$	447
Unadjusted residual land value		$	483,500
Value of land to be used for road	A	$	**483,500**

Potential Affect of Works

The sites highest and best use of the sites would be residential development
The Church will be demolished and a new one built to the same size as the existing one
A betterment argument could be floated to the Church but we have assumed that it would not be accepted by the Church
The church may elect to rationalise its total holdings in this location and they may not require the reinstatement of this Church and on this basis TNZ would not have to pay compensation, however they also may choose the right to have the bdlg reinstated
We have therefore had to adopt this option as a real possibility and allow for its cost in the project

Cost to demolish & construct a new Church	710	$1,300	B	**$923,000**
Total Compensation (A+ B+ C)				$1,406,500
Fees (TPG, LINZ, Legal)			C	$40,000
Total Cost				**$1,446,500**

Summary of TNZ 53

An improved site owned by TNZ

Current Market Value		365,000
Land Value		210,000
Improvements		155,000
Existing Land Area		303
Land Requirement		59
Residual Land Area		244
Unadjusted LV rate per square metre		693
Unadjusted residual land value		169,109
Value of land to be used for road		40,891

Potential Affect of Works

The improvements will be demolished.
The residual vacant site will be amalgamated with other sites for disposal
We have assumed that a 6 month lease termination clause exists which would avoid disturbance claims
At this stage we see no benefit in Transit developing this site (along with the amalgamated sites) for disposal
We have used the Current Market Value of this property as the cost of this property to the project

Current Market Value (Assumed to be the actual cost to the project. Please note *)		365,000
Fees		5,000
Total Acquisition Costs	A	370,000
Disposal Revenue		169,109
Disposal Costs @ 6%		10,147
Net Disposal Revenue	B	158,962
Net Acquisition Cost (A-B)		211,038

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Summary of P Boolieris

An improved site currently leased

Current Market Value	590,000
Land Value	185,000
Improvements	405,000
Existing Land Area	256
Land Requirement	**209**
Residual Land Area	47
Unadjusted LV rate per square metre	723
Unadjusted residual land value	33,965
Value of land to be used for road	151,035

Potential Affect of Works

The improvements will be demolished
The residual vacant site will be amalgamated with other sites for disposal
Residual site will not need to be developed (only amalgamated with other similar sites) for disposal
The property appears to be leased & these tenants may want to be relocated or
may want to have their lessee's interest acquired
Until we view the lease documents we have had to assume that they are short term, say 3 yr leases
and that Transit will acquire the properties immediately & take the leases over. As soon as
the original lease term expires Transit will renew the lease with a 6 month termination clause
This way Transit only have to acquire the property at its current market value & they will avoid
any claims for relocation costs, loss of profits, increased rental costs for any tenants.

Capital Value	590,000
Disturbance claims (mortgage refiancing?)	50,000
Fees	30,000
Total Acquisition Costs	670,000
Disposal Revenue	33,965
Disposal Costs @ 6%	2,038
Net Disposal Revenue	31,927
Net Acquisition Cost	638,073

Option E/1
Summary of TNZ 55-58

Six units identified on the rating valuations and 1 vacant site

Current Market Value			A	$759,000
Land Value				$462,000
Improvements				$297,000
Existing Land Area				795
Land Requirement				**57**
Residual Land Area				738
Unadjusted LV rate per square metre				$581
Unadjusted residual land value	738			$428,875
Unadjusted value of land to be consumed by road		57		**$33,125**

Potential Affect of Works to the residual site

We have assumed these sites highest and best use will be combined commerical/residential developmt
We have assumed that TNZ would need to demolish 2 buildings for the road and that the other bldgs would be demolished by TNZ to realise a higher residual value for the land to be sold.
The cost of demolishing these bldgs for disposing of the land should not be an extra cost according Meritec & therefore we have not allowed a sum for this
The residual site will be surveyed early for immediate disposal.
We have assumed that Transit has lease agreements with termination clauses to avoid tenant compensation claims

Unadjusted residual land value	738		$428,875
Less likely disposal costs and fees @ 8%			$34,310
Net disposal value		B	$394,565
Fees for strategy & tenant negotiations		C	$7,000
Total Cost to Project (A-B+C)			$371,435

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Option E/1
Summary of TNZ 44-55

A large mixture of vacant & improved land owned by TNZ. Several leases exist

Rating Valuation requires adjustment as it has been affected by the designation

Current Rating Value			$3,999,000
Land Value			$3,790,000
Improvements			$209,000
Existing Land Area			10542
Land Requirement			560
Residual Land Area			9982
Unadjusted LV rate per square metre			$360
Adjust LV rate (increase by 15%)			**$413.44**
Adjusted Current Rating Value		A	$4,567,500
Adjusted Land Value			**$4,358,500**
Improvements			$209,000
Unadjusted residual land value	9982		$4,126,973
Unadjusted value of land to be consumed by road	560		$231,527

Potential Affect of Works to the residual site

We understand that this land is designated & therefore the rating valuation has been reduced because of this factor. We have therefore made an increase to our assessment to allow for this as we do not have to take the designation into account when assessing values
We have assumed that the entire site from Cambridge Tce through to Tory Street will be used in the acquisition & disposal costs for this project.
We have assumed the sites highest and best use will be commerical development.
The residual site will be surveyed early for immediate disposal.
There are a number of improvements on the site but we have assumed that they are the tenants except for the historic bldg.
To assess the optimum disposal value would require a full valuation including a development proposal along with subdivision plan and costings. Due to the preliminary nature of these costings we have not undertaken this exercise which means that the figures used should be the lowest value of the residual land if sold on the open market as one block.

Compensation considerations
We understand there is a lease in place between TNZ & motor company for $100,000 pa with no termination clauses. This lease expires in 2006.
We have assumed that construction will begin in 2004 and therefore an agreement will be required before this date which could mean the TNZ will have to compensate the owners for the remaining 3 years of their lease

Compensation for 3 years remaining in the lease	B	$75,000
Relocation Cost for shifting the historic building	C	$250,000
We have assumed that this bldg would be relocated to another Transit site & disposed of to the Wellington City Council as a gift.		
Fees- Strategy, detailed valn, subdivision proposal, Legal, LINZ	D	20,000
Disposal Revenue		$4,126,973
Disposal Costs @10%		$412,697
Net disposal revenue	E	$3,714,275
Net Acquisition Cost (A+B+C+D-E)		$1,198,225

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Please note that Meritec gave us a land area of 6229m2 for the "before" area of the site but we have used 1.0542ha for our analysis

Summary of TNZ 43

A small piece of Vacant land owned by TNZ

Current Market Value			5,000
Land Value			5,000
Improvements			
Existing Land Area			211
Land Requirement			6
Residual Land Area			205
Unadjusted LV rate per square metre			24
Unadjusted residual land value			4,858
Value of land to be used for road			142

Potential Affect of Works

The residual land will be amalgamated with the adjoining property & sold
At this stage we see no benefit in Transit developing this site (along with the amalgamated sites) for disposal
We have used the Current Market Value of this property as the cost of this property to the project

Current Market Value (Assumed to be the actual cost to the project. Please note *)			5,000
Fees			1,000
Total Acquisition Costs	**A**		6,000
Disposal Revenue			4,858
Disposal Costs			5,000
Net Disposal Revenue	**B**	-	142
Net Acquisition Cost (A-B)			6,142

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Option F
Summary of TNZ 1

A vacant site currently zoned residential & owned by Transit

Current Market Value		$890,000
Land Value	A	$890,000
Improvements		$0
Existing Land Area		1988
Land Requirement		**1015**
Residual Land Area		973
Unadjusted LV rate per square metre		$448
Unadjusted residual land value (962 m^2)		$435,599
Unadjusted value of land to be consumed by road (1015m^2)		$454,401

Potential Affect of Works to the residual site
The above anaylsis is 'basic' & does not take account of a number of valuation factors such as size, shape,location, frontage, demand, development costs & likelihood of gaining consents. Taking these factors into account the residual land area in our opinion has a greater value than the land that will be consumed by the new road.Therefore we have made a subjective increase to the residual land & reduced the value of the land to be consumed by road.
We have assumed the sites highest and best use will be residential development.
Access to the site will be provided from Ellice Street.
The protected Elm tree will not be relocated to the residual site.
The residual site will be surveyed early for immediate disposal.
No construction costs needed to enhance site for disposal. Site will be sold vacant.

In our opinion the superior shape, location & road access of the residual site warrants a subjective increase of 15% on the unadjusted rate of $448

Adjusted residual land value (962 m^2)

$448	15%	$515	$514.84	x	973	$500,938
					say	**$500,000**

Adjusted value of land to be consumed by road (1015m^2)

$890,000	less	$500,938		$389,062
			say	**$390,000**

Adjusted square metre rate of land to be consumed by the road is therefore
$383 compared to $515 per square for the residual land

Adjusted residual land value (962 m^2)	(962 m2)		$500,938
Less likely disposal costs and fees @ 8% (agent fees, TPG, LINZ & Legal)			$40,075
Net disposal value		B	**$460,863**
Other fees, strategy, general		C	$5,000
A - B + C = Total Cost to Project			$434,136.69
		say	**$435,000**

*Note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project.The actual cost would be its purchase price + any holdings costs

over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Summary of Roman Catholic Church

An improved site currently used as a Church

Current Market Value			$	1,050,000
Land Value			$	967,000
Improvements			$	83,000
Existing Land Area				2161
Land Requirement				1081
Residual Land Area				1081
Unadjusted LV rate per square metre			$	447
Unadjusted residual land value			$	483,500
Value of land to be used for road		A	$	**483,500**

Potential Affect of Works

The sites highest and best use of the sites would be residential development
The Church will be demolished and a new one built to the same size as the existing one
A betterment argument could be floated to the Church but we have assumed that it would not be accepted by the Church
The church may elect to rationalise its total holdings in this location and they may not require the reinstatement of this Church and on this basis TNZ would not have to pay compensation, however they also may choose the right to have the bdlg reinstated
We have therefore had to adopt this option as a real possibility and allow for its cost in the project

Cost to demolish & construct a new Church	710	$1,300	B	**$923,000**
Total Compensation (A+ B+ C)				$1,406,500
Fees (TPG, LINZ, Legal)			C	$40,000
Total Cost				**$1,446,500**

Summary of TNZ 53

An improved site owned by TNZ

Current Market Value		365,000
Land Value		210,000
Improvements		155,000
Existing Land Area		303
Land Requirement		59
Residual Land Area		244
Unadjusted LV rate per square metre		693
Unadjusted residual land value		169,109
Value of land to be used for road		40,891

Potential Affect of Works

The improvements will be demolished.
The residual vacant site will be amalgamated with other sites for disposal
We have assumed that a 6 month lease termination clause exists which would avoid disturbance claims
At this stage we see no benefit in Transit developing this site (along with the amalgamated sites) for disposal
We have used the Current Market Value of this property as the cost of this property to the project

Current Market Value (Assumed to be the actual cost to the project. Please note *)		365,000
Fees		5,000
Total Acquisition Costs	A	370,000
Disposal Revenue		169,109
Disposal Costs @ 6%		10,147
Net Disposal Revenue	B	158,962
Net Acquisition Cost (A-B)		211,038

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Summary of P Boolieris

An improved site currently leased

Current Market Value	590,000
Land Value	185,000
Improvements	405,000
Existing Land Area	256
Land Requirement	**209**
Residual Land Area	47
Unadjusted LV rate per square metre	723
Unadjusted residual land value	33,965
Value of land to be used for road	151,035

Potential Affect of Works

The improvements will be demolished
The residual vacant site will be amalgamated with other sites for disposal
Residual site will not need to be developed (only amalgamated with other similar sites) for disposal
The property appears to be leased & these tenants may want to be relocated or
may want to have their lessee's interest acquired
Until we view the lease documents we have had to assume that they are short term, say 3 yr leases
and that Transit will acquire the properties immediately & take the leases over. As soon as
the original lease term expires Transit will renew the lease with a 6 month termination clause
This way Transit only have to acquire the property at its current market value & they will avoid
any claims for relocation costs, loss of profits, increased rental costs for any tenants.

Capital Value	590,000
Disturbance claims (mortgage refiancing?)	50,000
Fees	30,000
Total Acquisition Costs	670,000
Disposal Revenue	33,965
Disposal Costs @ 6%	2,038
Net Disposal Revenue	31,927
Net Acquisition Cost	638,073

Summary of TNZ 55-58

Six units identified on the rating valuations and 1 vacant site

Current Market Value			A	$759,000
Land Value				$462,000
Improvements				$297,000
Existing Land Area				795
Land Requirement				**57**
Residual Land Area				738
Unadjusted LV rate per square metre				$581
Unadjusted residual land value	738			$428,875
Unadjusted value of land to be consumed by road		57		**$33,125**

Potential Affect of Works to the residual site

We have assumed these sites highest and best use will be combined commerical/residential developmt
We have assumed that TNZ would need to demolish 2 buildings for the road and that the other bldgs would be demolished by TNZ to realise a higher residual value for the land to be sold.
The cost of demolishing these bldgs for disposing of the land should not be an extra cost according Meritec & therefore we have not allowed a sum for this
The residual site will be surveyed early for immediate disposal.
We have assumed that Transit has lease agreements with termination clauses to avoid tenant compensation claims

Unadjusted residual land value	738		$428,875
Less likely disposal costs and fees @ 8%			$34,310
Net disposal value		B	$394,565
Fees for strategy & tenant negotiations		C	$7,000
Total Cost to Project (A-B+C)			$371,435

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Option F
Summary of TNZ 44-55

A large mixture of vacant & improved land owned by TNZ. Several leases exist

Rating Valuation requires adjustment as it has been affected by the designation

Current Rating Value			$3,999,000
Land Value			$3,790,000
Improvements			$209,000
Existing Land Area			10542
Land Requirement			**1625**
Residual Land Area			8917
Unadjusted LV rate per square metre			$360
Adjust LV rate (increase by 15%)			**$413.44**
Adjusted Current Rating Value		A	$4,567,500
Adjusted Land Value			**$4,358,500**
Improvements			$209,000
Unadjusted residual land value	8917		$3,686,658
Unadjusted value of land to be consumed by road	1625		$671,842

Potential Affect of Works to the residual site

We understand that this land is designated & therefore the rating valuation has been reduced because of this factor. We have therefore made an increase to our assessment to allow for this as we do not have to take the designation into account when assessing values
We have assumed that the entire site from Cambridge Tce through to Tory Street will be used in the acquisition & disposal costs for this project.
We have assumed the sites highest and best use will be commerical development.
The residual site will be surveyed early for immediate disposal.
There are a number of improvements on the site but we have assumed that they are the tenants except for the historic bldg.
To assess the optimum disposal value would require a full valuation including a development proposal along with subdivision plan and costings. Due to the preliminary nature of these costings we have not undertaken this exercise which means that the figures used should be the lowest value of the residual land if sold on the open market as one block.

Compensation considerations
We understand there is a lease in place between TNZ & motor company for $100,000 pa with no termination clauses. This lease expires in 2006.
We have assumed that construction will begin in 2004 and therefore an agreement will be required before this date which could mean the TNZ will have to compensate the owners for the remaining 3 years of their lease

Compensation for 3 years remaining in the lease	B	$75,000
Relocation Cost for shifting the historic building	C	$0
Fees- Strategy, detailed valn, subdivision proposal, Legal, LINZ	D	20,000
Disposal Revenue		$3,686,658
Disposal Costs @10%		$368,666
Net disposal revenue	E	$3,317,992
Net Acquisition Cost (A+B+C+D-E)		$1,344,508

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Please note that Meritec gave us a land area of 6229m2 for the "before" area of the site but we have used 1.0542ha for our analysis

Summary of TNZ 43

A small piece of Vacant land owned by TNZ

Current Market Value			5,000
Land Value			5,000
Improvements			
Existing Land Area			211
Land Requirement			48
Residual Land Area			163
Unadjusted LV rate per square metre			24
Unadjusted residual land value			3,863
Value of land to be used for road			1,137

Potential Affect of Works

The residual land will be amalgamated with the adjoining property & sold
At this stage we see no benefit in Transit developing this site (along with the amalgamated sites) for disposal
We have used the Current Market Value of this property as the cost of this property to the project
It will cost TNZ more than the residual land is worth to dispose of it but we have had to assume that Transit would want to tidy this up now

Land Value			1,137
Fees			1,000
Total Acquisition Costs	A		2,137
Disposal Revenue			3,863
Disposal Costs			5,000
Net Disposal Revenue	B	-	1,137
Net Acquisition Cost (A-B)			3,275

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
- We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Summary of Basin

An improved site used as a studium

Current Market Value of land to be taken	-
Land Value	-
Improvements	-
Existing Land Area	-
Land Requirement	**893**
Average LV rate per square metre	551
Value of land to be used for road	492,043

Potential Affect of Works

Construction Costs to reinstate carparks, fencing etc	25,000
Disturbance claims	30,000
Fees	20,000
Total Acquisition Costs	567,043
	-
	-
	-
	567,043

Option H
Summary of TNZ 1

A vacant site currently zoned residential & owned by Transit

Current Market Value		$890,000
Land Value	A	$890,000
Improvements		$0
Existing Land Area		1988
Land Requirement		**1418**
Residual Land Area		570
Unadjusted LV rate per square metre		$448
Unadjusted residual land value		$255,181
Unadjusted value of land to be consumed by road		$634,819

Potential Affect of Works to the residual site
The above anaylsis is 'basic' & does not take account of a number of valuation factors such as size, shape,location, frontage, demand, development costs & likelihood of gaining consents.
Our opinion is that the residual site will have little value if sold seperately due to its location & would be better to be used to exchange with the Church
The protected Elm tree will <u>not</u> be relocated to the residual site.
The residual site will be surveyed early for immediate disposal.
No construction costs needed to enhance site for disposal. Site will be sold vacant.
In our opinion the superior shape, location & road access of the residual site warrants a subjective decrease of 5% on the unadjusted rate of $448

Adjusted residual land value

$448	5%	$425.30	$425.30	x	570		$242,422
					say		**$240,000**

Adjusted value of land to be consumed by road

$890,000	less	$242,422		$647,578
			say	**$648,000**

Adjusted square metre rate of land to be consumed by the road is therefore
$457 compared to $425 per square for the residual land

Adjusted residual land value		$242,422
Less likely disposal costs and fees @ 8% (agent fees, TPG, LINZ & Legal)		$19,394
Net disposal value	B	**$223,028**
Other fees, strategy, general	C	$5,000
A - B + C = Total Cost to Project		$671,971.73
	say	**$672,000**

*Note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project.The actual cost would be its purchase price + any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Summary of Roman Catholic Church

An improved site currently used as a Church

Current Market Value		$	1,050,000
Land Value		$	967,000
Improvements		$	83,000
Existing Land Area			2161
Land Requirement			1081
Residual Land Area			1081
Unadjusted LV rate per square metre		$	447
Unadjusted residual land value		$	483,500
Value of land to be used for road	**A**	**$**	**483,500**

Potential Affect of Works

The sites highest and best use of the sites would be residential development
The Church will be demolished and a new one built to the same size as the existing one
A betterment argument could be floated to the Church but we have assumed that it would not be accepted by the Church
The church may elect to rationalise its total holdings in this location and they may not require the reinstatement of this Church and on this basis TNZ would not have to pay compensation, however they also may choose the right to have the bdlg reinstated
We have therefore had to adopt this option as a real possibility and allow for its cost in the project

Cost to demolish & construct a new Church	710	$1,300	**B**	**$923,000**
Total Compensation (A+ B+ C)				$1,406,500
Fees (TPG, LINZ, Legal)			**C**	$40,000
Total Cost				**$1,446,500**

Summary of TNZ 53

An improved site owned by TNZ

Current Market Value		365,000
Land Value		210,000
Improvements		155,000
Existing Land Area		303
Land Requirement		110
Residual Land Area		193
Unadjusted LV rate per square metre		693
Unadjusted residual land value		133,762
Value of land to be used for road		76,238

Potential Affect of Works

The improvements will be demolished.
The residual vacant site will be amalgamated with other sites for disposal
We have assumed that a 6 month lease termination clause exists which would avoid disturbance claims
At this stage we see no benefit in Transit developing this site (along with the amalgamated sites) for disposal
We have used the Current Market Value of this property as the cost of this property to the project

Current Market Value (Assumed to be the actual cost to the project. Please note *)		365,000
Fees		5,000
Total Acquisition Costs	A	370,000
Disposal Revenue		133,762
Disposal Costs @ 6%		8,026
Net Disposal Revenue	B	125,737
Net Acquisition Cost (A-B)		244,263

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Summary of P Boolieris

An improved site currently leased

Current Market Value	590,000
Land Value	185,000
Improvements	405,000
Existing Land Area	256
Land Requirement	**256**
Residual Land Area	-
Unadjusted LV rate per square metre	723
Unadjusted residual land value	-
Value of land to be used for road	185,000

Potential Affect of Works

The improvements will be demolished
The property appears to be leased & these tenants may want to be relocated or
may want to have their lessee's interest acquired
Until we view the lease documents we have had to assume that they are short term, say 3 yr leases
and that Transit will acquire the properties immediately & take the leases over. As soon as
the original lease term expires Transit will renew the lease with a 6 month termination clause
This way Transit only have to acquire the property at its current market value & they will avoid
any claims for relocation costs, loss of profits, increased rental costs for any tenants.

Capital Value	590,000
Disturbance claims (mortgage refiancing?)	50,000
Fees	30,000
Total Acquisition Costs	670,000
Disposal Revenue	-
Disposal Costs @ 6%	-
Net Disposal Revenue	-
Net Acquisition Cost	670,000

Option H
Summary of TNZ 55-58

Six units identified on the rating valuations and 1 vacant site

Current Market Value		A	$759,000
Land Value			$462,000
Improvements			$297,000
Existing Land Area			795
Land Requirement			**288**
Residual Land Area			507
Unadjusted LV rate per square metre			$581
Unadjusted residual land value	507		$294,634
Unadjusted value of land to be consumed by road		288	**$167,366**

Potential Affect of Works to the residual site

We have assumed these sites highest and best use will be combined commerical/residential developmt
We have assumed that TNZ would need to demolish 2 buildings for the road and that the other bldgs would be demolished by TNZ to realise a higher residual value for the land to be sold.
The cost of demolishing these bldgs for disposing of the land should not be an extra cost according Meritec & therefore we have not allowed a sum for this
The residual site will be surveyed early for immediate disposal.
We have assumed that Transit has lease agreements with termination clauses to avoid tenant compensation claims

Unadjusted residual land value	507		$294,634
Less likely disposal costs and fees @ 8%			$23,571
Net disposal value		B	$271,063
Fees for strategy & tenant negotiations		C	$7,000
Total Cost to Project (A-B+C)			$494,937

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Option H
Summary of TNZ 44-55

A large mixture of vacant & improved land owned by TNZ. Several leases exist

Rating Valuation requires adjustment as it has been affected by the designation

Current Rating Value			$3,999,000
Land Value			$3,790,000
Improvements			$209,000
Existing Land Area			10542
Land Requirement			**1498**
Residual Land Area			9044
Unadjusted LV rate per square metre			$360
Adjust LV rate (Increase by 15%)			**$413.44**
Adjusted Current Rating Value		A	$4,567,500
Adjusted Land Value			**$4,358,500**
Improvements			$209,000
Unadjusted residual land value	9044		$3,739,165
Unadjusted value of land to be consumed by road	1498		$619,335

Potential Affect of Works to the residual site

We understand that this land is designated & therefore the rating valuation has been reduced because of this factor. We have therefore made an increase to our assessment to allow for this as we do not have to take the designation into account when assessing values
We have assumed that the entire site from Cambridge Tce through to Tory Street will be used in the acquisition & disposal costs for this project.
We have assumed the sites highest and best use will be commerical development.
The residual site will be surveyed early for immediate disposal.
There are a number of improvements on the site but we have assumed that they are the tenants except for the historic bldg.
To assess the optimum disposal value would require a full valuation including a development proposal along with subdivision plan and costings. Due to the preliminary nature of these costings we have not undertaken this exercise which means that the figures used should be the lowest value of the residual land if sold on the open market as one block.

Compensation considerations
We understand there is a lease in place between TNZ & motor company for $100,000 pa with no termination clauses. This lease expires in 2006.
We have assumed that construction will begin in 2004 and therefore an agreement will be required before this date which could mean the TNZ will have to compensate the owners for the remaining 3 years of their lease

Compensation for 3 years remaining in the lease	B	$75,000
Relocation Cost for shifting the historic building	C	$250,000
Fees- Strategy, detailed valn, subdivision proposal, Legal, LINZ	D	20,000
Disposal Revenue		$3,739,165
Disposal Costs @10%		$373,916
Net disposal revenue	E	$3,365,248
Net Acquisition Cost (A+B+C+D-E)		$1,547,252

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Please note that Meritec gave us a land area of 6229m2 for the "before" area of the site but we have used 1.0542ha for our analysis

Summary of P Tanoshi

An improved site -bottlestore

Current Market Value		405,000
Land Value		335,000
Improvements		70,000
Existing Land Area		630
Land Requirement		**126**
Residual Land Area		504
Unadjusted LV rate per square metre		532
Unadjusted residual land value		268,000
Value of land to be used for road		67,000

Potential Affect of Works

The improvements will remain
The owner is likely to want sell the entire property to TNZ due to the current competion in liquor sales
We have allowed to buy the stock & resell it

Capital Value		405,000
Disturbance claims & relocation costs		100,000
Fees		30,000
Total Acquisition Costs	**A**	535,000
Disposal Revenue		350,000
Disposal Costs@8%		28,000
Net Disposal Revenue	**B**	322,000
Total Acq Cost (A -B)		213,000

Summary of P Valentines

An improved site -Restaurant

Current Market Value		1,160,000
Land Value		850,000
Improvements		310,000
Existing Land Area		1,954
Land Requirement		**233**
Residual Land Area		1,721
Unadjusted LV rate per square metre		435
Unadjusted residual land value		748,644
Value of land to be used for road		101,356

Potential Affect of Works

Even though only part of the bldg is to be demolished there is no value in altering the the bldg for resale. It is likely that the site would be redeveloped into Residential or a commercial retail development
The owner is likely to want sell the entire property to TNZ due to the current competition in the restaurant business
We have allowed to buy the stock & resell it at a discount

Capital Value		1,160,000
Disturbance claims & relocation costs		250,000
Fees		35,000
Total Acquisition Costs	A	1,445,000
Disposal Revenue		750,000
Disposal Costs@10%		75,000
Net Disposal Revenue	B	675,000
Total Acq Cost (A -B)		770,000

Summary of TNZ 43

A small piece of Vacant land owned by TNZ

Current Market Value		5,000
Land Value		5,000
Improvements		
Existing Land Area		211
Land Requirement		183
Residual Land Area		28
Unadjusted LV rate per square metre		24
Unadjusted residual land value		664
Value of land to be used for road		4,336

Potential Affect of Works

The residual land will be amalgamated with the adjoining property & sold
At this stage we see no benefit in Transit developing this site (along with the amalgamated sites) for disposal
We have assumed that TNZ will retain the residual land area due to its size.

Land Value		4,336
Fees		1,000
Total Acquisition Costs	A	5,336
Residual Land		664
Net Acquisition Cost		6,000

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
- We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Option I
Summary of TNZ 1

A vacant site currently zoned residential & owned by Transit

Current Market Value		$890,000
Land Value	A	$890,000
Improvements		$0
Existing Land Area		1988
Land Requirement		**814**
Residual Land Area		1174
Unadjusted LV rate per square metre		$448
Unadjusted residual land value		$525,584
Unadjusted value of land to be consumed by road		$364,416

Potential Affect of Works to the residual site
The above anaylsis is 'basic' & does not take account of a number of valuation factors such as size, shape,location, frontage, demand, development costs & likelihood of gaining consents.
The residual site would have a reasonable disposal value and could be sold seperately on the open mkt or exchanged for Church land
The protected Elm tree will <u>not</u> be relocated to the residual site.
The residual site will be surveyed early for immediate disposal.
No construction costs needed to enhance site for disposal. Site will be sold vacant.
In our opinion the superior shape, location & road access of the residual site warrants a subjective increase of 15% on the unadjusted rate of $448

Adjusted residual land value						
$448	15%	$514.84	$514.84	x	1174	$604,421
					say	**$604,000**
Adjusted value of land to be consumed by road						
$890,000	less	$604,421				$285,579
					say	**$286,000**

Adjusted square metre rate of land to be consumed by the road is therefore
$351 compared to $515 per square for the residual land

Adjusted residual land value		$604,421
Less likely disposal costs and fees @ 8% (agent fees, TPG, LINZ & Legal)		$48,354
Net disposal value	B	**$556,067**
Other fees, strategy, general	C	$5,000
A - B + C = Total Cost to Project		$338,932.66
	say	**$339,000**

*Note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project.The actual cost would be its purchase price + any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Summary of Roman Catholic Church

An improved site currently used as a Church

Current Market Value			$	1,050,000
Land Value			$	967,000
Improvements			$	83,000
Existing Land Area				2161
Land Requirement				1081
Residual Land Area				1081
Unadjusted LV rate per square metre			$	447
Unadjusted residual land value			$	483,500
Value of land to be used for road		A	$	**483,500**

Potential Affect of Works

The sites highest and best use of the sites would be residential development
The Church will be demolished and a new one built to the same size as the existing one
A betterment argument could be floated to the Church but we have assumed that it would not be accepted by the Church
The church may elect to rationalise its total holdings in this location and they may not require the reinstatement of this Church and on this basis TNZ would not have to pay compensation, however they also may choose the right to have the bdlg reinstated
We have therefore had to adopt this option as a real possibility and allow for its cost in the project

Cost to demolish & construct a new Church	710	$1,300	B	**$923,000**
Total Compensation (A+ B+ C)				$1,406,500
Fees (TPG, LINZ, Legal)			C	$40,000
Total Cost				**$1,446,500**

Summary of TNZ 53

An improved site owned by TNZ

Current Market Value		365,000
Land Value		210,000
Improvements		155,000
Existing Land Area		303
Land Requirement		83
Residual Land Area		220
Unadjusted LV rate per square metre		693
Unadjusted residual land value		152,475
Value of land to be used for road		57,525

Potential Affect of Works

The improvements will be demolished.
The residual vacant site will be amalgamated with other sites for disposal
We have assumed that a 6 month lease termination clause exists which would avoid disturbance claims
At this stage we see no benefit in Transit developing this site (along with the amalgamated sites) for disposal
We have used the Current Market Value of this property as the cost of this property to the project

Current Market Value (Assumed to be the actual cost to the project. Please note *)		365,000
Fees		5,000
Total Acquisition Costs	A	370,000
Disposal Revenue		152,475
Disposal Costs @ 6%		9,149
Net Disposal Revenue	B	143,327
Net Acquisition Cost (A-B)		226,673

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Summary of P Boolieris

An improved site currently leased

Current Market Value	590,000
Land Value	185,000
Improvements	405,000
Existing Land Area	256
Land Requirement	**233**
Residual Land Area	23
Unadjusted LV rate per square metre	723
Unadjusted residual land value	16,621
Value of land to be used for road	168,379

Potential Affect of Works

The improvements will be demolished
The property appears to be leased & these tenants may want to be relocated or may want to have their lessee's interest acquired
Until we view the lease documents we have had to assume that they are short term, say 3 yr leases and that Transit will acquire the properties immediately & take the leases over. As soon as the original lease term expires Transit will renew the lease with a 6 month termination clause
This way Transit only have to acquire the property at its current market value & they will avoid any claims for relocation costs, loss of profits, increased rental costs for any tenants.

Capital Value	590,000
Disturbance claims (mortgage refiancing?)	50,000
Fees	30,000
Total Acquisition Costs	670,000
Disposal Revenue	16,621
Disposal Costs	7,000
Net Disposal Revenue	9,621
Net Acquisition Cost	660,379

Option I
Summary of TNZ 55-58

Six units identified on the rating valuations and 1 vacant site

Current Market Value		A	$759,000
Land Value			$462,000
Improvements			$297,000
Existing Land Area			795
Land Requirement			**104**
Residual Land Area			691
Unadjusted LV rate per square metre			$581
Unadjusted residual land value	691		$401,562
Unadjusted value of land to be consumed by road	104		**$60,438**

Potential Affect of Works to the residual site

We have assumed these sites highest and best use will be combined commerical/residential developmt
We have assumed that TNZ would need to demolish 2 buildings for the road and that the other bldgs would be demolished by TNZ to realise a higher residual value for the land to be sold.
The cost of demolishing these bldgs for disposing of the land should not be an extra cost according Meritec & therefore we have not allowed a sum for this
The residual site will be surveyed early for immediate disposal.
We have assumed that Transit has lease agreements with termination clauses to avoid tenant compensation claims

Unadjusted residual land value	691		$401,562
Less likely disposal costs and fees @ 8%			$32,125
Net disposal value		B	$369,437
Fees for strategy & tenant negotiations		C	$7,000
Total Cost to Project (A-B+C)			$396,563

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Option I
Summary of TNZ 44-55

A large mixture of vacant & improved land owned by TNZ. Several leases exist

Rating Valuation requires adjustment as it has been affected by the designation

Current Rating Value			$3,999,000
Land Value			$3,790,000
Improvements			$209,000
Existing Land Area			10542
Land Requirement			**2188**
Residual Land Area			8354
Unadjusted LV rate per square metre			$360
Adjust LV rate (increase by 15%)			**$413.44**
Adjusted Current Rating Value		A	$4,567,500
Adjusted Land Value			**$4,358,500**
Improvements			$209,000
Unadjusted residual land value	8354		$3,453,890
Unadjusted value of land to be consumed by road	2188		$904,610

Potential Affect of Works to the residual site

We understand that this land is designated & therefore the rating valuation has been reduced because of this factor. We have therefore made an increase to our assessment to allow for this as we do not have to take the designation into account when assessing values
We have assumed that the entire site from Cambridge Tce through to Tory Street will be used in the acquisition & disposal costs for this project.
We have assumed the sites highest and best use will be commerical development.
The residual site will be surveyed early for immediate disposal.
There are a number of improvements on the site but we have assumed that they are the tenants except for the historic bldg.
To assess the optimum disposal value would require a full valuation including a development proposal along with subdivision plan and costings. Due to the preliminary nature of these costings we have not undertaken this exercise which means that the figures used should be the lowest value of the residual land if sold on the open market as one block.

Compensation considerations
We understand there is a lease in place between TNZ & motor company for $100,000 pa with no termination clauses. This lease expires in 2006.
We have assumed that construction will begin in 2004 and therefore an agreement will be required before this date which could mean the TNZ will have to compensate the owners for the remaining 3 years of their lease

Compensation for 3 years remaining in the lease	B	$75,000
Relocation Cost for shifting the historic building	C	$250,000
Fees- Strategy, detailed valn, subdivision proposal, Legal, LINZ	D	20,000
Disposal Revenue		$3,453,890
Disposal Costs @10%		$345,389
Net disposal revenue	E	$3,108,501
Net Acquisition Cost (A+B+C+D-E)		$1,803,999

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Please note that Meritec gave us a land area of 6229m2 for the "before" area of the site but we have used 1.0542ha for our analysis

Summary of P Tanoshi

An improved site -bottlestore

Current Market Value		405,000
Land Value		335,000
Improvements		70,000
Existing Land Area		630
Land Requirement		**313**
Residual Land Area		317
Unadjusted LV rate per square metre		532
Unadjusted residual land value		168,563
Value of land to be used for road		166,437

Potential Affect of Works

The improvements will be demolished
The owner is likely to want sell the entire property to TNZ due to the current competition in liquor sales
We have allowed to buy the stock & resell it

Capital Value		405,000
Disturbance claims & relocation costs		100,000
Fees		30,000
Total Acquisition Costs	A	535,000
Disposal Revenue		168,563
Disposal Costs@8%		13,485
Net Disposal Revenue	B	155,078
Total Acq Cost (A -B)		379,922

Summary of P Valentines

An improved site -Restaurant

Current Market Value		1,160,000
Land Value		850,000
Improvements		310,000
Existing Land Area		1,954
Land Requirement		**704**
Residual Land Area		1,250
Unadjusted LV rate per square metre		435
Unadjusted residual land value		543,756
Value of land to be used for road		306,244

Potential Affect of Works

The bldg will be demolished
It is likely that the site would be redeveloped into Residential or a commercial retail development
The owner is likely to want sell the entire property to TNZ due to the current competition in the restaurant business
We have allowed to buy the stock & resell it at a discount

Capital Value		1,160,000
Disturbance claims & relocation costs		500,000
Fees		35,000
Total Acquisition Costs	A	1,695,000
Disposal Revenue		543,756
Disposal Costs@10%		54,376
Net Disposal Revenue	B	489,381
Total Acq Cost (A -B)		1,205,619

Summary of TNZ 43- Option I

A small piece of Vacant land owned by TNZ

Current Market Value	5,000
Land Value	5,000
Improvements	
Existing Land Area	211
Land Requirement	203
Residual Land Area	8
Unadjusted LV rate per square metre	24
Unadjusted residual land value	190
Value of land to be used for road	4,810

Potential Affect of Works

The residual land will be amalgamated with the adjoining property & sold
At this stage we see no benefit in Transit developing this site (along with the amalgamated sites) for disposal
We have used the Current Market Value of this property as the cost of this property to the project

Current Market Value (Assumed to be the actual cost to the project. Please note *)		5,000
Fees		1,000
Total Acquisition Costs	A	6,000
Disposal Revenue		
Disposal Costs		-
Net Disposal Revenue	B	-
Net Acquisition Cost (A-B)		6,000

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Summary of Blackwood - Option I - No. 19

An improved site -lge commerical/retail building

Current Market Value		1,270,000
Land Value		650,000
Improvements		620,000
Existing Land Area		1,479
Land Requirement		**20**
Residual Land Area		1,459
Unadjusted LV rate per square metre		439
Unadjusted residual land value		641,210
Value of land to be used for road		8,790

Potential Affect of Works

This is a large building but it appears that only a small corner of the building will be affected and we have assumed that the building could be altered to allow for proposal

Land		8,790
Disturbance claims		25,000
Building Alteration Costs		80,000
Fees		20,000
Total Acquisition Costs	A	133,790
Disposal Revenue		-
Disposal Costs@8%		-
Net Disposal Revenue	B	-
Total Acq Cost (A -B)		133,790

Summary of Chans - Option I - No.20

An improved site -retail building

Current Market Value		385,000
Land Value		105,000
Improvements		280,000
Existing Land Area		167
Land Requirement		**95**
Residual Land Area		72
Unadjusted LV rate per square metre		629
Unadjusted residual land value		45,269
Value of land to be used for road		59,731

Potential Affect of Works

Have assumed that the building will be demolished & TNZ will have to acquire the entire property

Land		385,000
Disturbance claims		25,000
Building Alteration Costs		-
Fees		15,000
Total Acquisition Costs	A	425,000
Disposal Revenue		45,269
Disposal Costs@8%		3,622
Net Disposal Revenue	B	41,648
Total Acq Cost (A -B)		383,352

Summary of National Distributors - Option I - No. 21 & 22

An improved site -lge commerical/retail building

Current Market Value	1,590,000
Land Value	430,000
Improvements	1,160,000
Existing Land Area	797
Land Requirement	**164**
Residual Land Area	633
Unadjusted LV rate per square metre	540
Unadjusted residual land value	341,518
Value of land to be used for road	88,482

Potential Affect of Works

Have assumed that TNZ willl acquire the entire ppty and then demo the bldg for disposal

Current Mkt Value		1,590,000
Disturbance claims		100,000
Building Alteration Costs		-
Fees		25,000
Total Acquisition Costs	A	1,715,000
Disposal Revenue		341,518
Disposal Costs@8%		27,321
Net Disposal Revenue	B	314,197
Total Acq Cost (A -B)		1,400,803

Summary of Richard Keenan - Option I - No. 24 & 25

2 Residential properties

Current Market Value		705,000
Land Value		160,000
Improvements		545,000
Existing Land Area		325
Land Requirement		**54**
Residual Land Area		271
Unadjusted LV rate per square metre		492
Unadjusted residual land value		133,415
Value of land to be used for road		26,585

Potential Affect of Works

Assume complete acquisition

Current Market Value		705,000
Disturbance claims		15,000
Building Alteration Costs		-
Fees		25,000
Total Acquisition Costs	A	745,000
Disposal Revenue		133,415
Disposal Costs@8%		10,673
Net Disposal Revenue	B	122,742
Total Acq Cost (A -B)		622,258

Summary of Ruddings & Marksman - Option I - No. 27, 28,

Motel

Current Market Value		1,300,000
Land Value		470,000
Improvements		830,000
Existing Land Area		1,068
Land Requirement		**128**
Residual Land Area		940
Unadjusted LV rate per square metre		440
Unadjusted residual land value		413,670
Value of land to be used for road		56,330

Potential Affect of Works

Land taken only

Land		56,330
Disturbance claims		25,000
Building Alteration Costs		-
Fees		25,000
Total Acquisition Costs	A	106,330
Disposal Revenue		-
Disposal Costs@8%		-
Net Disposal Revenue	B	-
Total Acq Cost (A -B)		106,330

Summary of Australasian Conf Assn - Option I - No.29

Old Church Hall at rear of site

Current Market Value		1,080,000
Land Value		520,000
Improvements		560,000
Existing Land Area		1,284
Land Requirement		**57**
Residual Land Area		1,227
Unadjusted LV rate per square metre		405
Unadjusted residual land value		496,916
Value of land to be used for road		23,084

Potential Affect of Works

Land take only

Land		23,084
Disturbance claims		5,000
Building Alteration Costs		-
Fees		20,000
Total Acquisition Costs	A	48,084
Disposal Revenue		-
Disposal Costs@8%		-
Net Disposal Revenue	B	-
Total Acq Cost (A -B)		48,084

Summary of Various (Townscape) - Option I - No.31-34

Modern residential multi unit development on unit titles

Current Market Value	$245,000 per unit	15 units	3,675,000
Land Value	$105,000	15	1,575,000
Improvements			2,100,000
Existing Land Area			-
Land Requirement			**341**
Residual Land Area			
Unadjusted LV rate per square metre			536
Unadjusted residual land value			-
Value of land to be used for road			182,776

Potential Affect of Works

We have assumed that 12 units would need to be acquired
The Land is owned by various owners and has a number of diff rating valns
We have adopted the average rate per square metre by taking 14 typical sites in the area and dividing there square metre rates by 14 to give us an avg rate per square metre

Current Mkt Value		3,675,000
Disturbance claims		200,000
Building Alteration Costs		500,000
Fees		120,000
Total Acquisition Costs	A	4,495,000
Disposal Revenue		-
Disposal Costs@8%		-
Net Disposal Revenue	B	-
Total Acq Cost (A -B)		4,495,000

Summary of Various Owners - Option I - No. A

Old Church Hall at rear of site

Current Market Value		-
Land Value		-
Improvements		-
Existing Land Area		-
Land Requirement		**271**
Residual Land Area	-	271
LV rate per square metre		536
Unadjusted residual land value	-	145,256
Value of land to be used for road		145,256

Potential Affect of Works

Land take only
The Land is owned by various owners and has a number of diff rating valns
We have adopted the average rate per square metre by taking 14 typical sites in the area and dividing there square metre rates by 14 to give us an avg rate per square metre

Land		145,256
Disturbance claims		5,000
Building Alteration Costs		-
Fees		20,000
Total Acquisition Costs	A	170,256
Disposal Revenue		-
Disposal Costs@8%		-
Net Disposal Revenue	B	-
Total Acq Cost (A -B)		170,256

Summary of TS Emanual - Option I - No. 30

Old residential house

Current Market Value		136,000
Land Value		72,000
Improvements		64,000
Existing Land Area		100
Land Requirement		**46**
Residual Land Area		54
Unadjusted LV rate per square metre		720
Unadjusted residual land value		38,880
Value of land to be used for road		33,120

Potential Affect of Works

Acquire entire property

Current Market Value		136,000
Disturbance claims		5,000
Fees		15,000
Total Acquisition Costs	A	156,000
Disposal Revenue		38,880
Disposal Costs@8%		3,110
Net Disposal Revenue	B	35,770
Total Acq Cost (A -B)		120,230

Option J
Summary of TNZ 1

A vacant site currently zoned residential & owned by Transit

Current Market Value		$890,000
Land Value	A	$890,000
Improvements		$0
Existing Land Area		1988
Land Requirement		**627**
Residual Land Area		1361
Unadjusted LV rate per square metre		$448
Unadjusted residual land value		$609,301
Unadjusted value of land to be consumed by road		$280,699

Potential Affect of Works to the residual site
The above anaylsis is 'basic' & does not take account of a number of valuation factors such as size, shape,location, frontage, demand, development costs & likelihood of gaining consents.
The residual site would have a reasonable disposal value and could be sold seperately on the open mkt or exchanged for Church land
The protected Elm tree will not be relocated to the residual site.
The residual site will be surveyed early for immediate disposal.
No construction costs needed to enhance site for disposal. Site will be sold vacant.
In our opinion the superior shape, location & road access of the residual site warrants a subjective decrease of 5% on the unadjusted rate of $448

Adjusted residual land value

$448	5%	$470.07	$470.07	x	1361		$639,766
					say		**$640,000**

Adjusted value of land to be consumed by road

$890,000	less	$639,766		$250,234
			say	**$250,000**

Adjusted square metre rate of land to be consumed by the road is therefore
$399 compared to $470 per square for the residual land

Adjusted residual land value		$639,766
Less likely disposal costs and fees @ 8% (agent fees, TPG, LINZ & Legal)		$51,181
Net disposal value	B	**$588,585**
Other fees, strategy, general	C	$5,000
A - B + C = Total Cost to Project		$306,415.42
	say	**$306,000**

*Note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project.The actual cost would be its purchase price + any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Summary of Roman Catholic Church

An improved site currently used as a Church

Current Market Value				$ 1,050,000
Land Value				$ 967,000
Improvements				$ 83,000
Existing Land Area				2161
Land Requirement				1081
Residual Land Area				1081
Unadjusted LV rate per square metre				$ 447
Unadjusted residual land value				$ 483,500
Value of land to be used for road			A	**$ 483,500**

Potential Affect of Works

The sites highest and best use of the sites would be residential development
The Church will be demolished and a new one built to the same size as the existing one
A betterment argument could be floated to the Church but we have assumed that it would not be accepted by the Church
The church may elect to rationalise its total holdings in this location and they may not require the reinstatement of this Church and on this basis TNZ would not have to pay compensation, however they also may choose the right to have the bdlg reinstated
We have therefore had to adopt this option as a real possibility and allow for its cost in the project

Cost to demolish & construct a new Church	710	$1,300	B	**$923,000**
Total Compensation (A+ B+ C)				$1,406,500
Fees (TPG, LINZ, Legal)			C	$40,000
Total Cost				**$1,446,500**

Summary of TNZ 53

An improved site owned by TNZ

Current Market Value		365,000
Land Value		210,000
Improvements		155,000
Existing Land Area		303
Land Requirement		48
Residual Land Area		255
Unadjusted LV rate per square metre		693
Unadjusted residual land value		176,733
Value of land to be used for road		33,267

Potential Affect of Works

The improvements will be demolished.
The residual vacant site will be amalgamated with other sites for disposal
We have assumed that a 6 month lease termination clause exists which would avoid disturbance claims
At this stage we see no benefit in Transit developing this site (along with the amalgamated sites) for disposal
We have used the Current Market Value of this property as the cost of this property to the project

Current Market Value (Assumed to be the actual cost to the project. Please note *)		365,000
Fees		5,000
Total Acquisition Costs	A	370,000
Disposal Revenue		176,733
Disposal Costs @ 6%		10,604
Net Disposal Revenue	B	166,129
Net Acquisition Cost (A-B)		203,871

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Summary of P Boolieris

An improved site currently leased

Current Market Value	590,000
Land Value	185,000
Improvements	405,000
Existing Land Area	256
Land Requirement	**173**
Residual Land Area	83
Unadjusted LV rate per square metre	723
Unadjusted residual land value	59,980
Value of land to be used for road	125,020

Potential Affect of Works

The improvements will be demolished
The property appears to be leased & these tenants may want to be relocated or may want to have their lessee's interest acquired
Until we view the lease documents we have had to assume that they are short term, say 3 yr leases and that Transit will acquire the properties immediately & take the leases over. As soon as the original lease term expires Transit will renew the lease with a 6 month termination clause
This way Transit only have to acquire the property at its current market value & they will avoid any claims for relocation costs, loss of profits, increased rental costs for any tenants.

Capital Value	590,000
Disturbance claims (mortgage refiancing?)	50,000
Fees	30,000
Total Acquisition Costs	670,000
Disposal Revenue	59,980
Disposal Costs @ 6%	3,599
Net Disposal Revenue	56,382
Net Acquisition Cost	613,618

Option J
Summary of TNZ 55-58

Six units identified on the rating valuations and 1 vacant site

Current Market Value		A	$759,000
Land Value			$462,000
Improvements			$297,000
Existing Land Area			795
Land Requirement			**104**
Residual Land Area			691
Unadjusted LV rate per square metre			$581
Unadjusted residual land value	691		$401,562
Unadjusted value of land to be consumed by road	104		**$60,438**

Potential Affect of Works to the residual site

We have assumed these sites highest and best use will be combined commerical/residential developmt
We have assumed that TNZ would need to demolish 2 buildings for the road and that the other bldgs would be demolished by TNZ to realise a higher residual value for the land to be sold.
The cost of demolishing these bldgs for disposing of the land should not be an extra cost according Meritec & therefore we have not allowed a sum for this
The residual site will be surveyed early for immediate disposal.
We have assumed that Transit has lease agreements with termination clauses to avoid tenant compensation claims

Unadjusted residual land value	691		$401,562
Less likely disposal costs and fees @ 8%			$32,125
Net disposal value		B	$369,437
Fees for strategy & tenant negotiations		C	$7,000
Total Cost to Project (A-B+C)			$396,563

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Option J
Summary of TNZ 44-55

A large mixture of vacant & improved land owned by TNZ. Several leases exist

Rating Valuation requires adjustment as it has been affected by the designation

Current Rating Value			$3,999,000
Land Value			$3,790,000
Improvements			$209,000
Existing Land Area			10542
Land Requirement			**919**
Residual Land Area			9623
Unadjusted LV rate per square metre			$360
Adjust LV rate (Increase by 15%)			**$413.44**
Adjusted Current Rating Value		A	$4,567,500
Adjusted Land Value			**$4,358,500**
Improvements			$209,000
Unadjusted residual land value	9623		$3,978,547
Unadjusted value of land to be consumed by road	919		$379,953

Potential Affect of Works to the residual site

We understand that this land is designated & therefore the rating valuation has been reduced because of this factor. We have therefore made an increase to our assessment to allow for this as we do not have to take the designation into account when assessing values
We have assumed that the entire site from Cambridge Tce through to Tory Street will be used in the acquisition & disposal costs for this project.
We have assumed the sites highest and best use will be commerical development.
The residual site will be surveyed early for immediate disposal.
There are a number of improvements on the site but we have assumed that they are the tenants except for the historic bldg.
To assess the optimum disposal value would require a full valuation including a development proposal along with subdivision plan and costings. Due to the preliminary nature of these costings we have not undertaken this exercise which means that the figures used should be the lowest value of the residual land if sold on the open market as one block.

Compensation considerations
We understand there is a lease in place between TNZ & motor company for $100,000 pa with no termination clauses. This lease expires in 2006.
We have assumed that construction will begin in 2004 and therefore an agreement will be required before this date which could mean the TNZ will have to compensate the owners for the remaining 3 years of their lease

Compensation for 3 years remaining in the lease	B	$75,000
Relocation Cost for shifting the historic building	C	$0
Fees- Strategy, detailed valn, subdivision proposal, Legal, LINZ	D	20,000
Disposal Revenue		$3,978,547
Disposal Costs @10%		$397,855
Net disposal revenue	E	$3,580,693
Net Acquisition Cost (A+B+C+D-E)		$1,081,807

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Please note that Meritec gave us a land area of 6229m2 for the "before" area of the site but we have used 1.0542ha for our analysis

Summary of P Tanoshi

An improved site -bottlestore

Current Market Value		405,000
Land Value		335,000
Improvements		70,000
Existing Land Area		630
Land Requirement		**309**
Residual Land Area		321
Unadjusted LV rate per square metre		532
Unadjusted residual land value		170,690
Value of land to be used for road		164,310

Potential Affect of Works

The improvements will be demolished
The owner is likely to want sell the entire property to TNZ due to the current competition in liquor sales
We have allowed to buy the stock & resell it

Capital Value		405,000
Disturbance claims & relocation costs		100,000
Fees		30,000
Total Acquisition Costs	A	535,000
Disposal Revenue		170,690
Disposal Costs@8%		13,655
Net Disposal Revenue	B	157,035
Total Acq Cost (A -B)		377,965

Summary of P Valentines

An improved site -Restaurant

Current Market Value		1,160,000
Land Value		850,000
Improvements		310,000
Existing Land Area		1,954
Land Requirement		**306**
Residual Land Area		1,648
Unadjusted LV rate per square metre		435
Unadjusted residual land value		716,888
Value of land to be used for road		133,112

Potential Affect of Works

The bldg will be demolished
It is likely that the site would be redeveloped into Residential or a commercial retail development
The owner is likely to want sell the entire property to TNZ due to the current competition in the restaurant business
We have allowed to buy the stock & resell it at a discount

Current Mkt Value		1,160,000
Disturbance claims & relocation costs		100,000
Construction Costs		-
Fees		35,000
Total Acquisition Costs	A	1,295,000
Disposal Revenue		716,888
Disposal Costs@10%		71,689
Net Disposal Revenue	B	645,200
Total Acq Cost (A -B)		649,800

Summary of TNZ 43 Option J

A small piece of Vacant land owned by TNZ

Current Market Value			5,000
Land Value			5,000
Improvements			
Existing Land Area			211
Land Requirement			116
Residual Land Area			95
Unadjusted LV rate per square metre			24
Unadjusted residual land value			2,251
Value of land to be used for road			2,749

Potential Affect of Works

The residual land will be amalgamated with the adjoining property & sold
At this stage we see no benefit in Transit developing this site (along with the amalgamated sites) for disposal
We have used the Current Market Value of this property as the cost of this property to the project

Current Market Value (Assumed to be the actual cost to the project. Please note *)			5,000
Fees			1,000
Total Acquisition Costs	A		6,000
Disposal Revenue			2,251
Disposal Costs			5,000
Net Disposal Revenue	B	-	2,749
Net Acquisition Cost (A-B)			8,749

* Please note that we do note consider the Current Market Value of this site to be the actual cost of this site to TNZ for this project. The actual cost would be its purchase price plus any holdings costs over the time Transit have owned it less any income over that period.
We understand TNZ do not incurr holding costs for this site over its ownership lifetime.

Summary of Basin- OptionJ

An improved site used as a studium

Current Market Value of land to be taken	-	
Land Value	-	
Improvements	-	
Existing Land Area	-	
Land Requirement		705
Average LV rate per square metre		551
Value of land to be used for road		388,455
Potential Affect of Works		
Construction Costs to reinstate carparks, fencing etc		25,000
Disturbance claims		30,000
Fees		20,000
Total Acquisition Costs		567,043
	-	
	-	
	-	
		567,043

Summary of Various (Townscape) - Option J - No.31-34

Modern residential multi unit development on unit titles

Current Market Value	$245,000 per unit	12 units	2,940,000
Land Value	$105,000	12	1,260,000
Improvements			1,680,000
Existing Land Area			-
Land Requirement			**196**
Residual Land Area			
Unadjusted LV rate per square metre			536
Unadjusted residual land value			-
Value of land to be used for road			105,056

Potential Affect of Works

We have assumed that 12 units would need to be acquired
The Land is owned by various owners and has a number of diff rating valns
We have adopted the average rate per square metre by taking 14 typical sites in the area and dividing there square metre rates by 14 to give us an avg rate per square metre

Current Mkt Value		2,940,000
Disturbance claims		200,000
Building Alteration Costs		500,000
Fees		120,000
Total Acquisition Costs	A	3,760,000
Disposal Revenue		-
Disposal Costs@8%		-
Net Disposal Revenue	B	-
Total Acq Cost (A -B)		3,760,000

Appendix H
Preliminary Geotechnical Assessment

Basin Reserve Long Term Improvements

Geotechnical Assessment of 5 Options

1.0 INTRODUCTION

Long term improvements for traffic flow around the Basin Reserve in Wellington are proposed.

A Preliminary Geotechnical Assessment of the site comprising a desk study of existing geological maps of the area and an examination of existing records of previous investigations located around the Basin Reserve was carried out in February 2000. The geology of the area and current knowledge of ground conditions at the site are provided in that report.

This report presents our geotechnical assessment of specific site conditions for five proposed options for the Basin Reserve Improvements. The assessment is based on existing available geotechnical information only.

2.0 SUMMARY OF IMPROVEMENT OPTIONS

The five options proposed can be divided into two categories. The first category includes an at grade intersection with few geotechnical issues, and the second including bridges and cuts requiring significant geotechnical input..

The first category includes options E and F which comprise at grade intersections and require shallow cuts to a maximum height of 2m. The second category includes options H, I and J which comprise a combination of bridge structures with cuts to 4m and embankment fills to 5m.

Improvement options and geotechnical issues are summarised below. The option layouts are shown on the scheme plans. Geotechnical assessment of pavement subgrade is common to all options.

a) Option E comprises a realignment and an at-grade intersection at Buckle/Sussex Streets, and a realignment of Paterson/Dufferin Streets. The geotechnical issues for this option are minor and relate to two low cuts that will require retaining to 2m height, and a pedestrian underpass beneath Paterson Street.

b) Option F is very similar to Option E. It comprises a realignment and an at grade intersection at Buckle/Sussex Streets, and a realignment of Paterson/Dufferin Streets. The geotechnical issues for this option are minor and relate to two low cuts that will require retaining to 2m height, and a pedestrian underpass beneath Paterson Street.

c) Option H comprises a 2 lane bridge passing Buckle Street over Sussex Street, and a 4 lane bridge passing Paterson Street over Dufferin Street. The bridge approach at Buckle Street will include a 2m high fill above a 4.6m deep cut (total 7m retained height) forming its western abutment. The geotechnical issues associated with this option relate to bridge foundations, cut batter slopes and retaining structures, embankment fills and groundwater conditions. Seismic issues include foundation liquefaction potential.

Option H is the preferred option.

d) Option I comprises a 2 lane bridge passing Buckle Street over Sussex Street, a realignment of Paterson Street and a pedestrian underpass beneath Paterson Street. The bridge at Buckle Street will include a cut to 5m beneath it. The geotechnical issues associated with this option relate to bridge foundations, cut slopes, retaining structures to 5m, embankment fills and

groundwater conditions. Seismic issues include foundation liquefaction potential.

e) Option J comprises a 4 lane bridge passing Sussex Street over Buckle Street, a realignment of Patterson Street, and a pedestrian underpass beneath Paterson Street. The bridge at Buckle Street will include a cut to 3.5m beneath it. The geotechnical issues associated with this option relate to bridge foundations, cut slopes, retaining structures to 5m, embankment fills and groundwater conditions. Seismic issues include foundation liquefaction potential.

Details of the five options are described in the following section.

3.0 DETAILED DESCRIPTIONS OF OPTIONS

The following sections describe the geotechnical issues relating to each of the 5 options described above. These sections are somewhat repetitious, however for completeness it is considered necessary to include details of each feature in each section so that each section can stand alone.

3.1 Option E

Option E comprises a realignment and an at grade intersection at Buckle/Sussex streets, a realignment of Paterson/Dufferin Streets and a pedestrian underpass beneath Paterson Street.

Geotechnical issues relate to low (2m maximum height) retaining structures to accommodate the realignments of Paterson/Dufferin and Sussex Streets, and the construction of the pedestrian underpass beneath Paterson Street.

3.1.1 Likely Ground Conditions

3.1.1.1 Paterson/Dufferin Streets Realignment and Pedestrian Underpass

The Paterson/Dufferin Streets realignment will require a shallow (2m maximum) cut across the gentle slope from the flat at the Basin Reserve to the steep slopes of Mt Victoria, and a 6m deep cut and cover pedestrian underpass.

From previous investigations (machine drillhole D11) it appears that the area is underlain by up to 3m of fill. The fill is underlain by medium dense alluvium comprising gravelly, sandy clay. The basement rock was intersected in D11 at 9.5m depth and appears to be sloping steeply to the west deepening to greater than 30m depth beneath Dufferin Street.

Standard Penetration Tests in D11 show N values of 1 and less for the top 3m (fill). This layer is identified as a potentially liquefiable layer. Below 3m SPT N values increase rapidly from 7 at 3m to greater than 50 at 8m depth.

Groundwater levels were measured in D11 from a standpipe piezometer with a tip sealed beneath 7.5m. A water level has been measured in this piezometer approximately 0.5m below ground surface and most likely represents a piezometric pressure at depth and not a static water level in the surrounding ground.

3.1.1.2 Sussex/Buckle Streets Realignment

The Sussex/Buckle Streets realignment will require a shallow (2m max) cut across the gentle slope from Te Aro area down to the valley invert at Cambridge Terrace.

From previous investigations (machine drillhole D4) it appears that the area is underlain by approximately 25m of alluvium comprising medium dense to very dense gravel, silt, sand and clay. The basement rock was intersected in D4 at 27m depth and appears to be sloping gradually to the east deepening to greater than 30m depth beneath Dufferin Street.

Standard Penetration Tests in D4 show N values to be variable between 11and 96 for the upper 11m, below this depth N values vary between 24 and 75, and are greater than 100 within 2m of the basement contact.

Groundwater levels were measured in D4 from a standpipe piezometer with a tip sealed beneath 19m. A water level has been measured in this piezometer approximately 2m below ground surface and most likely represents a piezometric pressure at depth.

3.1.2 Recommended Geotechnical Investigations

Recommended geotechnical investigations for this option are summarised on the following table.

Feature	Inspection Pitting	Machine Drilling
Patterson Street Realignment Retaining Structure	4 x 4m	2 x 10m
Buckle Street Realignment Retaining Structure	4 x 4m	2 x 10m
Paterson Street Pedestrian Underpass		2 x 12m

Machine drilling depths are selected to allow consideration of a number of cut retention options including piled walls.

Existing pavement and subgrade condition will be assessed from pavement pitting and where proposed subgrade is deep inspection pitting. Sampling for laboratory testing (CBR MDD/OMC) will be carried out. DCP will be used to provide insitu strength data.

3.2 *Option F*

Option F comprises a realignment and an at grade intersection at Buckle/Sussex streets, a realignment of Paterson/Dufferin Streets and a pedestrian underpass beneath Paterson Street.

Geotechnical issues relate to low (2m maximum height) retaining structures to accommodate the realignments of Paterson/Dufferin and Sussex Streets, and the construction of the pedestrian underpass beneath Paterson Street.

3.2.1 *Likely Ground Conditions*

3.2.1.1 *Paterson/Dufferin Streets Realignment and Pedestrian Underpass*

The Paterson/Dufferin Streets realignment will require a shallow (2m maximum) cut across the gentle slope from the flat at the Basin Reserve to the steep slopes of Mt Victoria, and a 6m deep cut and cover pedestrian underpass.

From previous investigations (machine drillhole D11) it appears that the area is underlain by up to 3m of fill. The fill is underlain by medium dense alluvium comprising gravelly, sandy clay. The basement rock was intersected in D11 at 9.5m depth and appears to be sloping steeply to the west deepening to greater than 30m depth beneath Dufferin Street.

Standard Penetration Tests in D11 show N values of 1 and less for the top 3m (fill). This layer is identified as a potentially liquefiable layer. Below 3m SPT N values increase rapidly from 7 at 3m to greater than 50 at 8m depth.

Groundwater levels were measured in D11 from a standpipe piezometer with a tip sealed beneath 7.5m. A water level has been measured in this piezometer approximately 0.5m below ground surface and most likely represents a piezometric pressure at depth and not a static water level in the surrounding ground.

3.2.1.2 *Sussex/Buckle Streets Realignment*

The Sussex/Buckle Streets realignment will require a shallow (2m max) cut across the gentle slope from Te Aro area down to the valley invert at Cambridge Terrace.

From previous investigations (machine drillhole D4) it appears that the area is underlain by approximately 25m of alluvium comprising medium dense to very dense gravel, silt, sand and clay. The basement rock was intersected in D4 at 27m depth and appears to be sloping gradually to the east deepening to greater than 30m depth beneath Dufferin Street.

Standard Penetration Tests in D4 show N values to be variable between 11and 96 for the upper 11m, below this depth N values vary between 24 and 75, and are greater than 100 within 2m of the basement contact.

Groundwater levels were measured in D4 from a standpipe piezometer with a tip sealed beneath 19m. A water level has been measured in this piezometer approximately 2m below ground surface and most likely represents a piezometric pressure at depth.

3.2.2 *Recommended Geotechnical Investigations*

Recommended geotechnical investigations for this option are summarised on the following table.

Feature	Inspection Pitting	Machine Drilling
Patterson Street Realignment Retaining Structure	4 x 4m	2 x 10m
Buckle Street Realignment Retaining Structure	4 x 4m	2 x 10m
Paterson Street Pedestrian Underpass		2 x 12m

Machine drilling depths are selected to allow consideration of a number of cut retention options including piled walls.

Existing pavement and subgrade condition will be assessed from pavement pitting and where proposed subgrade is deep inspection pitting. Sampling for laboratory testing (CBR MDD/OMC) will be carried out. DCP will be used to provide insitu strength data.

3.3 Option H

Option H comprises a 2 lane bridge passing Buckle Street across Sussex Street and a 4 lane bridge passing Patterson street across Dufferin Street. The bridge at Buckle Street will include a 2m high fill above a 4.6m cut. The fill and cut form the bridge's western approach, and allows two traffic lanes on Sussex Street to pass beneath the bridge.

The geotechnical issues associated with this option relate to bridge foundations at 2 locations, cut batter stability, retaining structures to 6m, embankment fill foundations and batter/retaining structure design, and groundwater conditions. Seismic issues include foundation liquefaction potential.

3.3.1 General Ground Conditions

Ground and groundwater conditions have been interpreted from the results of previous investigations carried out by others. A preliminary geotechnical assessment of the site was prepared by Worley and reported in February 2000. The documents reviewed for this study are listed in that report and in the references in section 4.0. The locations of the previous investigations are illustrated on Figure 2 of that report.

Previous investigations were related to at-grade and below-grade construction. Machine drill holes in the basin area were to a depth of 30m and revealed a profile along the proposed alignment comprising alluvial materials overlying greywacke basement rock. The contact between greywacke and alluvium slopes down from west to east, at its deepest beneath Dufferin Street, then sloping up steeply toward Mt Victoria. The drill holes encountered the contact along most of the alignment (D11, D3, D4, D102 and B5) but were stopped short of it where it is deepest (D1 and D2).

3.3.2 Patterson Street Bridge Foundation Conditions

Foundations for the Patterson Street bridge structure are likely to be driven or bored piles. Piles may either be socketed into the greywacke basement beneath the alluvium or driven as an end bearing/friction piles terminating at some shallower depth, depending on the magnitude of applied loads. The principal geotechnical issues are:

a) The geotechnical properties and thickness of the alluvium and underlying greywacke with respect to piling.
b) Groundwater conditions.
c) Seismic response of foundation materials

From previous investigations (machine drillhole D1, D2 and D11) it appears that the eastern part of the area is underlain by up to 3m of fill. The fill is underlain by medium dense alluvium comprising gravelly, sandy clay. The basement rock was intersected in D11 at 9.5m depth and appears to be sloping steeply to the west deepening to greater than 30m depth (D1 and D2) beneath Dufferin Street. Previous drillholes did not reach the base of the alluvial materials where the basement contact is deepest (D1 and D2) and provide only a minimum thickness of alluvium (30m).

Standard Penetration Tests in D11 show N values of 1 and less for the top 3m (fill). This layer is identified as a potentially liquefiable layer. Below 3m SPT N values increase rapidly from 7 at 3m to greater than 50 at 8m depth. SPT N values in D1 are 13 to 19 in the upper 6m and between 30 and 60 for the remainder of the hole. In D2 SPT N values are 9 to 12 in

the upper 5m and between 20 and 40 for the remainder of the hole. Near basement all holes have SPT N values greater than 50.

Groundwater levels were measured in D11 from a standpipe piezometer with a tip sealed beneath 7.5m. A water level has been measured in this piezometer approximately 0.5m below ground surface and most likely represents a piezometric pressure at depth and not a static water level in the surrounding ground. In D1 groundwater levels were not measured. In D2 groundwater levels were measured in two standpipe piezometers. The shallow piezometer with its tip sealed below 4m showed a water level 0.6m above ground level, the deeper piezometer with its tip sealed below 15m showed a water level of 3m above ground surface. These water levels most likely represent a pressure head increasing with depth, which is not unexpected for this area.

Potentially liquefiable layers have been identified in the upper 3m of DH11 and in the upper 2m of DH2.

3.3.2.1 Recommended Investigations for Paterson Street Bridge Foundations

Investigations for bridge foundation are recommended to confirm the thickness and geotechnical properties of alluvium beneath Dufferin Street and asses pile embedment depth in the underlying greywacke. Machine drill holes, and where possible Dutch Cone Penetrometer Testing (CPT), will be required to provide ground condition data at specific pier locations. This will require approximately 3 drill holes to 40m depth and 5 CPTs to 30m depth. Standard Penetration Test (SPT) data from drill holes and CPT data will be used together with laboratory test results (Particle Size Distribution (PSD), Atterberg Limits) to determine potential liquefaction characteristics, and provide data for seismic hazard assessment and subsequent site response analyses. The extent of subsurface investigations and laboratory testing recommended are summarised in the following table and scheduled in more detail in the tables in Section 3.3.9 and their locations shown on Figure 1.

Feature	Machine Drilling	CPT	Laboratory Testing
Patterson Street Bridge	3x 40m with SPT and piezometer clusters	5x30m	PSD, Limits, MC%, DTX

3.3.3 Buckle Street Bridge Foundations

Foundations for the Buckle Street bridge structure are likely to be driven or bored piles. Piles may either be socketed into the greywacke basement beneath the alluvium or driven as an end bearing/friction piles terminating at some shallower depth, depending on the magnitude of applied loads. The principal geotechnical issues are:

d) The geotechnical properties and thickness of the alluvium and underlying greywacke with respect to piling.
e) Groundwater conditions.
f) Seismic response of foundation materials

From previous investigations (machine drillholes D4 and DH3) it appears that the area is underlain by approximately between 20m and 30m of alluvium comprising medium dense to very dense gravel, silt, sand and clay. The basement rock was intersected in D4 at 27m depth and appears to be sloping steeply gradually to the east and intersected at 25m depth (DH3) at Cambridge terrace. The elevation of the ground surface falls 8m from DH4 to DH3.

Standard Penetration Tests in D4 show N values vary between 11and 96 for the upper 11m, below this N values vary between 24 and 75, and greater than 100 within 2m of the basement contact. SPT N values in DH3 are between 3 and 9 in the upper 6m then generally increase to greater than 50 below 11m depth.

Groundwater levels were measured in D4 from a standpipe piezometer with a tip sealed beneath 19m. A water level has been measured in this piezometer approximately 2m below ground surface and most likely represents a piezometric pressure at depth and not a static water level in the surrounding ground. Groundwater levels were not measured in DH3.

Potentially liquefiable layers have been identified in the upper 4m of DH4 and in the upper 10m of DH3.

3.3.3.1 Recommended Investigations for Buckle Street Bridge Foundations

Investigations for bridge foundation are recommended to determine geotechnical properties and thickness of the alluvium between existing investigation locations to confirm piling conditions, groundwater conditions and asses pile embedment depth in the underlying greywacke. Machine drill holes and where possible CPTs will be required to provide ground condition data for specific pier locations. This will require a minimum of 2 machine drill holes to approximately 30m depth and 4 CPTs to 30m depth. Standard Penetration Test (SPT) data from drill holes and CPT data will be used together with laboratory test results (PSD and Atterberg Limits) to determine potential liquefaction characteristics, and provide data for seismic hazard assessment and subsequent site response analyses. The extent of subsurface investigations and laboratory testing recommended are summarised in the following table and scheduled in more detail in the tables in Section 3.3.9 and their locations shown on Figure 1.

Feature	Machine Drilling	CPT	Laboratory Testing
Buckle Street Bridge	2x 30m with SPT and piezometer clusters	4x30m	PSD, Limits, MC%, DTX

3.3.4 Bridge Approach Embankment Structures

Low Embankments to maximum height of 3m are proposed at either end of both bridge structures. These embankments will most likely have retained sides although in some cases fill batters may be more appropriate, particularly where space permits and landscaping is required. Geotechnical issues relating to approach embankments are foundation conditions, embankment fill material, fill slope and retaining structure foundations.

Foundation conditions at the proposed embankment locations are indicated from previous investigations and described in the following sections.

3.3.4.1 Buckle Street Bridge Western Approach

At the western end of the project area, foundation conditions for the eastern approach to the Buckle Street bridge are likely to be favorable; groundwater levels are well below the founding level and materials appear to be dense. Pervious investigations (D4) show a thin layer of fill underlain by fine grained materials with SPT N values greater than 10 and generally greater than 20. Fill foundation settlement is expected to be within tolerable limits.

3.3.4.2 Paterson Street Bridge Eastern Approach

Foundation conditions for the eastern approach to the proposed Paterson street bridge will be variable. Previous investigations indicate that in some areas the site is underlain by up to 3m of fill (D11). In this hole SPT N values for the fill were very low (0 to 1). It will be necessary to remove this fill and replace with compacted hardfill. Foundation conditions beneath the proposed compacted hardfill are favorable with SPT N values in drill holes greater than 10. Groundwater levels may be close to foundation levels, in which case drainage will be required. Gravity drainage is available toward Dufferin Street.

3.3.4.3 Buckle Street Bridge Eastern and Paterson Street Western Approach

These approach embankments are to 2m high and will be founded within 5m of mean sea level. Foundation conditions will be variable. In this area recent swamp deposits up to 2m thick with low SPT N values (<10) underlie the fill.

Groundwater levels are expected to be close to ground surface. In D2 groundwater levels were measured in two standpipe piezometers. The shallow piezometer with its tip sealed below 4m showed a water level 0.6m above ground level, the deeper piezometer with its tip sealed below 15m showed a water level of 3m above ground surface. These water levels

most likely represent a piezometric head increasing with depth, which is not unexpected for this area.

It is likely that settlement of embankment foundations may be an issue for these bridge approaches, however foundation treatment such as undercutting and replacement with compacted hard fill will limit embankment foundation settlement within tolerable limits.

3.3.4.4 Recommended Investigations for Bridge Approach Embankments

Investigations will be required to confirm foundation ground and groundwater conditions for approach embankments. It is proposed that 2 inspection pits to 4m depth at each embankment locations are excavated and logged. Hand shear vane tests in pit walls together with DCP tests carried out as pit excavation proceeds will provide foundation strength parameters and identify any requirement for foundation treatment. It is also recommended that machine drill hole (15m) is drilled at each of the two embankment locations near Kent and Cambridge Terraces to confirm groundwater conditions and provide samples for consolidation testing. No consolidation data for the site is available from the previous investigations. It is proposed that samples are collected from embankment foundation locations for consolidation testing during the stage 1 investigations. If required, these samples will be tested during stage 2.

The extent of subsurface investigations recommended are summarised in the following table and scheduled in more detail in the tables in Section 3.3.9 and their locations shown on Figure 1.

Feature	Machine Drilling	Inspection Pit	Laboratory Testing
Patterson Street Bridge Eastern Approach		2 x 4m	CBR
Patterson Street Bridge Western Approach	1x 15m with piezometer cluster	2 x 4m	CBR, Consolidation
Buckle Street Bridge Eastern Approach		2 x 4m	CBR
Buckle Street Bridge Western Approach	1x 15m with piezometer cluster	2 x 4m	CBR, Consolidation

3.3.5 Sussex Street Cut

An underpass comprising a cut to 4.6m is to be located at the western end of the alignment to allow two lanes of traffic on Sussex Street to pass underneath Buckle Street. This cut will be retained to vertical in medium dense to dense alluvial materials near groundwater level. It is proposed that the western approach embankment to the Buckle Street Bridge will be located at the top of this cut resulting in an effective height requiring retaining of 6.6m.

The principal geotechnical issues are the geotechnical properties of the alluvium, groundwater conditions within the cut, the seismic performance of these materials.

From previous investigations (machine drillhole D4) it appears that the area is underlain by approximately between 28m of alluvium comprising medium dense to very dense gravel, silt, sand and clay. Standard Penetration Tests in D4 show N values to be variable between 11and 96 for the upper 11m, below this N values are variable between 24 and 75, and greater than 100 within 2m of the basement contact.

Groundwater levels were measured in D4 from a standpipe piezometer with a tip sealed beneath 19m. Water level has been measured in this piezometer approximately 2m below ground surface and most likely represents a pressure head on groundwater at depth and not a static water level in the surrounding ground. However it is likely that groundwater will be encountered in the proposed 4.6m cut.

Potentially liquefiable layers have been identified in the upper 4m of DH4 and in the upper 10m of DH3.

3.3.5.1 Recommended Investigations for Cuts

Investigations are proposed at proposed cut locations to provide subsurface ground and groundwater information for excavation and retaining structure design. Sub-surface investigations will comprise machine drill holes (15m) with installed piezometers and inspection pitting up to 4m in depth. Insitu strength data will be provided by SPTing in machine drill holes and hand shear vane tests carried out in inspection pits.

Material will be sampled from pits and drill holes for laboratory testing. Testing will provide strength parameters for design of retaining structures (triaxial testing), classification of materials for liquefaction analysis (PSD and limits), and compaction characteristics and strength parameters (CBR, MDD/OWC and insitu density testing) of cut material to determine suitability for use in approach embankment construction.

The extent of subsurface investigations recommended are summarised in the following table and detailed in the schedule in in the tables in Section 3.3.9 and their locations shown on Figure 1.

Feature	Machine Drilling	Inspection Pit	Laboratory Testing
Sussex Street Cut	2 x 20m with piezometer clusters	5 x 4m	CBR, MDD, WC, Density, PSD, Limits, Triaxial

3.3.6 Pavement Subgrade

Pavement subgrade condition is expected to be variable across the site. Results from previous investigations indicate that most of the site is underlain by a variable thickness of fill, at the eastern end of the site up to 3m thick. The condition of this fill is not clear from the reports reviewed, however it is likely that this material will provide a less than satisfactory subgrade and will require treatment. Likely treatment will comprise undercutting the fill to a depth of 0.5m to 1.0m below finished grade and replacement with a subgrade improvement layer.

Previous investigations indicate that subgrade conditions in the base of the Sussex Street cut can be expected to be reasonably good. SPT N values in drill holes are typically greater than 10 indicating equivalent CBR% of greater than 7.

The recommended investigations provide for a more detailed assessment of insitu subgrade conditions.

3.3.6.1 Recommended Investigations for Pavement Foundations

Existing pavement and subgrade condition will be assessed from pavement pitting and where proposed subgrade is deep inspection pitting.

Subgrade conditions in the Sussex Street cut will be investigated using inspection pits and machine drill holes that are otherwise scheduled for the investigation of that cut.

Sampling for laboratory testing (CBR MDD/OMC) will be carried out. DCP and SPT will be used to provide insitu strength data.

Recommended pavement subgrade investigations are summarised on the following table and detailed in the schedule in the tables in Section 3.3.9 and their locations shown on Figure 1.

Feature	Machine Drilling	Pavement Pit	Inspection Pit	Laboratory Testing
At Grade Sections		10		CBR
Sussex Street Cut Subgrade	SPT testing in Drillholes for Sussex Street Cut	2	DCP Testing in Inspection pits for Sussex Street Cut	CBR, MDD, MC, Density

3.3.7 Seismic Hazard General

It is assumed at this stage that the Wellington fault, located approximately 2.5km from the project area, will influence project design. This fault has a return period of 600 years. It is proposed that the seismic hazard will be based on a deterministic assessment of the Wellington fault as the controlling seismic source rather than a probabilistic analysis that considers all possible sources.

The presence of alluvium of variable depth over the length of the bridge structure will effect ground motions and will require assessment for final design.

3.3.7.1 Recommendations for Seismic Hazard Evaluation and Seismic Design Parameter Determination

It is recommended that a staged approach to assessing the seismic hazard is made. The first stage will result in the quantification of seismic hazard in terms of acceleration response spectra for the range of site-soil conditions that exist on site.

The second stage will be required for final design and will depend on the design methodology and the type of structure adopted. In this stage site response analyses and selection of time histories may be necessary. Quantification of likely out of phase ground motions over the extent of the structure may also be necessary.

Dynamic analysis of founding material (dynamic triaxial testing) may be required to provide parameters for dynamic modelling for bridge design. An allowance for two tests has been made for stage 2 investigation. Sampling for these tests will be carried out during stage 1.

3.3.8 Preliminary Design Recommendations

Buckle Street Abutments

Bored Piles		Driven Piles			Retaining Walls						Slopes	
					Foundation			Backfill				
Ultimate Bearing Capacity (MPa)	Length * (m)	Ultimate Bearing Capacity (MPa)	Ultimate Skin Friction (kPa/m^2)	Length ** (m)	γ_b (kN/m^3)	c' (kPa)	ϕ' (°)	γ_b (kN/m^3)	c' (kPa)	ϕ' (°)	Cut***	Fill
16	Varies , up to 30m	5	30	Varies , up to 25m	18	0	25	18	0	30	1V : 2H	1V : 2H

Notes:
* From existing ground level to 2m embedment into greywacke
** For 6m embedment in 'peri-glacial' deposits
*** Cut slopes less than 3m high
**** Assume groundwater level is at the surface for scheme design
***** Geotechnical strength reduction factor = 0.5

Patterson Street Abutments

Bored Piles		Driven Piles			Retaining Walls						Slopes	
					Foundation			Backfill				
Ultimate Bearing Capacity (MPa)	Length * (m)	Ultimate Bearing Capacity (MPa)	Ultimate Skin Friction (kPa/m^2)	Length ** (m)	γ_b (kN/m^3)	c' (kPa)	ϕ' (°)	γ_b (kN/m^3)	c' (kPa)	ϕ' (°)	Cut***	Fill
16	Varies , up to 40m	8	50	Varies , up to 15m	18	0	30	18	0	30	1V : 2H	1V : 2H

Notes:
* From existing ground level to 2m embedment into greywacke
** For 6m embedment in 'peri-glacial' deposits
*** Cut slopes less than 3m high
**** Assume groundwater level is at the surface for scheme design
***** Geotechnical strength reduction factor = 0.5

3.3.9 Recommendations for Further Investigations

Previous investigations at the project location were carried out for the proposed "Tunnel Link" between the Terrace and Mt Victoria Tunnels in the early 1990s. The majority of that proposed route was below grade. Consequently the investigations concentrated on geotechnical issues relating to at-grade and below-grade construction.

Investigations are proposed for option 3 to provide geological, geotechnical, groundwater and seismic data sufficient for design of the project. The proposed investigations have been separated into two stages. Stage 1 investigations are intended to be sufficient for design of the project provided that ground conditions are similar to those interpreted from the results of previous investigations and illustrated on Figure 2. If ground conditions are significantly different from those indicated, or structure element locations are changed after stage 1 investigations are complete further investigations will be required. These are detailed in the table below as stage 2 investigations and are intended as a contingency.

Description	Stage 1 Investigations															
	Field							Lab								
	FP/HA	HA/DCP	IP	CPT		DH		CBR	PSD	MCC/OWC	Lim's	MC	Con sol	TX	UCS	DTX
	#	#	#	#	Each m	#	Each m	#	#	#	#	#	#	#	#	#
Sussex Street Cut to 4.5m	2		5			2	20	7	4	4	4	10		3		
Buckle Street Bridge				4	30	2	30		15		15	20				
Paterson Street Bridge				5	30	3	40		15		15	20				
Dufferin Street Realignment			3													
At Grade Pavement	10							10								
Approach Embankments to 3m			8			2	15		2	2	2	4	6			
Alternative Borrow Materials								5		5						
Total	**12**	**0**	**16**	**9**	**270**	**9**	**250**	**22**	**36**	**11**	**36**	**54**	**6**	**3**	**0**	**0**
	Stage 2 Investigations															
Sussex Street Cut to 4.5m			2			1	15	2		2	1			1		
Buckle Street Bridge				2	30	1	30		8		8	16		1		1
Paterson Street Bridge				2	30	1	40		10		10	20		1		1
Dufferin Street Realignment																
At Grade Pavement	4							4								
Approach Embankments to 3m			4										2	1		
Alternative Borrow Materials								2		2						
Total	**4**	**0**	**6**	**4**	**120**	**3**	**85**	**8**	**18**	**4**	**19**	**36**	**2**	**4**	**0**	**2**

3.4 Option I

Option I comprises a 2 lane bridge passing Buckle Street over Sussex Street, and a realignment of Paterson/Dufferin Streets and a pedestrian underpass beneath Paterson Street. The bridge at Buckle Street will include a combined cut to 5m with fill above it to 2m (total 7m retained height) forming its western abutment and allowing 4 traffic lanes on Sussex Street to pass beneath it.

The geotechnical issues associated with this option relate to bridge foundations at 1 location, cut batter stability, retaining structures to 6m, embankment fill foundations and batter/retaining structure design, and groundwater conditions. Seismic issues include foundation liquefaction potential.

3.4.1 General Ground Conditions

Previous investigations were related to at-grade and below-grade construction. Machine drill holes in the basin area were to a depth of 30m and revealed a profile along the proposed alignment comprising alluvial materials overlying greywacke basement rock. The contact between greywacke and alluvium slopes down from west to east, at its deepest beneath Dufferin Street, then sloping up steeply toward Mt Victoria. The drill holes encountered the contact along most of the alignment (D11, D3, D4, D102 and B5) but were stopped short of it where it is deepest (D1 and D2)

3.4.2 Paterson/Dufferin Streets Realignment and Pedestrian Underpass

The Paterson/Dufferin Streets realignment will require a shallow (2m max) cut across the gentle slope from the flat at the Basin Reserve to the steep slopes of Mt Victoria, and a 6m deep cut and cover constructed pedestrian underpass.

From previous investigations (machine drillhole D11) it appears that the area is underlain by up to 3m of fill. The fill is underlain by medium dense alluvium comprising gravelly, sandy clay. The basement rock was intersected in D11 at 9.5m depth and appears to be sloping steeply to the west deepening to greater than 30m depth beneath Dufferin Street.

Standard Penetration Tests in D11 show N values of 1 and less for the top 3m (fill), this layer flagged as a potentially liquefiable layer. Below 3m SPT N values increase rapidly from 7 at 3m to greater than 50 at 8m.

Groundwater levels were measured in D11 from a standpipe piezometer with a tip sealed beneath 7.5m. Water level has been measured in this piezometer approximately 0.5m below ground surface and most likely represents a pressure head on groundwater at depth and not a static water level in the surrounding ground.

3.4.3 Buckle Street Bridge Foundations

Foundations for the Buckle Street bridge structure are likely to be driven or bored piles. Piles may either be socketed into the greywacke basement beneath the alluvium or driven as an end bearing/friction piles terminating at some shallower depth, depending on the magnitude of applied loads. The principal geotechnical issues are:

g) The geotechnical properties and thickness of the alluvium and underlying greywacke with respect to piling.
h) Groundwater conditions.
i) Seismic response of foundation materials

From previous investigations (machine drillholes D4 and DH3) it appears that the area is underlain by approximately between 20m and 30m of alluvium comprising medium dense to very dense gravel, silt, sand and clay. The basement rock was intersected in D4 at 27m depth and appears to be sloping steeply gradually to the east and intersected at 25m depth (DH3) at Cambridge terrace. The elevation of the ground surface falls 8m from DH4 to DH3.

Standard Penetration Tests in D4 show N values vary between 11and 96 for the upper 11m, below this N values vary between 24 and 75, and greater than 100 within 2m of the basement contact. SPT N values in DH3 are between 3 and 9 in the upper 6m then generally increase to greater than 50 below 11m depth.

Groundwater levels were measured in D4 from a standpipe piezometer with a tip sealed beneath 19m. A water level has been measured in this piezometer approximately 2m below ground surface and most likely represents a piezometric pressure at depth and not a static water level in the surrounding ground. Groundwater levels were not measured in DH3.

Potentially liquefiable layers have been identified in the upper 4m of DH4 and in the upper 10m of DH3.

3.4.4 Bridge Approach Embankment Structures

Low Embankments to maximum height of 3m are proposed at either end of the bridge structure. These embankments will most likely have retained sides although in some cases fill batters may be more appropriate, particularly where space permits and landscaping is required. Geotechnical issues relating to approach embankments are foundation conditions, fill batter design, retaining structure design and embankment fill material properties.

Foundation conditions for the eastern approach to the Buckle Street Bridge are likely to be favorable, groundwater levels are well below the founding level and materials appear to be dense. Pervious investigations (D4) show a thin layer of fill underlain by fine grained materials with SPT N values greater than 10 and generally greater than 20. Groundwater levels will be well below the foundation level. Fill foundation settlement is expected to be within tolerable limits.

The western approach embankment will be founded within 5m of mean sea level. Foundation conditions will be variable. In this area recent swamp deposits up to 2m thick with low SPT N values (<10) underlie the fill. Groundwater levels are expected to be close to the surface. In D2 groundwater levels were measured in two standpipe piezometers. The shallow piezometer with its tip sealed below 4m showed a water level 0.6m above ground level, the deeper piezometer with its tip sealed below 15m showed a water level of 3m above ground surface. These water levels most likely represent a pressure head increasing with depth, which is not unexpected for this area.

It is likely that settlement of embankment foundations may be an issue for these bridge approaches, however foundation treatment such as undercutting and replacement with compacted hard fill will limit embankment foundation settlement within tolerable limits.

3.4.5 Sussex Street Cut

An underpass comprising a cut to 4.6m is to be located at the western end of the alignment to allow two lanes of traffic on Sussex Street to pass underneath Buckle Street. This cut will be retained to vertical in medium dense to dense alluvial materials near groundwater level. It is proposed that the western approach embankment to the Buckle Street Bridge will be located at the top of this cut resulting in an effective height requiring retaining of 6.6m.

The principal geotechnical issues are the geotechnical properties of the alluvium, groundwater conditions within the cut, the seismic performance of these materials.

From previous investigations (machine drillhole D4) it appears that the area is underlain by approximately between 28m of alluvium comprising medium dense to very dense gravel, silt, sand and clay. Standard Penetration Tests in D4 show N values to be variable between 11and 96 for the upper 11m, below this N values are variable between 24 and 75, and greater than 100 within 2m of the basement contact.

Groundwater levels were measured in D4 from a standpipe piezometer with a tip sealed beneath 19m. Water level has been measured in this piezometer approximately 2m below ground surface and most likely represents a pressure head on groundwater at depth and not

a static water level in the surrounding ground. However it is likely that groundwater will be encountered in the proposed 4.6m cut.

Potentially liquefiable layers have been identified in the upper 4m of DH4 and in the upper 10m of DH3.

3.4.6 Pavement Subgrade

Pavement subgrade condition is expected to be variable across the site. Results from previous investigations indicate that most of the site is underlain by a variable thickness of fill, at the eastern end of the site up to 3m thick. The condition of this fill is not clear from the reports reviewed, however it is likely that this material will provide a less than satisfactory subgrade and will require treatment. Likely treatment will comprise undercutting the fill to a depth of 0.5m to 1.0m below finished grade and replacement with a subgrade improvement layer.

Previous investigations indicate that subgrade conditions in the base of the Sussex Street cut can be expected to be reasonably good. SPT N values in drill holes are typically greater than 10 indicating equivalent CBR% of greater than 7.

3.4.7 Seismic Hazard

It is assumed at this stage that the Wellington fault, located approximately 2.5km from the project area, will influence project design. This fault has a return period of 600 years. It is proposed that the seismic hazard will be based on a deterministic assessment of the Wellington fault as the controlling seismic source rather than a probabilistic analysis that considers all possible sources.

The presence of alluvium of variable depth over the length of the bridge structure will effect ground motions and will require assessment for final design.

3.4.8 Recommended Geotechnical Investigations

Recommended geotechnical investigations for this option are summarised on the following table.

Feature	Machine Drilling	CPT	Inspection Pit	Pavement Pit
Patterson Street Realignment Retaining Structure	2 x 10m		4 x 4m	
Paterson Street Pedestrian Underpass	2 x 12m			
Sussex Street Cut	2 x 20m		5 x 4m	
Buckle Street Bridge Approachs	1 x 10m		4 x 4m	
Buckle Street Bridge	3 x 30m	4 x 30m		
Subgrade for at Grade Sections				10
Sussex Street Cut Subgrade	SPT testing in DHs for Cut		DCP in IPs for Cut	

3.4.8.1 *Recommendations for Seismic Hazard Evaluation and Seismic Design Parameter Determination*

It is recommended that a staged approach to assessing the seismic hazard is made. The first stage will result in the quantification of seismic hazard in terms of acceleration response spectra for the range of site-soil conditions that exist on site.

The second stage will be required for final design and will depend on the design methodology and the type of structure adopted. In this stage site response analyses and selection of time histories may be necessary. Quantification of likely out of phase ground motions over the extent of the structure may also be necessary.

Dynamic analysis of founding material (dynamic triaxial testing) may be required to provide parameters for dynamic modelling for bridge design. An allowance for two tests has been made for stage 2 investigation. Sampling for these tests will be carried out during stage 1.

3.5 *Option J*

Option J comprises a 4 lane bridge passing Sussex Street over Buckle Street, and a realignment of Paterson/Dufferin Streets and a pedestrian underpass beneath Paterson Street. The bridge at Sussex will include a cut to 3.6m to allow 2 traffic lanes on Buckle street to pass beneath it.

The geotechnical issues associated with this option relate to bridge foundations at 1 location, cut batter stability, retaining structures to 4m, embankment fill foundations and batter/retaining structure design, and groundwater conditions. Seismic issues include foundation liquefaction potential.

3.5.1 *General Ground Conditions*

Previous investigations were related to at-grade and below-grade construction. Machine drill holes in the basin area were to a depth of 30m and revealed a profile along the proposed alignment comprising alluvial materials overlying greywacke basement rock. The contact between greywacke and alluvium slopes down from west to east, at its deepest beneath Dufferin Street, then sloping up steeply toward Mt Victoria. The drill holes encountered the contact along most of the alignment (D11, D3, D4, D102 and B5) but were stopped short of it where it is deepest (D1 and D2)

3.5.2 *Paterson/Dufferin Streets Realignment and Pedestrian Underpass*

The Paterson/Dufferin Streets realignment will require a shallow (2m maximum) cut across the gentle slope from the flat at the Basin Reserve to the steep slopes of Mt Victoria, and a 6m deep cut and cover pedestrian underpass.

From previous investigations (machine drillhole D11) it appears that the area is underlain by up to 3m of fill. The fill is underlain by medium dense alluvium comprising gravelly, sandy clay. The basement rock was intersected in D11 at 9.5m depth and appears to be sloping steeply to the west deepening to greater than 30m depth beneath Dufferin Street.

Standard Penetration Tests in D11 show N values of 1 and less for the top 3m (fill). This layer is identified as a potentially liquefiable layer. Below 3m SPT N values increase rapidly from 7 at 3m to greater than 50 at 8m depth.

Groundwater levels were measured in D11 from a standpipe piezometer with a tip sealed beneath 7.5m. A water level has been measured in this piezometer approximately 0.5m below ground surface and most likely represents a piezometric pressure at depth and not a static water level in the surrounding ground.

3.5.3 *Sussex Street Bridge Foundations*

Foundations for the Sussex Street bridge structure are likely to be driven or bored piles. Piles may either be socketed into the greywacke basement beneath the alluvium or driven as an end bearing/friction piles terminating at some shallower depth, depending on the magnitude of applied loads. The principal geotechnical issues are:

j) The geotechnical properties and thickness of the alluvium and underlying greywacke with respect to piling.
k) Groundwater conditions.
l) Seismic response of foundation materials

From previous investigations (machine drillholes D4 and DH3) it appears that the area is underlain by approximately between 20m and 30m of alluvium comprising medium dense to very dense gravel, silt, sand and clay. The basement rock was intersected in D4 at 27m depth and appears to be sloping steeply gradually to the east and intersected at 25m depth (DH3) at Cambridge terrace. The elevation of the ground surface falls 8m from DH4 to DH3.

Standard Penetration Tests in D4 show N values vary between 11and 96 for the upper 11m, below this N values vary between 24 and 75, and greater than 100 within 2m of the basement contact. SPT N values in DH3 are between 3 and 9 in the upper 6m then generally increase to greater than 50 below 11m depth.

Groundwater levels were measured in D4 from a standpipe piezometer with a tip sealed beneath 19m. A water level has been measured in this piezometer approximately 2m below ground surface and most likely represents a piezometric pressure at depth and not a static water level in the surrounding ground. Groundwater levels were not measured in DH3.

Potentially liquefiable layers have been identified in the upper 4m of DH4 and in the upper 10m of DH3.

3.5.4 Bridge Approach Embankment Structures

Low Embankments to maximum height of 3m are proposed at either end of the bridge structure. These embankments will most likely have retained sides although in some cases fill batters may be more appropriate, particularly where space permits and landscaping is required. Geotechnical issues relating to approach embankments are foundation conditions, fill slope design, retaining structure design and embankment fill material properties.

Foundation conditions for the southern approach to the Sussex Street Bridge are likely to be favorable, groundwater levels are well below the founding level and materials appear to be dense. Pervious investigations (D4) show a thin layer of fill underlain by fine grained materials with SPT N values greater than 10 and generally greater than 20. Groundwater levels will be well below the foundation level. Settlement of the foundation is likely to be within tolerable limits.

The northern approach embankment will be founded within 5m of mean sea level. Foundation conditions will be variable. In this area recent swamp deposits up to 2m thick with low SPT N values (<10) underlie 1m – 2m of fill. Groundwater levels are expected to be close to the surface. In D2 groundwater levels were measured in two standpipe piezometers. The shallow piezometer with its tip sealed below 4m showed a water level 0.6m above ground level, the deeper piezometer with its tip sealed below 15m showed a water level of 3m above ground surface. These water levels most likely represent a pressure head increasing with depth, which is not unexpected for this area.

It is likely that settlement of embankment foundations may be an issue for the northern bridge approach.

3.5.5 Buckle Street Cut

An underpass comprising a cut to 3.6m is to be located at the western end of the alignment to allow 2 lanes of traffic on Buckle Street to pass underneath Sussex Street. This cut will be retained to vertical in medium dense to dense alluvial materials near groundwater level

The principal geotechnical issues are the geotechnical properties of the alluvium, groundwater conditions within the cut, and the effects of seismic events on these materials.

From previous investigations (machine drillhole D4) it appears that the area is underlain by approximately between 28m of alluvium comprising medium dense to very dense gravel, silt, sand and clay. Standard Penetration Tests in D4 show N values to be variable between 11and 96 for the upper 11m, below this N values are variable between 24 and 75, and greater than 100 within 2m of the basement contact.

Groundwater levels were measured in D4 from a standpipe piezometer with a tip sealed beneath 19m. Water level has been measured in this piezometer approximately 2m below ground surface and most likely represents a pressure head on groundwater at depth and not a static water level in the surrounding ground. However it is likely that groundwater will be encountered in the proposed 4.6m cut.

Potentially liquefiable layers have been identified in the upper 4m of DH4 and in the upper 10m of DH3.

3.5.6 Pavement Subgrade

Pavement subgrade condition is expected to be variable across the site. Results from previous investigations indicate that most of the site is underlain by a variable thickness of fill, at the eastern end of the site up to 3m thick. The condition of this fill is not clear from the reports reviewed, however it is likely that this material will provide a less than satisfactory subgrade and will require treatment. Likely treatment will comprise undercutting the fill to a depth of 0.5m to 1.0m below finished grade and replacement with a subgrade improvement layer.

Previous investigations indicate that subgrade conditions in the base of the Buckle Street cut can be expected to be reasonably good. SPT N values in drill holes are typically greater than 10 indicating equivalent CBR% of greater than 7.

3.5.7 Seismic Hazard

It is assumed at this stage that the Wellington fault, located approximately 2.5km from the project area, will influence project design. This fault has a return period of 600 years. It is proposed that the seismic hazard will be based on a deterministic assessment of the Wellington fault as the controlling seismic source rather than a probabilistic analysis that considers all possible sources.

The presence of alluvium of variable depth over the length of the bridge structure will effect ground motions and will require assessment for final design.

3.5.8 Recommended Geotechnical Investigations

Recommended geotechnical investigations for this option are summarised on the following table.

Feature	Machine Drilling	CPT	Inspection Pit	Pavement Pit
Patterson Street Realignment Retaining Structure	2 x 6m		4 x 4m	
Paterson Street Pedestrian Underpass	2 x 8m			
Buckle Street Cut	2 x 15m		4 x 4m	
Sussex Street Bridge Approaches	1 x 8m		4 x 4m	
Sussex Street Bridge	4 x 30m	4 x 30m		
Subgrade for at Grade Sections				10
Buckle Street Cut	SPT testing in		DCP in IPs	

3.5.8.1 *Recommendations for Seismic Hazard Evaluation and Seismic Design Parameter Determination*

It is recommended that a staged approach to assessing the seismic hazard is made. The first stage will result in the quantification of seismic hazard in terms of acceleration response spectra for the range of site-soil conditions that exist on site.

The second stage will be required for final design and will depend on the design methodology and the type of structure adopted. In this stage site response analyses and selection of time histories may be necessary. Quantification of likely out of phase ground motions over the extent of the structure may also be necessary.

Dynamic analysis of founding material (dynamic triaxial testing) may be required to provide parameters for dynamic modelling for bridge design. An allowance for two tests has been made for stage 2 investigation. Sampling for these tests will be carried out during stage 1.

4.0 LIMITATION

This report is an assessment of geological conditions in the project area and is based on a review of existing available published and unpublished data form investigations and studies carried out by others only. Inferences about the nature and continuity of ground conditions are made but cannot be guaranteed.

The report has been prepared for the particular project described in the brief to Worley Consultants Limited and no responsibility is accepted for the use of any part of this report in any other or for any other purpose. .

5.0 REFERENCES

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Appendix I
PEM Worksheets & Economic Analysis

PROJECT APPRAISAL SUMMARY SHEET - Preliminary Economic Analysis of the Options

BCR Cut Off = 3.0

Project:- BASIN RESERVE LONG TERM TRAFFIC SOLUTIONS

Calculated by : P M Stewart

Dated : Nov-00

4 Lane Options

Option 1:	Option E	Patterson Buckle Link, Sussex Route, Double Intersection
Option 2:	Option F	Patterson Buckle Link, Sussex Route, Combined Intersections
Option 3:	Option H	Patterson Buckle Link, Dufferin/Sussex Route, Twin Overpass
Option 4:	Option I	Patterson Buckle Link, Sussex Route, Overpass and Intersection

BENEFIT CALCULATIONS

	Do Minimum	Option 1	Option 2	Option 3	Option 4
3 TTS, VOC & F Costs	$ 95,498,010	$ 66,141,911	$ 66,148,301	$ 48,017,681	$ 54,210,163
4 Accident Costs	$ 9,176,171	$ 2,752,851	$ 2,752,851	$ 2,939,822	$ 3,393,007

Net Benefit of the Option

Option 1	Option 2	Option 3	Option 4
$ 29,356,099	$ 29,349,709	$ 47,480,330	$ 41,287,847
$ 6,423,320	$ 6,423,320	$ 6,236,350	$ 5,783,164
$ 35,779,419	$ 35,773,029	$ 53,716,679	$ 47,071,012

COST CALCULATIONS

1 Capital Costs	-$ 6,054,980	$ 1,292,153	$ 2,187,640	$ 5,692,929	$ 12,132,173
2 Maintenance Costs	$ 297,562	$ 377,054	$ 337,405	$ 284,438	$ 369,921
TOTAL COSTS	-$ 5,757,418	$ 1,669,207	$ 2,525,045	$ 5,977,366	$ 12,502,094

Net Costs of the Option

	Option 1	Option 2	Option 3	Option 4
	$ 7,347,133	$ 8,242,620	$ 11,747,909	$ 18,187,153
	$ 79,492	$ 39,843	-$ 13,124	$ 72,360
	$ 7,426,625	$ 8,282,464	$ 11,734,785	$ 18,259,513
BENEFIT/COST RATIO	4.8	4.3	4.6	2.6
Ranking (by increasing cost)	1	2	3	4

INCREMENTAL B/C

BASE OPTION FOR COMPARISON			NEXT HIGHEST COST OPTION			INCREMENTAL ANALYSIS			Incremental Cut Off = 3.0
OPTION	TOTAL COST	TOTAL BENEFITS	OPTION	TOTAL COST	TOTAL BENEFITS	INCRTL COSTS	INCRTL BENEFIT	INCRTL B/C	
1	$ 7,426,625	$ 35,779,419	2	$ 8,282,464	$ 35,773,029	$ 855,838	-$ 6,390	0.0	< cut off. Base option for comparison remains.
1	$ 7,426,625	$ 35,779,419	3	$ 11,734,785	$ 53,716,679	$ 4,308,160	$ 17,937,260	4.2	=> cut off. New base option for comparison.
3	$ 11,734,785	$ 53,716,679	4	$ 18,259,513	$ 47,071,012	$ 6,524,728	-$ 6,645,667	-1.0	< cut off. Base option preferred.

FIRST YEAR RATE OF RETURN

Preferred Project Option:	3
Present Value of Net Costs:	$ 11,734,785
Mid Point of First Year of Benefits:	2.50
SPPWF for First Year of Benefits:	0.7880

	Annual Benefits	Growth Rate	PV of Benefits in First Year
VOC Savings	$ 1,114,645	0.02	$ 922,257
Time Savings	$ 2,510,441	0.02	$ 2,077,139
Accident Savings	$ 588,924	0.01	$ 475,674
		Total =	$ 3,475,070
FIRST YEAR RATE OF RETURN			30%

PROJECT APPRAISAL SUMMARY SHEET - Preliminary Economic Analysis of the Options

BCR Cut Off = 4.0

Project:- BASIN RESERVE LONG TERM TRAFFIC SOLUTIONS

Calculated by : P M Stewart

Dated : Nov-00

Options

Option 1: J Patterson Buckle Link, Sussex Route, Underpass and Intersection

Option 2:

Option 3:

Option 4:

BENEFIT CALCULATIONS

	Do Minimum	Option 1	Option 2	Option 3	Option 4	Net Benefit of the Option: Option 1	Option 2	Option 3	Option 4
3 TTS, VOC & F Costs	$ 95,498,010	$ 51,973,860				$ 43,524,151			
4 Accident Costs	$ 9,176,171	$ 3,393,007				$ 5,783,164			
						$ 49,307,315			

COST CALCULATIONS

						Net Costs of the Option:			
1 Capital Costs	-$ 6,054,980	$ 13,131,786				$ 19,186,766			
2 Maintenance Costs	$ 297,562	$ 390,341				$ 92,779			
TOTAL COSTS	-$ 5,757,418	$ 13,522,128				$ 19,279,546			
					BENEFIT/COST RATIO	2.6			
					Ranking (by increasing cost)				

INCREMENTAL B/C

BASE OPTION FOR COMPARISON			NEXT HIGHEST COST OPTION			INCREMENTAL ANALYSIS			Incremental Cut Off = 4.0
OPTION	TOTAL COST	TOTAL BENEFITS	OPTION	TOTAL COST	TOTAL BENEFITS	INCRTL COSTS	INCRTL BENEFIT	INCRTL B/C	
3 on other worksheet	$ 11,734,785	$ 53,716,679	1 on this worksheet	$ 19,279,546	$ 49,307,315	$ 7,544,761	-$ 4,409,364	-0.6	< cut off. Base option for comparison remains.
									< cut off. Base option for comparison remains.
									< cut off. Base option preferred.

FIRST YEAR RATE OF RETURN see other worksheet

Preferred Project Option:

Present Value of Net Costs:

Mid Point of First Year of Benefits:

SPPWF for First Year of Benefits:

Annual Benefits	Growth Rate	PV of Benefits in First Year
	Total =	
FIRST YEAR RATE OF RETURN		

Discounted Costs for BCR Calculations

year beg 1 July	time	disc factor	Do Min				E				F				H				I				J			
			TTC	VOC	Accidents	CO2	TTC	VOC	Accidents	CO2	TTC	VOC	Accidents	CO2	TTC	VOC	Accidents	CO2	TTC	VOC	Accidents	CO2	TTC	VOC	Accidents	CO2
2000	0	1.0000																								
2001	1	0.9091																								
2002	2	0.8264	$4,980,049	$2,811,464	$898,544	$140,573	$3,517,269	$2,121,118	$250,963	$105,056	$3,076,573	$2,021,221	$258,063	$101,091	$2,479,606	$1,696,820	$277,620	$84,641	$2,875,188	$1,829,165	$341,515	$91,458	$2,746,854	$1,761,174	$320,416	$88,058
2003	3	0.7513	$4,763,021	$2,628,512	$795,490	$131,428	$3,270,033	$1,967,918	$238,647	$96,386	$3,413,066	$1,872,974	$238,647	$93,629	$2,297,539	$1,572,228	$254,658	$78,611	$2,665,864	$1,695,699	$313,512	$84,785	$2,547,008	$1,632,951	$294,143	$81,648
2004	4	0.6830	$4,536,030	$2,455,588	$730,184	$122,779	$3,040,301	$1,825,039	$219,058	$91,252	$3,167,912	$1,734,249	$219,058	$86,712	$2,126,081	$1,456,286	$233,636	$72,813	$2,470,629	$1,571,342	$287,778	$78,569	$2,362,713	$1,513,468	$269,899	$75,674
2005	5	0.6209	$4,310,946	$2,292,361	$670,196	$114,619	$2,824,970	$1,691,676	$201,059	$84,584	$2,939,123	$1,605,586	$201,059	$80,280	$1,970,445	$1,348,394	$214,714	$67,420	$2,289,223	$1,455,654	$264,132	$72,783	$2,187,241	$1,402,245	$247,813	$70,112
2006	6	0.5645	$4,004,553	$2,119,174	$615,071	$105,658	$2,623,950	$1,567,604	$184,521	$78,380	$2,725,714	$1,486,845	$184,521	$74,332	$1,823,883	$1,248,101	$197,054	$62,405	$2,119,689	$1,347,660	$242,407	$67,384	$2,025,811	$1,298,121	$227,431	$64,966
2007	7	0.5132	$3,718,240	$1,958,514	$564,431	$97,926	$2,440,099	$1,451,945	$169,329	$72,597	$2,526,817	$1,376,051	$169,329	$68,803	$1,687,884	$1,154,996	$180,830	$57,745	$1,962,080	$1,247,307	$222,449	$62,365	$1,876,291	$1,201,339	$209,706	$60,057
2008	8	0.4665	$3,450,488	$1,809,551	$517,914	$90,478	$2,266,338	$1,344,359	$155,374	$67,218	$2,341,558	$1,273,279	$155,374	$63,664	$1,561,175	$1,068,327	$165,927	$53,416	$1,816,573	$1,154,048	$204,116	$57,702	$1,735,562	$1,111,425	$191,506	$55,571
2009	9	0.4241	$3,201,417	$1,671,486	$475,191	$83,574	$2,104,003	$1,244,335	$142,557	$62,217	$2,169,098	$1,177,820	$142,557	$58,891	$1,443,720	$987,851	$152,240	$49,393	$1,679,505	$1,067,433	$187,278	$53,372	$1,605,740	$1,027,931	$175,708	$51,397
2010	10	0.3855	$2,958,784	$1,543,569	$435,855	$77,178	$1,952,453	$1,151,366	$130,766	$57,569	$2,008,640	$1,089,194	$130,766	$54,460	$1,334,718	$913,380	$139,659	$45,668	$1,553,172	$987,031	$171,816	$49,352	$1,485,179	$950,433	$161,200	$47,523
2011	11	0.3505	$2,775,193	$1,426,778	$399,828	$71,339	$1,818,117	$1,065,837	$119,976	$53,297	$1,862,099	$1,007,379	$119,976	$50,379	$1,233,603	$844,169	$128,126	$42,208	$1,435,138	$912,425	$157,615	$45,621	$1,373,297	$878,530	$147,878	$43,926
2012	12	0.3186	$2,562,264	$1,318,465	$368,844	$65,923	$1,688,433	$966,508	$110,053	$49,325	$1,725,598	$931,801	$110,053	$46,590	$1,139,842	$780,005	$117,528	$39,000	$1,327,547	$843,227	$144,578	$42,161	$1,269,428	$811,845	$135,648	$40,582
2013	13	0.2897	$2,419,980	$1,218,054	$338,472	$60,903	$1,568,655	$912,712	$100,942	$45,636	$1,598,625	$861,474	$100,942	$43,074	$1,052,933	$720,532	$107,786	$36,027	$1,226,931	$779,059	$132,606	$38,953	$1,173,120	$750,024	$124,418	$37,501
2014	14	0.2633	$2,257,015	$1,125,003	$308,591	$56,250	$1,457,247	$844,180	$92,577	$42,209	$1,480,298	$796,233	$92,577	$39,812	$972,408	$665,426	$98,885	$33,271	$1,133,450	$719,608	$121,619	$35,980	$1,083,832	$692,734	$114,105	$34,637
2015	15	0.2394	$2,103,845	$1,038,803	$282,998	$51,940	$1,352,842	$780,668	$84,899	$39,028	$1,370,353	$735,735	$84,899	$36,787	$897,818	$614,345	$90,866	$30,719	$1,046,918	$664,519	$111,633	$33,226	$1,001,082	$639,682	$104,642	$31,983
2016	16	0.2176	$1,933,632	$956,848	$259,508	$47,842	$1,249,104	$719,817	$77,852	$35,991	$1,268,731	$679,439	$77,852	$33,972	$828,755	$567,125	$83,140	$28,356	$966,985	$613,456	$102,275	$30,673	$924,638	$590,558	$95,956	$29,528
2017	17	0.1978	$1,776,887	$881,206	$237,850	$44,060	$1,153,013	$663,683	$71,385	$33,143	$1,174,261	$627,296	$71,345	$31,365	$764,829	$523,380	$76,233	$26,169	$892,497	$566,185	$93,778	$28,309	$853,620	$545,085	$87,985	$27,255
2018	18	0.1799	$1,632,879	$811,410	$218,187	$40,570	$1,084,070	$611,789	$65,450	$30,568	$1,088,482	$579,020	$65,450	$28,951	$705,877	$482,901	$69,695	$24,145	$824,304	$522,439	$85,982	$26,122	$788,296	$503,017	$80,670	$25,151
2018	19	0.1635	$1,499,998	$747,021	$200,015	$37,351	$981,770	$563,828	$60,004	$28,191	$1,004,858	$534,335	$60,004	$26,717	$650,858	$445,457	$64,050	$22,273	$760,804	$481,858	$78,828	$24,088	$727,520	$464,080	$73,954	$23,204
2020	20	0.1486	$1,377,847	$687,834	$183,358	$34,382	$895,039	$519,544	$55,008	$25,977	$929,277	$492,982	$55,008	$24,650	$600,357	$410,830	$58,744	$20,541	$702,036	$444,637	$72,264	$22,227	$671,329	$428,075	$67,800	$21,404
2021	21	0.1351	$1,265,890	$632,871	$168,080	$31,644	$835,689	$478,872	$50,424	$23,944	$860,818	$454,938	$50,424	$22,747	$553,678	$378,817	$53,849	$18,941	$647,839	$409,882	$66,242	$20,499	$618,450	$394,803	$62,150	$19,740
2022	22	0.1228	$1,162,456	$582,382	$154,082	$29,118	$770,090	$441,302	$46,219	$22,065	$795,764	$418,729	$46,219	$20,986	$510,339	$349,230	$49,358	$17,461	$597,330	$378,037	$60,716	$18,902	$571,458	$364,043	$56,987	$18,202
2023	23	0.1117	$1,057,532	$535,843	$141,205	$26,792	$711,140	$408,805	$42,361	$20,330	$737,406	$387,161	$42,361	$19,356	$470,388	$321,491	$45,239	$16,085	$550,016	$348,511	$55,650	$17,426	$527,058	$335,613	$52,212	$16,781
2024	24	0.1015	$880,259	$492,851	$129,412	$24,646	$655,800	$374,509	$38,823	$18,728	$682,256	$357,046	$38,823	$17,852	$433,483	$298,637	$41,480	$14,832	$507,823	$321,230	$51,033	$16,091	$486,028	$309,344	$47,852	$15,467
2025	25	0.0923	$900,031	$453,430	$118,598	$22,671	$604,848	$344,994	$35,579	$17,250	$631,039	$329,207	$35,578	$16,460	$399,401	$273,314	$37,995	$13,666	$468,094	$296,028	$46,740	$14,801	$448,084	$285,077	$43,852	$14,254
SUM			$61,689,177	$32,188,036	$9,176,171	$1,609,947	$40,857,443	$24,090,446	$2,752,851	$1,204,022	$42,176,154	$22,630,616	$2,752,851	$1,141,631	$27,841,218	$19,170,441	$3,839,822	$958,022	$32,670,712	$20,656,070	$3,818,439	$1,032,031	$31,067,868	$19,891,611	$3,393,097	$994,581
Sum of TTC, VOC and CC $85,498,010							$66,141,911				$68,148,301				$48,017,681				$54,210,183				$51,973,860			
Savings							$20,831,085	$8,116,480	$6,423,320	$405,925	$18,512,073	$9,368,320	$6,423,320	$468,416	$33,747,910	$13,076,425	$8,236,350	$653,925	$29,168,415	$11,642,317	$5,559,732	$577,116	$30,801,458	$12,307,325	$5,783,164	$815,368

Basin Reserve
Option E Benefits

traffic growth 0.020 accident growth 0.010

year beg 1 July	time	disc factor	traffic grow	accident grow	Do Min TTC	Do Min VOC	Do Min Accidents	Do Min CO2 0.05	Option E TTC $ 3,144,634	Option E VOC $ 2,022,166	Option E Accidents 70% reduction	Option E CO2 0.05	Benefits TTC	Benefits VOC	Benefits Accidents	Benefits CO2	Benefits Total	Benefits Discounted
2000	0	1.0000	1.0000	1.0000	$ -	$ -	$ 1,027,959	$ -	$ -	$ -		$ -					$ -	$ -
2001	1	0.9091	1.0200	1.0100			$ 1,038,239	$ -	$ -	$ -		$ -					$ -	$ -
2002	2	0.8264	1.0400	1.0200	$ 6,037,959	$ 3,401,872	$ 1,048,518	$ 170,094	$ 4,255,920	$ 2,586,553	$ 314,555	$ 128,326	$ 1,782,040	$ 835,319	$ 733,963	$ 41,768	$ 3,393,087	$ 2,804,204
2003	3	0.7513	1.0600	1.0300	$ 6,339,580	$ 3,498,549	$ 1,058,798	$ 174,927	$ 4,353,612	$ 2,619,296	$ 317,639	$ 130,965	$ 1,985,968	$ 879,253	$ 741,158	$ 43,963	$ 3,650,342	$ 2,742,556
2004	4	0.6830	1.0800	1.0400	$ 6,641,201	$ 3,595,226	$ 1,069,077	$ 179,761	$ 4,451,305	$ 2,672,040	$ 320,723	$ 133,602	$ 2,189,896	$ 923,188	$ 748,354	$ 46,159	$ 3,907,596	$ 2,668,941
2005	5	0.6209	1.1000	1.0500	$ 6,942,822	$ 3,691,903	$ 1,079,357	$ 184,595	$ 4,546,998	$ 2,724,783	$ 323,807	$ 136,239	$ 2,393,825	$ 967,120	$ 755,550	$ 48,356	$ 4,164,851	$ 2,586,044
2006	6	0.5645	1.1200	1.0600	$ 7,094,310	$ 3,754,247	$ 1,089,637	$ 187,712	$ 4,652,031	$ 2,777,106	$ 326,891	$ 138,855	$ 2,442,280	$ 977,140	$ 762,746	$ 48,857	$ 4,231,023	$ 2,388,302
2007	7	0.5132	1.1400	1.0700	$ 7,245,798	$ 3,816,590	$ 1,099,916	$ 190,830	$ 4,755,063	$ 2,829,430	$ 329,975	$ 141,471	$ 2,490,735	$ 987,161	$ 769,941	$ 49,358	$ 4,297,195	$ 2,205,140
2008	8	0.4665	1.1600	1.0800	$ 7,397,285	$ 3,878,934	$ 1,110,196	$ 193,947	$ 4,858,096	$ 2,881,753	$ 333,059	$ 144,088	$ 2,539,190	$ 997,181	$ 777,137	$ 49,859	$ 4,363,367	$ 2,035,643
2009	9	0.4241	1.1800	1.0900	$ 7,548,773	$ 3,941,278	$ 1,120,476	$ 197,064	$ 4,961,129	$ 2,934,076	$ 336,143	$ 146,704	$ 2,587,645	$ 1,007,202	$ 784,333	$ 50,360	$ 4,429,539	$ 1,876,557
2010	10	0.3855	1.2000	1.1000	$ 7,700,267	$ 4,003,622	$ 1,130,755	$ 200,181	$ 5,064,161	$ 2,986,398	$ 339,226	$ 149,320	$ 2,636,100	$ 1,017,222	$ 791,529	$ 50,861	$ 4,495,711	$ 1,729,211
2011	11	0.3505	1.2200	1.1100	$ 7,817,849	$ 4,070,765	$ 1,141,034	$ 203,538	$ 5,181,594	$ 3,041,243	$ 342,310	$ 152,082	$ 2,736,355	$ 1,029,522	$ 798,724	$ 51,475	$ 4,616,077	$ 1,617,907
2012	12	0.3186	1.2400	1.1200	$ 8,135,638	$ 4,137,908	$ 1,151,314	$ 206,895	$ 5,299,027	$ 3,098,088	$ 345,394	$ 154,804	$ 2,836,610	$ 1,041,823	$ 805,920	$ 52,091	$ 4,736,443	$ 1,509,177
2013	13	0.2897	1.2600	1.1300	$ 8,353,324	$ 4,205,052	$ 1,161,594	$ 210,253	$ 5,418,459	$ 3,150,829	$ 348,478	$ 157,548	$ 2,936,865	$ 1,054,123	$ 813,116	$ 52,706	$ 4,858,809	$ 1,406,845
2014	14	0.2633	1.2800	1.1400	$ 8,571,012	$ 4,272,196	$ 1,171,873	$ 213,610	$ 5,533,892	$ 3,205,773	$ 351,562	$ 160,289	$ 3,037,119	$ 1,066,423	$ 820,311	$ 53,321	$ 4,977,175	$ 1,310,646
2015	15	0.2394	1.3000	1.1500	$ 8,788,699	$ 4,339,340	$ 1,182,153	$ 216,967	$ 5,651,325	$ 3,260,616	$ 354,646	$ 163,031	$ 3,137,374	$ 1,078,724	$ 827,507	$ 53,936	$ 5,097,541	$ 1,220,311
2016	16	0.2178	1.3200	1.1600	$ 8,884,887	$ 4,386,884	$ 1,192,432	$ 219,834	$ 5,739,597	$ 3,307,539	$ 357,730	$ 165,377	$ 3,145,369	$ 1,089,144	$ 834,703	$ 54,457	$ 5,123,693	$ 1,115,065
2017	17	0.1978	1.3400	1.1700	$ 8,981,275	$ 4,454,027	$ 1,202,712	$ 222,701	$ 5,827,870	$ 3,354,463	$ 360,814	$ 167,723	$ 3,153,404	$ 1,099,564	$ 841,898	$ 54,978	$ 5,149,846	$ 1,018,869
2016	18	0.1799	1.3600	1.1800	$ 9,077,562	$ 4,511,371	$ 1,212,992	$ 225,568	$ 5,916,143	$ 3,401,386	$ 363,897	$ 170,069	$ 3,161,419	$ 1,109,985	$ 849,094	$ 55,499	$ 5,175,998	$ 930,849
2019	19	0.1635	1.3800	1.1900	$ 9,173,850	$ 4,568,715	$ 1,223,271	$ 228,436	$ 6,004,415	$ 3,448,309	$ 366,981	$ 172,415	$ 3,169,434	$ 1,120,405	$ 856,290	$ 56,020	$ 5,202,150	$ 850,593
2020	20	0.1486	1.4000	1.2000	$ 9,270,138	$ 4,626,058	$ 1,233,551	$ 231,303	$ 6,092,688	$ 3,495,233	$ 370,065	$ 174,762	$ 3,177,449	$ 1,130,826	$ 863,486	$ 56,541	$ 5,228,302	$ 777,154
2021	21	0.1351	1.4200	1.2100	$ 9,366,425	$ 4,683,402	$ 1,243,830	$ 234,170	$ 6,184,361	$ 3,545,776	$ 373,149	$ 177,189	$ 3,182,044	$ 1,139,828	$ 870,681	$ 56,981	$ 5,249,333	$ 709,345
2022	22	0.1228	1.4400	1.2200	$ 9,462,713	$ 4,740,746	$ 1,254,110	$ 237,037	$ 6,278,074	$ 3,592,319	$ 376,233	$ 179,516	$ 3,186,039	$ 1,148,428	$ 877,877	$ 57,421	$ 5,270,364	$ 647,443
2023	23	0.1117	1.4600	1.2300	$ 9,559,001	$ 4,798,089	$ 1,264,390	$ 239,904	$ 6,367,786	$ 3,640,863	$ 379,317	$ 182,043	$ 3,191,234	$ 1,157,227	$ 885,073	$ 57,861	$ 5,291,395	$ 590,933
2024	24	0.1015	1.4800	1.2400	$ 9,655,288	$ 4,855,433	$ 1,274,669	$ 242,772	$ 6,459,499	$ 3,689,406	$ 382,401	$ 184,470	$ 3,195,829	$ 1,166,027	$ 892,268	$ 58,301	$ 5,312,426	$ 539,347
2025	25	0.0923	1.5000	1.2500	$ 9,751,576	$ 4,912,776	$ 1,284,949	$ 245,639	$ 6,557,212	$ 3,737,949	$ 385,484	$ 186,897	$ 3,200,424	$ 1,174,827	$ 899,464	$ 58,741	$ 5,333,457	$ 492,247

		Ratio of cost to total cost			0.59	0.30	0.09	0.02	0.60	0.35	0.04	0.02					0.32	
								$ 334,177,749 (total cost)				$ 218,557,852 (total cost)	$ 21,268,852	$ 7,939,417 (discounted benefits)	$ 6,178,079	$ 396,971		

Option E Benefits NPV $ 35,779,419

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Basin Reserve
Option F Benefits

traffic growth 0.020 accident growth 0.010

year beg 1 July	time	disc factor	traffic grow	accident grow	Do Min TTC	Do Min VOC	Do Min Accidents	Do Min CO2	Option F TTC	Option F VOC	Option F Accidents	Option F CO2	Benefits TTC	Benefits VOC	Benefits Accidents	Benefits CO2	Benefits Total	Benefits Discounted
									$ 3,384,080	$ 2,002,574	70% reduction	0.05						
2000	0	1.0000	1.0000	1.0000	-	-	1,027,959	-	-	-		-	-	-	1,027,959	-	1,027,959	1,027,959
2001	1	0.9091	1.0200	1.0100	-	-	1,038,239	-	-	-		-	-	-	1,038,239	-	1,038,239	943,853
2002	2	0.8264	1.0400	1.0200	6,037,959	3,401,872	1,048,518	170,094	4,447,443	2,445,877	314,555	122,284	1,590,516	956,195	733,963	47,810	3,328,484	2,750,813
2003	3	0.7513	1.0600	1.0300	6,339,580	3,498,549	1,058,798	174,927	4,542,791	2,492,395	317,639	124,620	1,796,789	1,006,154	741,158	50,308	3,594,409	2,700,533
2004	4	0.6830	1.0800	1.0400	6,641,201	3,595,226	1,069,077	179,761	4,638,139	2,539,113	320,723	126,958	2,003,062	1,056,112	748,354	52,806	3,860,334	2,636,660
2005	5	0.6209	1.1000	1.0500	6,942,822	3,691,903	1,079,357	184,595	4,733,488	2,585,832	323,807	129,292	2,209,335	1,106,071	755,550	55,304	4,126,259	2,562,082
2006	6	0.5645	1.1200	1.0600	7,094,310	3,754,247	1,089,637	187,712	4,826,769	2,633,683	326,891	131,684	2,265,541	1,120,564	762,746	56,028	4,204,878	2,373,544
2007	7	0.5132	1.1400	1.0700	7,245,798	3,816,590	1,099,916	190,830	4,924,051	2,681,535	329,975	134,077	2,321,747	1,135,056	769,941	56,753	4,283,497	2,198,111
2008	8	0.4665	1.1600	1.0800	7,397,285	3,878,934	1,110,196	193,947	5,019,333	2,729,386	333,059	136,469	2,377,953	1,149,548	777,137	57,477	4,362,115	2,034,959
2009	9	0.4241	1.1800	1.0900	7,548,773	3,941,278	1,120,475	197,064	5,114,614	2,777,236	336,143	138,862	2,434,159	1,164,040	784,333	58,202	4,440,734	1,883,305
2010	10	0.3855	1.2000	1.1000	7,700,261	4,003,621	1,130,755	200,181	5,209,896	2,825,089	339,226	141,254	2,490,365	1,178,532	791,528	58,927	4,519,352	1,742,406
2011	11	0.3505	1.2200	1.1100	7,917,949	4,070,765	1,141,034	203,536	5,312,777	2,874,741	342,310	143,737	2,605,171	1,196,025	798,724	59,801	4,659,721	1,633,204
2012	12	0.3186	1.2400	1.1200	8,135,636	4,137,909	1,151,314	206,895	5,415,659	2,924,392	345,394	146,220	2,719,977	1,213,517	805,920	60,676	4,800,090	1,529,457
2013	13	0.2897	1.2600	1.1300	8,353,324	4,205,052	1,161,594	210,253	5,518,641	2,974,044	348,478	148,702	2,834,783	1,231,009	813,116	61,550	4,940,456	1,431,075
2014	14	0.2633	1.2800	1.1400	8,571,012	4,272,196	1,171,873	213,610	5,621,422	3,023,695	351,562	151,185	2,949,589	1,248,501	820,311	62,425	5,080,827	1,337,941
2015	15	0.2394	1.3000	1.1500	[illegible]	4,339,340	1,182,153	216,967	5,724,304	3,073,346	354,646	153,667	3,064,396	1,265,993	827,507	63,300	5,221,196	1,249,913
2016	16	0.2176	1.3200	1.1600	8,884,987	4,396,684	1,192,432	219,834	5,829,785	3,121,996	357,730	156,100	3,055,202	1,274,886	834,703	63,734	5,228,324	1,137,836
2017	17	0.1978	1.3400	1.1700	8,981,275	4,454,027	1,202,712	222,701	5,935,267	3,170,649	360,814	158,532	3,046,008	1,283,378	841,898	64,169	5,235,453	1,035,806
2018	18	0.1799	1.3600	1.1800	9,077,562	4,511,371	1,212,992	225,569	6,040,748	3,219,301	363,897	160,965	3,036,814	1,292,070	849,094	64,603	5,242,581	942,924
2019	19	0.1635	1.3800	1.1900	9,173,850	4,568,715	1,223,271	228,436	6,146,230	3,267,952	366,981	163,398	3,027,620	1,300,762	856,290	65,038	5,249,710	858,370
2020	20	0.1486	1.4000	1.2000	9,270,138	4,626,058	1,233,551	231,303	6,251,712	3,316,604	370,065	165,630	3,016,426	1,309,454	863,486	65,473	5,256,839	781,396
2021	21	0.1351	1.4200	1.2100	9,366,425	4,683,402	1,243,830	234,170	6,368,793	3,366,855	373,149	168,333	2,997,632	1,316,747	870,681	65,837	5,250,897	709,557
2022	22	0.1228	1.4400	1.2200	9,462,713	4,740,746	1,254,110	237,037	6,485,875	3,416,707	376,233	170,835	2,976,838	1,324,039	877,877	66,202	5,244,956	644,322
2023	23	0.1117	1.4600	1.2300	9,559,001	4,798,089	1,264,390	239,904	6,602,956	3,466,756	379,317	173,338	2,956,044	1,331,331	885,073	66,567	5,239,014	585,083
2024	24	0.1015	1.4800	1.2400	9,655,288	4,855,433	1,274,669	242,772	6,720,038	3,516,810	382,401	175,840	2,935,250	1,338,623	892,268	66,931	5,233,073	531,291
2025	25	0.0923	1.5000	1.2500	9,751,576	4,912,777	1,284,949	245,639	6,837,120	3,566,861	385,485	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5,227,132	482,449
Totals					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ratio of cost to total cost					0.59	0.30	0.09	0.02	0.62	0.33	0.04	0.02					0.33	
								$ 334,177,749 (total cost)				$ 218,281,218 (total cost)	$ 20,722,073	$ 9,491,837 (discounted benefits)	$ 7,056,549	$ 474,582		

Option F Benefits NPV $ 37,744,841

BeCo grow2 xls Option F
3/7/2001

Basin Reserve
SAR Option H Benefits

traffic growth	0.020	accident growth	0.010																		
year beg 1 July	time	disc factor	traffic growth	accident growth	Do Min TTC	Do Min VOC	Do Min Accidents	Do Min CO2	Option H TTC	Option H VOC	Option H Accidents	Option H CO2	Benefits TTC	Benefits VOC	Benefits Accidents	Benefits CO2	Benefits Total	Benefits Discounted
								0.050	$ 2,884,929	$ 1,974,184	$ 329,333	0.050						
2000	0	1.0000	1.0000	1.0000			$ 1,027,959	$ -	$ -	$ -		$ -	$ -	$ -		$ -	$ -	$ -
2001	1	0.9091	1.0200	1.0100			$ 1,038,239	$ -	$ -	$ -		$ -	$ -	$ -		$ -	$ -	$ -
2002	2	0.8264	1.0400	1.0200	$ 6,037,959	$ 3,401,872	$ 1,048,518	$ 170,094	$ 3,000,326	$ 2,053,152	$ 335,920	$ 102,658	$ 3,037,633	$ 1,348,720	$ 712,599	$ 67,436	$ 5,166,388	$ 4,269,742
2003	3	0.7513	1.0600	1.0300	$ 6,339,580	$ 3,498,549	$ 1,058,798	$ 174,927	$ 3,058,025	$ 2,092,835	$ 339,213	$ 104,632	$ 3,281,556	$ 1,405,914	$ 719,585	$ 70,296	$ 5,477,350	$ 4,115,214
2004	4	0.6830	1.0800	1.0400	$ 6,641,201	$ 3,595,226	$ 1,069,077	$ 179,761	$ 3,115,723	$ 2,132,119	$ 342,506	$ 106,606	$ 3,525,478	$ 1,463,107	$ 726,571	$ 73,155	$ 5,788,311	$ 3,953,495
2005	5	0.6209	1.1000	1.0500	$ 6,942,822	$ 3,691,903	$ 1,079,357	$ 184,595	$ 3,173,422	$ 2,171,603	$ 345,800	$ 108,580	$ 3,769,401	$ 1,520,300	$ 733,557	$ 76,015	$ 6,099,273	$ 3,787,189
2006	6	0.5645	1.1200	1.0600	$ 7,094,310	$ 3,754,247	$ 1,089,837	$ 187,712	$ 3,231,120	$ 2,211,088	$ 349,093	$ 110,554	$ 3,863,190	$ 1,543,160	$ 740,544	$ 77,158	$ 6,224,052	$ 3,513,315
2007	7	0.5132	1.1400	1.0700	$ 7,245,798	$ 3,816,590	$ 1,099,916	$ 190,830	$ 3,288,819	$ 2,250,570	$ 352,388	$ 112,529	$ 3,956,979	$ 1,566,020	$ 747,530	$ 78,301	$ 6,348,830	$ 3,257,954
2008	8	0.4665	1.1600	1.0800	$ 7,397,285	$ 3,878,934	$ 1,110,196	$ 193,947	$ 3,346,518	$ 2,290,054	$ 355,680	$ 114,503	$ 4,050,768	$ 1,588,880	$ 754,516	$ 79,444	$ 6,473,606	$ 3,019,988
2009	9	0.4241	1.1800	1.0900	$ 7,548,773	$ 3,941,278	$ 1,120,475	$ 197,064	$ 3,404,216	$ 2,329,537	$ 358,973	$ 116,477	$ 4,144,557	$ 1,611,740	$ 761,502	$ 80,587	$ 6,598,387	$ 2,798,360
2010	10	0.3855	1.2000	1.1000	$ 7,700,261	$ 4,003,621	$ 1,130,755	$ 200,181	$ 3,461,915	$ 2,369,021	$ 362,266	$ 118,451	$ 4,238,346	$ 1,634,600	$ 768,489	$ 81,730	$ 6,723,165	$ 2,592,071
2011	11	0.3505	1.2200	1.1100	$ 7,917,849	$ 4,070,765	$ 1,141,034	$ 203,538	$ 3,518,613	$ 2,408,505	$ 365,560	$ 120,425	$ 4,399,235	$ 1,662,260	$ 775,475	$ 83,113	$ 6,919,183	$ 2,425,132
2012	12	0.3186	1.2400	1.1200	$ 8,135,638	$ 4,137,809	$ 1,151,314	$ 206,895	$ 3,577,312	$ 2,447,989	$ 368,853	$ 122,399	$ 4,558,324	$ 1,689,920	$ 782,461	$ 84,496	$ 7,115,202	$ 2,267,123
2013	13	0.2897	1.2600	1.1300	$ 8,353,324	$ 4,205,052	$ 1,161,594	$ 210,253	$ 3,635,010	$ 2,487,472	$ 372,148	$ 124,374	$ 4,718,313	$ 1,717,580	$ 789,447	$ 85,879	$ 7,311,220	$ 2,117,600
2014	14	0.2633	1.2800	1.1400	$ 8,571,012	$ 4,272,196	$ 1,171,873	$ 213,610	$ 3,692,709	$ 2,528,956	$ 375,440	$ 126,348	$ 4,878,303	$ 1,745,240	$ 796,434	$ 87,262	$ 7,507,238	$ 1,976,891
2015	15	0.2394	1.3000	1.1500	$ 8,788,699	$ 4,339,340	$ 1,182,153	$ 216,967	$ 3,750,408	$ 2,568,440	$ 378,733	$ 128,322	$ 5,038,292	$ 1,772,900	$ 803,420	$ 88,645	$ 7,703,257	$ 1,844,098
2016	16	0.2176	1.3200	1.1600	$ 8,884,987	$ 4,386,684	$ 1,192,432	$ 219,834	$ 3,808,106	$ 2,605,923	$ 382,026	$ 130,296	$ 5,076,881	$ 1,780,760	$ 810,406	$ 89,538	$ 7,787,585	$ 1,690,453
2017	17	0.1978	1.3400	1.1700	$ 8,981,275	$ 4,454,027	$ 1,202,712	$ 222,701	$ 3,865,805	$ 2,645,407	$ 385,320	$ 132,270	$ 5,115,470	$ 1,808,620	$ 817,392	$ 90,431	$ 7,831,914	$ 1,549,502
2018	18	0.1799	1.3600	1.1800	$ 9,077,562	$ 4,511,371	$ 1,212,992	$ 225,569	$ 3,923,503	$ 2,684,891	$ 388,613	$ 134,245	$ 5,154,059	$ 1,826,480	$ 824,379	$ 91,324	$ 7,896,242	$ 1,420,209
2019	19	0.1635	1.3800	1.1900	$ 9,173,850	$ 4,568,715	$ 1,223,271	$ 228,436	$ 3,981,202	$ 2,724,374	$ 391,906	$ 136,219	$ 5,192,648	$ 1,844,340	$ 831,365	$ 92,217	$ 7,960,570	$ 1,301,617
2020	20	0.1486	1.4000	1.2000	$ 9,270,138	$ 4,626,058	$ 1,233,551	$ 231,303	$ 4,038,900	$ 2,763,858	$ 395,200	$ 138,193	$ 5,231,237	$ 1,862,200	$ 838,351	$ 93,110	$ 8,024,899	$ 1,192,850
2021	21	0.1351	1.4200	1.2100	$ 9,366,425	$ 4,683,402	$ 1,243,830	$ 234,170	$ 4,096,599	$ 2,803,342	$ 398,493	$ 140,167	$ 5,269,826	$ 1,880,060	$ 845,337	$ 94,003	$ 8,089,227	$ 1,093,102
2022	22	0.1228	1.4400	1.2200	$ 9,462,713	$ 4,740,746	$ 1,254,110	$ 237,037	$ 4,154,298	$ 2,842,825	$ 401,786	$ 142,141	$ 5,308,415	$ 1,897,920	$ 852,324	$ 94,896	$ 8,153,555	$ 1,001,831
2023	23	0.1117	1.4600	1.2300	$ 9,559,001	$ 4,798,089	$ 1,264,390	$ 239,904	$ 4,211,998	$ 2,882,309	$ 405,080	$ 144,115	$ 5,347,004	$ 1,915,780	$ 859,310	$ 95,789	$ 8,217,884	$ 917,758
2024	24	0.1015	1.4800	1.2400	$ 9,655,288	$ 4,855,433	$ 1,274,669	$ 242,772	$ 4,269,695	$ 2,921,793	$ 408,373	$ 146,090	$ 5,385,594	$ 1,933,640	$ 866,296	$ 96,682	$ 8,282,212	$ 840,857
2025	25	0.0923	1.5000	1.2500	$ 9,751,576	$ 4,912,777	$ 1,284,949	$ 245,639	$ 4,327,393	$ 2,961,276	$ 411,666	$ 148,064	$ 5,424,183	$ 1,951,500	$ 873,283	$ 97,575	$ 8,346,541	$ 770,352
					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$53,716,679
			Ratio of cost to total cost		0.59	0.30	0.09	0.02	0.55	0.38	0.06	0.02					0.31	
								$ 334,177,749 (total cost)				$ 160,085,458 (total cost)	$ 34,337,485	$ 12,796,884 (discounted benefits)	$ 5,942,466	$ 639,644		

Option H NPV $ 53,716,679

Basin Reserve
SAR Option I Benefits

traffic growth	0.020	accident growth	0.010																
year beg 1 July	time	disc factor	traffic growth	accident growth	Do Min TTC	Do Min VOC	Do Min Accidents	Do Min CO2	Option I TTC	Option I VOC	Option I Accidents	Option I CO2	Benefits TTC	Benefits VOC	Benefits Accidents	Benefits CO2	Benefits Total	Benefits Discounted
								0.050	$ 2,947,108	$ 1,987,587	$ 405,131	0.050						
2000	0	1.0000	1.0000	1.0000	$ -	$ -	$ 1,027,959	$ -	$ -	$ -	$ -	$ -						
2001	1	0.9091	1.0200	1.0100	$ -	$ -	$ 1,038,238	$ -	$ -	$ -	$ -	$ -						
2002	2	0.8264	1.0400	1.0200	$ 6,037,959	$ 3,401,872	$ 1,048,518	$ 170,094	$ 3,478,990	$ 2,213,280	$ 413,234	$ 110,884	$ 2,558,969	$ 1,188,592	$ 635,285	$ 59,429	$ 4,442,265	$ 3,671,293
2003	3	0.7513	1.0600	1.0300	$ 6,339,580	$ 3,498,549	$ 1,058,798	$ 174,927	$ 3,548,265	$ 2,256,975	$ 417,285	$ 112,849	$ 2,791,315	$ 1,241,574	$ 641,513	$ 62,079	$ 4,736,480	$ 3,558,588
2003	3	0.7513	1.0600	1.0300	$ 6,339,580	$ 3,498,549	$ 1,058,798	$ 174,927	$ 3,548,265	$ 2,256,975	$ 417,285	$ 112,849	$ 2,791,315	$ 1,241,574	$ 641,513	$ 62,079	$ 4,736,480	$ 3,558,588
2004	4	0.6830	1.0800	1.0400	$ 6,641,201	$ 3,595,226	$ 1,069,077	$ 179,761	$ 3,617,541	$ 2,300,660	$ 421,336	$ 115,033	$ 3,023,660	$ 1,294,566	$ 647,741	$ 64,728	$ 5,030,696	$ 3,436,033
2005	5	0.6209	1.1000	1.0500	$ 6,942,822	$ 3,691,904	$ 1,079,357	$ 184,595	$ 3,686,818	$ 2,344,345	$ 425,386	$ 117,217	$ 3,256,004	$ 1,347,558	$ 653,969	$ 67,376	$ 5,324,911	$ 3,306,351
2006	6	0.5645	1.1200	1.0600	$ 7,094,310	$ 3,754,247	$ 1,089,637	$ 187,712	$ 3,755,159	$ 2,387,497	$ 429,439	$ 119,375	$ 3,339,152	$ 1,388,750	$ 660,198	$ 68,337	$ 5,434,437	$ 3,067,598
2007	7	0.5132	1.1400	1.0700	$ 7,245,798	$ 3,816,580	$ 1,099,916	$ 190,830	$ 3,823,501	$ 2,430,649	$ 433,490	$ 121,532	$ 3,422,297	$ 1,385,842	$ 666,426	$ 69,297	$ 5,543,862	$ 2,844,929
2008	8	0.4665	1.1600	1.0800	$ 7,397,285	$ 3,878,934	$ 1,110,196	$ 193,947	$ 3,891,843	$ 2,473,800	$ 437,541	$ 123,690	$ 3,505,443	$ 1,405,134	$ 672,654	$ 70,257	$ 5,653,487	$ 2,637,394
2009	9	0.4241	1.1800	1.0900	$ 7,548,773	$ 3,941,278	$ 1,120,475	$ 197,064	$ 3,960,185	$ 2,516,952	$ 441,593	$ 125,848	$ 3,588,588	$ 1,424,326	$ 678,883	$ 71,216	$ 5,763,013	$ 2,444,080
2010	10	0.3855	1.2000	1.1000	$ 7,700,261	$ 4,003,621	$ 1,130,755	$ 200,181	$ 4,028,527	$ 2,560,104	$ 445,644	$ 128,006	$ 3,671,734	$ 1,443,518	$ 685,111	$ 72,176	$ 5,872,538	$ 2,264,116
2011	11	0.3505	1.2200	1.1100	$ 7,917,949	$ 4,070,765	$ 1,141,034	$ 203,536	$ 4,097,469	$ 2,603,256	$ 449,695	$ 130,163	$ 3,820,479	$ 1,487,510	$ 691,339	$ 73,375	$ 6,052,704	$ 2,121,436
2012	12	0.3186	1.2400	1.1200	$ 8,135,636	$ 4,137,909	$ 1,151,314	$ 206,895	$ 4,166,411	$ 2,646,407	$ 453,747	$ 132,320	$ 3,969,225	$ 1,491,501	$ 697,567	$ 74,575	$ 6,232,869	$ 1,985,984
2013	13	0.2897	1.2600	1.1300	$ 8,353,324	$ 4,205,052	$ 1,161,594	$ 210,253	$ 4,235,353	$ 2,689,559	$ 457,798	$ 134,478	$ 4,117,871	$ 1,515,493	$ 703,796	$ 75,775	$ 6,413,034	$ 1,857,828
2014	14	0.2633	1.2800	1.1400	$ 8,571,012	$ 4,272,196	$ 1,171,873	$ 213,610	$ 4,304,295	$ 2,732,711	$ 461,849	$ 136,636	$ 4,266,718	$ 1,539,485	$ 710,024	$ 76,974	$ 6,593,200	$ 1,736,186
2015	15	0.2394	1.3000	1.1500	$ 8,788,699	$ 4,339,340	$ 1,182,153	$ 216,967	$ 4,373,238	$ 2,775,862	$ 465,901	$ 138,793	$ 4,415,462	$ 1,563,477	$ 716,252	$ 78,174	$ 6,773,365	$ 1,621,390
2016	16	0.2176	1.3200	1.1600	$ 8,884,987	$ 4,386,884	$ 1,192,432	$ 219,634	$ 4,443,180	$ 2,818,814	$ 469,952	$ 140,941	$ 4,441,807	$ 1,577,869	$ 722,480	$ 78,893	$ 6,821,051	$ 1,484,459
2017	17	0.1978	1.3400	1.1700	$ 8,881,275	$ 4,454,027	$ 1,202,712	$ 222,701	$ 4,513,122	$ 2,861,766	$ 474,003	$ 143,088	$ 4,486,153	$ 1,592,261	$ 728,709	$ 79,613	$ 6,888,736	$ 1,358,943
2018	18	0.1799	1.3600	1.1800	$ 9,077,562	$ 4,511,371	$ 1,212,992	$ 225,569	$ 4,583,064	$ 2,904,718	$ 478,055	$ 145,236	$ 4,494,488	$ 1,606,653	$ 734,937	$ 80,333	$ 6,916,421	$ 1,243,978
2018	19	0.1635	1.3800	1.1900	$ 9,173,850	$ 4,568,715	$ 1,223,271	$ 228,436	$ 4,653,006	$ 2,947,669	$ 482,106	$ 147,383	$ 4,520,844	$ 1,621,045	$ 741,165	$ 81,052	$ 6,964,107	$ 1,138,687
2020	20	0.1486	1.4000	1.2000	$ 9,270,138	$ 4,626,058	$ 1,233,551	$ 231,303	$ 4,722,948	$ 2,990,621	$ 486,157	$ 149,531	$ 4,547,199	$ 1,635,437	$ 747,394	$ 81,772	$ 7,011,792	$ 1,042,258
2021	21	0.1351	1.4200	1.2100	$ 9,366,425	$ 4,683,402	$ 1,243,830	$ 234,170	$ 4,792,890	$ 3,033,573	$ 490,209	$ 151,689	$ 4,573,735	$ 1,649,429	$ 753,622	$ 82,471	$ 7,059,258	$ 953,822
2022	22	0.1228	1.4400	1.2200	$ 9,462,713	$ 4,740,746	$ 1,254,110	$ 237,037	$ 4,862,432	$ 3,077,525	$ 494,260	$ 153,866	$ 4,600,281	$ 1,663,421	$ 759,850	$ 83,171	$ 7,106,723	$ 873,032
2023	23	0.1117	1.4600	1.2300	$ 9,559,001	$ 4,798,089	$ 1,264,390	$ 239,904	$ 4,932,174	$ 3,120,676	$ 498,311	$ 156,034	$ 4,626,826	$ 1,677,413	$ 766,078	$ 83,871	$ 7,154,188	$ 798,967
2024	24	0.1015	1.4800	1.2400	$ 9,655,288	$ 4,855,433	$ 1,274,669	$ 242,772	$ 5,001,917	$ 3,164,628	$ 502,362	$ 158,201	$ 4,653,372	$ 1,691,405	$ 772,307	$ 84,570	$ 7,201,654	$ 731,152
2025	25	0.0923	1.5000	1.2500	$ 9,751,578	$ 4,912,777	$ 1,284,949	$ 245,639	$ 5,071,659	$ 3,207,580	$ 506,414	$ 160,369	$ 4,679,917	$ 1,705,397	$ 778,535	$ 85,270	$ 7,249,119	$ 669,065
		Total																0.31
		Ratio of cost to total cost			0.89	0.30	0.09	0.02	0.56	0.36	0.09	0.02						
								$ 334,177,749 (total cost)				$ 181,691,543 (total cost)	$ 29,736,865	$ 11,256,612 (discounted benefits)	$ 5,290,982	$ 582,841		

Option I NPV $ 46,847,579

Basin Reserve
SAR Option J Benefits

traffic growth	0.020	accident growth	0.010

year beg 1 July	time	disc factor	traffic growth	accident growth	Do Min TTC	Do Min VOC	Do Min Accidents	Do Min CO2	Option J TTC	Option J VOC	Option J Accidents	Option J CO2	Benefits TTC	Benefits VOC	Benefits Accidents	Benefits CO2	Benefits Total	Benefits Discounted
								0.050			$ 380,101	0.050						
2000	0	1.0000	1.0000	1.0000	$ -	$ -	$ 1,027,959	$ -	$ -	$ -		$ -						
2001	1	0.9091	1.0200	1.0100	$ -	$ -	$ 1,038,239	$ -	$ -	$ -		$ -						
2002	2	0.8264	1.0400	1.0200	$ 6,037,959	$ 3,401,872	$ 1,048,518	$ 170,094	$ 3,323,815	$ 2,131,021	$ 387,703	$ 108,551	$ 2,714,144	$ 1,270,851	$ 660,815	$ 63,543	$ 4,709,353	$ 3,892,027
2003	3	0.7513	1.0600	1.0300	$ 6,339,580	$ 3,498,549	$ 1,058,798	$ 174,927	$ 3,390,068	$ 2,173,457	$ 391,504	$ 108,873	$ 2,949,513	$ 1,325,092	$ 667,294	$ 66,255	$ 5,008,152	$ 3,762,699
2004	4	0.6830	1.0800	1.0400	$ 6,641,201	$ 3,595,226	$ 1,069,077	$ 178,761	$ 3,456,321	$ 2,215,894	$ 395,305	$ 110,785	$ 3,164,881	$ 1,379,332	$ 673,772	$ 68,967	$ 5,306,952	$ 3,624,720
2005	5	0.6209	1.1000	1.0500	$ 6,942,822	$ 3,691,903	$ 1,079,357	$ 184,595	$ 3,522,573	$ 2,256,330	$ 399,106	$ 112,917	$ 3,420,249	$ 1,433,673	$ 680,251	$ 71,679	$ 5,605,761	$ 3,480,731
2006	6	0.5645	1.1200	1.0600	$ 7,094,310	$ 3,754,247	$ 1,089,637	$ 187,712	$ 3,588,493	$ 2,299,700	$ 402,907	$ 114,985	$ 3,505,817	$ 1,454,547	$ 686,729	$ 72,727	$ 5,719,821	$ 3,228,690
2007	7	0.5132	1.1400	1.0700	$ 7,245,798	$ 3,816,590	$ 1,099,916	$ 190,630	$ 3,654,412	$ 2,341,069	$ 406,708	$ 117,053	$ 3,591,385	$ 1,475,521	$ 693,208	$ 73,776	$ 5,833,890	$ 2,993,708
2008	8	0.4665	1.1600	1.0800	$ 7,397,285	$ 3,878,934	$ 1,110,196	$ 193,947	$ 3,720,332	$ 2,382,439	$ 410,509	$ 119,122	$ 3,676,953	$ 1,496,495	$ 699,687	$ 74,825	$ 5,947,960	$ 2,774,767
2009	9	0.4241	1.1800	1.0900	$ 7,548,773	$ 3,941,278	$ 1,120,475	$ 197,064	$ 3,786,252	$ 2,423,809	$ 414,310	$ 121,190	$ 3,762,522	$ 1,517,469	$ 706,165	$ 75,873	$ 6,062,029	$ 2,570,892
2010	10	0.3855	1.2000	1.1000	$ 7,700,261	$ 4,003,621	$ 1,130,755	$ 200,181	$ 3,852,171	$ 2,465,178	$ 418,111	$ 123,259	$ 3,848,090	$ 1,538,449	$ 712,644	$ 76,922	$ 6,176,099	$ 2,381,154
2011	11	0.3505	1.2200	1.1100	$ 7,917,949	$ 4,070,765	$ 1,141,034	$ 203,538	$ 3,918,091	$ 2,506,546	$ 421,912	$ 125,327	$ 3,999,858	$ 1,564,217	$ 719,122	$ 78,211	$ 6,361,408	$ 2,229,835
2012	12	0.3186	1.2400	1.1200	$ 8,135,636	$ 4,137,909	$ 1,151,314	$ 206,895	$ 3,984,010	$ 2,547,917	$ 425,713	$ 127,396	$ 4,151,626	$ 1,589,991	$ 725,601	$ 79,500	$ 6,546,718	$ 2,085,986
2013	13	0.2897	1.2600	1.1300	$ 8,353,324	$ 4,205,052	$ 1,161,594	$ 210,253	$ 4,049,930	$ 2,589,287	$ 429,514	$ 129,464	$ 4,303,394	$ 1,615,765	$ 732,080	$ 80,788	$ 6,732,027	$ 1,950,029
2014	14	0.2633	1.2800	1.1400	$ 8,571,012	$ 4,272,196	$ 1,171,873	$ 213,610	$ 4,115,849	$ 2,630,657	$ 433,315	$ 131,533	$ 4,455,162	$ 1,641,539	$ 738,558	$ 82,077	$ 6,917,337	$ 1,821,551
2015	15	0.2394	1.3000	1.1500	$ 8,788,899	$ 4,339,340	$ 1,182,153	$ 216,967	$ 4,181,769	$ 2,672,026	$ 437,116	$ 133,601	$ 4,606,931	$ 1,667,313	$ 745,037	$ 83,366	$ 7,102,646	$ 1,700,317
2016	16	0.2176	1.3200	1.1600	$ 8,884,987	$ 4,396,684	$ 1,192,432	$ 219,834	$ 4,248,688	$ 2,713,596	$ 440,917	$ 135,680	$ 4,636,299	$ 1,683,088	$ 751,515	$ 84,154	$ 7,155,056	$ 1,557,149
2017	17	0.1978	1.3400	1.1700	$ 8,981,275	$ 4,454,027	$ 1,202,712	$ 222,701	$ 4,315,608	$ 2,755,166	$ 444,718	$ 137,758	$ 4,665,667	$ 1,698,862	$ 757,994	$ 84,943	$ 7,207,465	$ 1,425,959
2018	18	0.1799	1.3600	1.1800	$ 9,077,562	$ 4,511,371	$ 1,212,992	$ 225,569	$ 4,382,527	$ 2,796,735	$ 448,519	$ 139,837	$ 4,695,035	$ 1,714,636	$ 764,472	$ 85,732	$ 7,259,875	$ 1,305,752
2019	19	0.1635	1.3800	1.1900	$ 9,173,850	$ 4,568,715	$ 1,223,271	$ 228,436	$ 4,449,447	$ 2,838,305	$ 452,320	$ 141,915	$ 4,724,403	$ 1,730,410	$ 770,951	$ 86,520	$ 7,312,284	$ 1,195,817
2020	20	0.1486	1.4000	1.2000	$ 9,270,138	$ 4,626,058	$ 1,233,551	$ 231,303	$ 4,516,366	$ 2,879,676	$ 456,121	$ 143,994	$ 4,753,771	$ 1,746,184	$ 777,430	$ 87,309	$ 7,364,694	$ 1,094,715
2021	21	0.1351	1.4200	1.2100	$ 9,366,425	$ 4,683,402	$ 1,243,830	$ 234,170	$ 4,584,086	$ 2,921,844	$ 459,922	$ 146,082	$ 4,782,340	$ 1,761,758	$ 783,908	$ 88,088	$ 7,416,093	$ 1,002,141
2022	22	0.1228	1.4400	1.2200	$ 9,462,713	$ 4,740,746	$ 1,254,110	$ 237,037	$ 4,651,605	$ 2,963,414	$ 463,723	$ 148,171	$ 4,810,908	$ 1,777,332	$ 790,387	$ 88,887	$ 7,467,493	$ 917,351
2023	23	0.1117	1.4600	1.2300	$ 9,559,001	$ 4,798,089	$ 1,264,390	$ 239,904	$ 4,718,625	$ 3,005,183	$ 467,524	$ 150,259	$ 4,839,476	$ 1,792,906	$ 796,865	$ 89,645	$ 7,518,892	$ 839,696
2024	24	0.1015	1.4800	1.2400	$ 9,655,288	$ 4,855,433	$ 1,274,669	$ 242,772	$ 4,787,244	$ 3,046,953	$ 471,325	$ 152,348	$ 4,868,044	$ 1,808,480	$ 803,344	$ 90,424	$ 7,570,292	$ 768,576
2025	25	0.0923	1.5000	1.2500	$ 9,751,676	$ 4,912,777	$ 1,284,949	$ 245,639	$ 4,854,964	$ 3,088,723	$ 475,126	$ 154,436	$ 4,896,612	$ 1,824,054	$ 809,623	$ 91,203	$ 7,621,691	$ 703,452
Totals					$ 197,897,425	$ 101,164,784	$ 30,061,580	$ 5,057,[illegible]	$ 98,052,324	$ 62,846,926	$ 10,353,951	[illegible]	$ 99,843,08[illegible]	$ 38,507,858	$ 17,842,652	$ 1,925,39[illegible]	$ 157,973,983	$ 49,307,315
Ratio of cost to total cost					0.59	0.30	0.09	0.02	0.56	0.36	0.06	0.02					0.31	
								$334,177,749 (total cost)				$174,187,568 (total cost)	$ 31,173,189	$ 12,022,994 (discounted benefits)	$ 5,509,982	$ 601,150		

Option J NPV $ 49,307,315

SAR: Traffic Link Flows

Note

1 Data calculated considering 1 peak am hour and 2 peak pm hours
2 Peak flow is 9% of AADT

Existing Flow Distribution
Montgomery Watson Report 1998

Node A	Node B	length	AADT	peak vol	peak h	lanes	cap
1	5	0.100	20,100	1,809	3	2	2400
5	4	0.204	30,700	2,763	3	3	3600
4	7	0.261	31,200	2,808	3	3	3600
7	3	0.120	19,500	1,755	3	2	2400
7	6	0.100	11,700	1,053	3	2	2400
6	2	0.100	11,200	1,008	3	2	2400
2	6	0.100	26,400	2,376	3	3	3600
6	5	0.150	27,000	2,430	3	3	3600
5	1	0.100	16,400	1,476	3	2	2400
6	8	0.050	570	51	3	1	1200
		1.285					

Existing Flow Distribution
Updated to 2000 at 2% growth rate

Updating factor 1.04

Node A	Node B	length	AADT	peak vol	peak h	lanes	cap
1	5	0.100	20,904	1,881	3	2	2400
5	4	0.204	31,928	2,874	3	3	3600
4	7	0.261	32,448	2,920	3	3	3600
7	3	0.120	20,280	1,825	3	2	2400
7	6	0.100	12,168	1,095	3	2	2400
6	2	0.100	11,648	1,048	3	2	2400
2	6	0.100	27,456	2,471	3	3	3600
6	5	0.150	28,080	2,527	3	3	3600
5	1	0.100	17,056	1,535	3	2	2400
6	8	0.05	593	53	3	1	1200

Existing Movements year 2000

	length	AADT	
Mt Vic LT	0.304	2090	
Mt Vic T	0.685	13593	**20904**
Mt Vic RT	0.765	5221	
Kent LT	0.350	16474	
Kent T	0.454	9339	**27456**
Kent RT	0.835	1643	
Ad LT	0.381	5023	
Ad T	0.461	6344	**11960**
Ad RT	0.611	593	
	4.846		

SAR: Do Minimum INTANAL Model Results

Traffic flows updated to 2000 at 2.0% growth rate Subsequent analysis at 2.0% growth rate

Paterson / Dufferin Intersection

file	year	delay (h)	fuel (l)	AADT Paterson	AADT Dufferin	Delay ($)	VOC ($)	Total ($)
EXTPAT02	2002	58,764	419,264	20,436	27,725	884,000	$ 390,000	1,274,000
EXTPAT05	2005	99,440	556,948	21,618	29,337	1,477,000	$ 503,000	1,980,000
EXTPAT10	2010	152,032	699,871	23,589	31,994	2,226,000	$ 615,000	2,841,000

Notes

1 AM and PM peaks approaching saturated at 2005. Analysis capped at that level.
2 AADT Dufferin includes LT into Mt Vic Tunnel
3 Delay reflects a non-linear relationship with volume.

Adelaide Rugby Intersection

file	year	delay (h)	fuel (l)	AADT Rugby	AADT Adelaide	Delay ($)	VOC ($)	Total ($)
EXTADE02	2002	9,687	35,226	33,350	5,883	147,000	30,000	177,000
EXTADE05	2005	11,244	41,100	35,267	6,213	170,000	35,000	205,000
EXTADE10	2010	30,315	78,290	38,474	6,779	446,000	60,000	506,000
EXTADE15	2015	72,315	153,257	41,688	7,335	1,053,000	109,000	1,162,000
EXTADE20	2020	127,495	250,540	44,886	7,908	1,849,000	172,000	2,021,000

Notes

1 AM and PM peaks become saturated at 2015 for the equivalent signallised intersection. Therefore, LoS E reached at this point, and so analysis capped at this level. Refer Austroads Part 2 section 7.
2 AADT Adelaide excludes FLT lane into Rugby

Input to Economic Evaluation: Do Minimum

year	GF	TTC	Paterson i/s Delay	Adelaide i/s Delay	Adj TTC	VOC	Paterson i/s VOC	Adelaide i/s VOC	Adj VOC
2000		4,814,384				2,867,185			
2002	1.04	5,006,959	884,000	147,000	4,057,959	2,981,872	390,000	30,000	3,401,872
2005	1.10	5,295,822	1,477,000	170,000	3,648,822	3,153,903	503,000	35,000	3,691,903
2010	1.20	5,777,261	1,477,000	446,000	3,854,261	3,440,621	503,000	60,000	4,003,621
2015	1.30	6,258,699	1,477,000	1,053,000	3,728,699	3,727,340	503,000	109,000	4,339,340
2020	1.40	6,740,138	1,477,000	1,053,000	4,210,138	4,014,058	503,000	109,000	4,626,058
2025	1.50	7,221,576	1,477,000	1,053,000	4,691,576	4,300,777	503,000	109,000	4,912,777

'TTC' values above = TT costs + Congestion costs

SAR Existing

Travel Time Costs

			Existing (Year 00)				
	vpd	split	vpd	km	vkt/day	speed	h
Mt Vic LT	20,904	0.10	2,090	0.304	635	40	16
Mt Vic T		0.65	13,593	0.685	9,311	35	266
Mt Vic RT		0.25	5,221	0.765	3,994	35	114
Kent LT	27,456	0.60	16,474	0.350	5,766	35	165
Kent T		0.34	9,339	0.454	4,240	40	106
Kent RT		0.06	1,643	0.835	1,372	40	34
Ad LT	11,960	0.42	5,023	0.381	1,914	40	48
Ad T		0.53	6,344	0.461	2,925	40	73
Ad RT		0.05	593	0.611	362	40	9
	60,320		60,320	4.846	30,519		831

Network links	vkt/year	11,139,439		
	h/year			303,347
	$/year	4,814,384		4,701,872
Congestion	$/year			112,512
Total Cost	$/year			**4,814,384**
unit cost $/h	15.50			

SAR Do Minimum

Existing (Year 00)

unit cost $/h 4.50

Node A	Node B	length	AADT	peak vol	peak h	lanes	cap	vol/cap	$/veh-h	km/h	$/day
1	5	0.100	20,904	1,881	3	2	2400	0.78	1.26	40	18
5	4	0.204	31,928	2,874	3	3	3600	0.80	1.47	35	74
4	7	0.261	32,448	2,920	3	3	3600	0.81	1.67	35	109
7	3	0.120	20,280	1,825	3	2	2400	0.76	0.91	40	15
7	6	0.100	12,168	1,095	3	2	2400	0.46		40	0
6	2	0.100	11,648	1,048	3	2	2400	0.44		40	0
2	6	0.100	27,456	2,471	3	2	2400	1.03	4.94	40	92
6	5	0.150	28,080	2,527	3	3	3600	0.70	0.03	35	1
5	1	0.100	17,056	1,535	3	2	2400	0.64		40	0
6	8	0.050	593	53	3	1	1200	0.04		40	0
		1.285									308

Cost Existing $/year 112,512

SAR Existing

VOC

Existing (Year 00)

Node A	Node B	length	AADT	vkt	speed km/h	c/km	roughness counts	c/km	total c/km	total cost $
1	5	0.100	20,904	2,090	40	21.6	75	0.3	21.90	457.80
5	4	0.204	31,928	6,513	35	21.9	115	3.2	25.10	1634.84
4	7	0.261	32,448	8,469	35	21.9	125	4.0	25.90	2193.45
7	3	0.120	20,280	2,434	40	21.6	180	9.1	30.70	747.12
7	6	0.100	12,168	1,217	40	21.6	180	9.1	30.70	373.56
6	2	0.100	11,648	1,165	40	21.6	100	2.0	23.60	274.89
2	6	0.100	27,456	2,746	40	21.6	100	2.0	23.60	647.96
6	5	0.150	28,080	4,212	35	21.9	140	5.3	27.20	1145.66
5	1	0.100	17,056	1,706	40	21.6	75	0.3	21.90	373.53
6	8	0.050	593	30	40	21.6	75	0.3	21.90	6.49
		1.285		30,581					$/day	7,855
									$/year	2,867,185

Network links		2,867,185
Total	$/year	**2,867,185**

Basin Reserve

SAR: Traffic Link Flows

OptionE Flow Distribution

1998

Node A	Node B	length	AADT	lanes	cap
1	6	0.270	20100	2	2400
6	8	0.088	25700	3	3600
6	2	0.100	5000	2	2400
6	5	0.040	600	1	1200
2	6	0.100	10600	2	2400
2	5	0.100	15800	1	1200
5	1	0.233	16400	1	1200
8	4	0.300	11000	2	2400
8	3	0.131	14700	2	2400
8	7	0.064	6800	2	2400
7	6	0.040	600	1	1200
7	2	0.120	6200	2	2400
4	9	0.271	11500	1	1200
9	3	0.120	4800	2	2400
9	8	0.030	6800	2	2400
		2.007			

Option E Flow Distribution

Updated to 2000 at 2% growth rate

Updating factor 1.04

Node A	Node B	length	AADT	lanes	cap
1	6	0.270	20,904	2	2400
6	8	0.088	26,728	3	3600
6	2	0.100	5,200	2	2400
6	5	0.040	624	1	1200
2	6	0.100	11,024	2	2400
2	5	0.100	16,432	1	1200
5	1	0.233	17,056	1	1200
8	4	0.300	11,440	2	2400
8	3	0.131	15,288	2	2400
8	7	0.064	7,072	2	2400
7	6	0.040	624	1	1200
7	2	0.120	6,448	2	2400
4	9	0.271	11,960	1	1200
9	3	0.120	4,992	2	2400
9	8	0.030	7,072	2	2400

Option E Movements year 2000

	Length	AADT	
Mt Vic LT	0.66	2090	
Mt Vic T	0.49	13593	**20904**
Mt Vic RT	0.37	5221	
Kent LT	0.33	16474	
Kent T	0.49	9339	**27456**
Kent RT	0.32	1643	
Ad LT	0.39	5023	
Ad T	0.49	6344	**11960**
Ad RT	0.68	593	

Option E INTANAL Model Results

Traffic flows updated to 2000 at 1.5% growth rate

Cambridge Buckle Intersection INT1

file	year	delay (h)	fuel (l)	AADT Cambridge	AADT Buckle	Delay ($)	VOC ($)	Total ($)
EINT102	2002	32,898	271,251	7,150	26,196	502,000	256,000	758000
EINT105	2005	36,540	293,404	7,569	27,715	556,000	276,000	832000
EINT110	2010	44,619	333,302	8,257	30,226	676,000	311,000	987000
EINT115	2015	57,884	384,549	8,954	32,750	872,000	354,000	1226000

Notes 1 Flow becoming saturated at 2015 at AM peak. Analysis capped at this point D/S of 0.9 (Med AM) and 0.95 (Peak AM)

Kenrt Ellice Intersection INT2

file	year	delay (h)	fuel (l)	AADT Kent	AADT Ellice	Delay ($)	VOC ($)	Total ($)
EINT202	2002	39,000	279,272	10,757	20,780	593,000	259,000	852000
EINT205	2005	43,205	302,590	11,487	22,175	655,000	280,000	935000
EINT210	2010	50,063	337,763	12,526	24,207	758,000	311,000	1069000
EINT215	2015	57,301	377,470	13,565	26,201	865,000	348,000	1213000
EINT220	2020	66,793	419,640	14,610	28,234	1,006,000	384,000	1390000
EINT225	2025	77,646	470,013	15,656	30,260	1,166,000	429,000	1595000

Both Intersections

1. The sum of results from both intersections have been multiplied by a reduction factor to account for some assumed co-ordination of both sets of signals.

Reduction factor 0.9

file	year	delay (h)	Delay ($)	VOC ($)	Total ($)
DUF1202	2002	64,708	985,500	463,500	1,449,000
DUF1205	2005	71,771	1,089,900	500,400	1,590,300
DUF1210	2010	85,214	1,290,600	559,800	1,850,400
DUF1215	2015	103,667	1,563,300	631,800	2,195,100
DUF1220	2020	112,209	1,690,200	664,200	2,354,400
DUF1225	2025	121,977	1,834,200	704,700	2,538,900

Input to Economic Evaluation: Option E

year	GF	TTC	i/s Delay	Adjusted TTC	VOC	i/s VOC	Adjusted VOC
2000	1.00	3,144,634		3,144,634	2,022,166		2,022,166
2002	1.04	3,270,420	985,500	4,255,920	2,103,053	463,500	2,566,553
2005	1.10	3,459,098	1,089,900	4,548,998	2,224,383	500,400	2,724,783
2010	1.20	3,773,561	1,290,600	5,064,161	2,426,599	559,800	2,986,399
2015	1.30	4,088,025	1,563,300	5,651,325	2,628,816	631,800	3,260,616
2020	1.40	4,402,488	1,690,200	6,092,688	2,831,033	664,200	3,495,233
2025	1.50	4,716,952	1,834,200	6,551,152	3,033,249	704,700	3,737,949

'TTC' values above = TT costs + Congestion costs

Option E

Flyover (Buckle), signal for RT Sussex into Kent, Kent RT via Sussex, Rugby and Dufferin

Travel Time Reduction Option E

				Option E (Year 00)			
	vpd	split	vpd	km	vkt/day	speed	h
Mt Vic LT	20,904	0.10	2,090	0.66	1,377	40	34
Mt Vic T		0.65	13,593	0.49	6,647	50	133
Mt Vic RT		0.25	5,221	0.37	1,932	50	39
Kent LT	27,456	0.60	16,474	0.33	5,486	50	110
Kent T		0.34	9,339	0.49	4,557	50	91
Kent RT		0.06	1,643	0.32	524	40	13
Ad LT	11,960	0.42	5,023	0.39	1,964	50	39
Ad T		0.53	6,344	0.49	3,077	50	62
Ad RT		0.05	593	0.68	402	35	11
	60,320		60,320		25,966		532

Network links	vkt/year	9,477,712	
	h/year		194,282
	$/year	3,144,634	3,011,374
Congestion	$/year		133,260
Total Cost	$/year		3,144,634

unit cost $/h 15.50

Option E

Flyover (Buckle), signal for RT Sussex into Kent, Kent RT via Sussex, Rugby and Dufferin

Option E

unit cost $/h 4.50

Node A	Node B	length	AADT	peak vol	peak h	lanes	cap	vol/cap	$/veh-h	km/h	$/day
1	6	0.270	20,904	1,881	3	2	2400	0.78	1.26	50	38
6	8	0.088	26,728	2,406	3	3	3600	0.67		50	0
6	2	0.100	5,200	468	3	2	2400	0.20		50	0
6	5	0.040	624	56	3	1	1200	0.05		50	0
2	6	0.100	11,024	992	3	2	2400	0.41		40	0
2	5	0.100	16,432	1,479	3	1	1200	1.23	7.99	40	89
5	1	0.233	17,056	1,535	3	1	1200	1.28	8.69	50	186
8	4	0.300	11,440	1,030	3	2	2400	0.43		50	0
8	3	0.131	15,288	1,376	3	2	2400	0.57		50	0
8	7	0.064	7,072	636	3	2	2400	0.27		50	0
7	6	0.040	624	56	3	1	1200	0.05		50	0
7	2	0.120	6,448	580	3	2	2400	0.24		50	0
4	9	0.271	11,960	1,076	3	1	1200	0.90	2.96	50	52
9	3	0.120	4,992	449	3	2	2400	0.19		50	0
9	8	0.030	7,072	636	3	2	2400	0.27		50	0
		2.007									365

Cost Option 1 $/year **133,260**

Notes 1 Peak volumes assumed to be 9% of AADT

Option E

Flyover (Buckle), signal for RT Sussex into Kent, Kent RT via Sussex, Rugby and Dufferin

Option E (Year 00)

									NAASRA	counts/km 50
					speed	speed	roughness		total	total cost
Node A	Node B	length	AADT	vkt	km/h	c/km	counts	c/km	c/km	$
1	6	0.270	20,904	5,644	50	21.3	50	0.0	21.30	1202.19
6	8	0.088	26,728	2,352	50	21.3	50	0.0	21.30	500.99
6	2	0.100	5,200	520	50	21.3	50	0.0	21.30	110.76
6	5	0.040	624	25	30	22.2	50	0.0	22.20	5.54
2	6	0.100	11,024	1,102	50	21.3	50	0.0	21.30	234.81
2	5	0.100	16,432	1,643	50	21.3	50	0.0	21.30	350.00
5	1	0.233	17,056	3,974	50	21.3	50	0.0	21.30	846.47
8	4	0.300	11,440	3,432	50	21.3	50	0.0	21.30	731.02
8	3	0.131	15,288	2,003	50	21.3	50	0.0	21.30	426.58
8	7	0.064	7,072	453	50	21.3	50	0.0	21.30	96.41
7	6	0.040	624	25	30	22.2	50	0.0	22.20	5.54
7	2	0.120	6,448	774	50	21.3	50	0.0	21.30	164.81
4	9	0.271	11,960	3,241	50	21.3	50	0.0	21.30	690.37
9	3	0.120	4,992	599	50	21.3	50	0.0	21.30	127.60
9	8	0.030	7,072	212	30	22.2	50	0.0	22.20	47.10
		2.007		25,999					$/day	5,540
									$/year	2,022,166

SAR: Traffic Link Flows

Option F Flow Distribution
Montgomery Watson Report 1998

Node A	Node B	length	AADT	lanes	cap
1	6	0.327	20,100	2	2400
6	4	0.303	11,000	1	1200
6	5	0.106	600	1	1200
6	2	0.130	11,200	2	2400
6	3	0.158	14,700	2	2400
2	5	0.116	15,800	2	2400
2	6	0.130	10,600	2	2400
5	1	0.228	16,400	1	1200
4	7	0.237	11,500	2	2400
7	3	0.150	4,800	1	1200
7	6	0.070	6,800	3	3600
		1.955			

Option F Flow Distribution
Updated to 2000 at 2% growth rate

Updating factor 1.04

Option F

Node A	Node B	length	AADT	lanes	cap
1	6	0.327	20,904	2	2400
6	4	0.303	11,440	1	1200
6	5	0.106	624	1	1200
6	2	0.130	11,648	2	2400
6	3	0.158	15,288	2	2400
2	5	0.116	16,432	2	2400
2	6	0.130	11,024	2	2400
5	1	0.228	17,056	1	1200
4	7	0.237	11,960	2	2400
7	3	0.150	4,992	1	1200
7	6	0.070	7,072	3	3600

Option F Movements year 2000

	length	AADT	
Mt Vic LT	0.634	2090	
Mt Vic T	0.485	13593	**20904**
Mt Vic RT	0.457	5221	
Kent LT	0.344	16474	
Kent T	0.437	9339	**27456**
Kent RT	0.288	1643	
Ad LT	0.387	5023	
Ad T	0.437	6344	**11960**
Ad RT	0.641	593	

Option F

Traffic flows updated to 2000 at 2% growth rate

Cambridge Sussex Ellice Intersection

file	year	delay (h)	fuel (l)	AADT Cambridge	AADT Ellice	Delay ($)	VOC ($)	Total ($)
F02	2002	60,649	394,410	18,359	20,455	928,000	363,000	1291000
F05	2005	66,079	417,566	19,396	21,623	1,011,000	383,000	1394000
F10	2010	75,311	462,230	21,174	23,593	1,149,000	422,000	1571000
F15	2015	87,029	516,742	22,948	25,558	1,325,000	470,000	1795000
F20	2020	99,713	566,242	24,712	27,529	1,514,000	513,000	2027000
F25	2025	116,260	626,784	26,479	29,489	1,761,000	563,000	2324000

Input to Economic Evaluation: Option F

year	GF	TTC	Ellice i/s Delay	input Adjusted TTC	VOC	Ellice i/s VOC	input Adjusted VOC
2000	1.00	3,384,080		3,384,080	2,002,574		2,002,574
2002	1.04	3,519,443	928,000	4,447,443	2,082,677	363,000	2,445,677
2005	1.10	3,722,488	1,011,000	4,733,488	2,202,832	383,000	2,585,832
2010	1.20	4,060,896	1,149,000	5,209,896	2,403,089	422,000	2,825,089
2015	1.30	4,399,304	1,325,000	5,724,304	2,603,346	470,000	3,073,346
2020	1.40	4,737,712	1,514,000	6,251,712	2,803,604	513,000	3,316,604
2025	1.50	5,076,120	1,761,000	6,837,120	3,003,861	563,000	3,566,861

'TTC' values above = TT costs + Congestion costs

Option F

Flyover (Buckle), signal for RT Sussex into Kent, Kent RT via Sussex, Rugby and Dufferin

Travel Time Reduction Option F

				Option F (Year 00)			
	vpd	split	vpd	km	vkt/day	speed	h
Mt Vic LT	20,904	0.10	2,090	0.634	1,325	40	33
Mt Vic T		0.65	13,593	0.485	6,593	50	132
Mt Vic RT		0.25	5,221	0.457	2,386	40	60
Kent LT	27,456	0.60	16,474	0.344	5,667	50	113
Kent T		0.34	9,339	0.437	4,081	40	102
Kent RT		0.06	1,643	0.288	473	50	9
Ad LT	11,960	0.42	5,023	0.387	1,944	40	49
Ad T		0.53	6,344	0.437	2,772	40	69
Ad RT		0.05	593	0.641	380	40	10
	60,320		60,320		25,621		577

Network links	vkt/year	9,351,806	
	h/year		210,558
	$/year	3,384,080	3,263,645
Congestion	$/year		120,435
Total Cost	$/year		3,384,080

unit cost $/h 15.50

Option F Congestion

Flyover (Buckle), signal for RT Sussex into Kent, Kent RT via Sussex, Rugby and Dufferin

Option F

unit cost $/h 4.50

Node A	Node B	length	AADT	peak vol	peak h	lanes	cap	vol/cap	$/veh-h	km/h	$/day
1	6	0.327	20,904	1,881	3	2	2400	0.78	1.26	50	46
6	4	0.303	11,440	1,030	3	1	1200	0.86	2.37	40	55
6	5	0.106	624	56	3	1	1200	0.05		50	0
6	2	0.130	11,648	1,048	3	2	2400	0.44		50	0
6	3	0.158	15,288	1,376	3	2	2400	0.57		50	0
2	5	0.116	16,432	1,479	3	2	2400	0.62		50	0
2	6	0.130	11,024	992	3	2	2400	0.41		50	0
5	1	0.228	17,056	1,535	3	1	1200	1.28	8.69	40	228
4	7	0.237	11,960	1,076	3	2	2400	0.45		40	0
7	3	0.150	4,992	449	3	1	1200	0.37		40	0
7	6	0.070	7,072	636	3	3	3600	0.18		50	0
		1.955									330

Cost Option 2 $/year **120,435**

Option F VOC

Flyover (Buckle), signal for RT Sussex into Kent, Kent RT via Sussex, Rugby and Dufferin

Option F (Year 00)

									NAASRA	counts/km 50
					speed	speed	roughness		total	total cost
Node A	Node B	length	AADT	vkt	km/h	c/km	counts	c/km	c/km	$
1	6	0.327	20,904	6,836	50	21.3	50	0.0	21.30	1455.98
6	4	0.303	11,440	3,466	40	21.6	50	0.0	21.60	748.73
6	5	0.106	624	66	50	21.3	50	0.0	21.30	14.09
6	2	0.130	11,648	1,514	50	21.3	50	0.0	21.30	322.53
6	3	0.158	15,288	2,416	50	21.3	50	0.0	21.30	514.50
2	5	0.116	16,432	1,906	50	21.3	50	0.0	21.30	406.00
2	6	0.130	11,024	1,433	50	21.3	50	0.0	21.30	305.25
5	1	0.228	17,056	3,889	40	21.6	50	0.0	21.60	839.97
4	7	0.237	11,960	2,835	40	21.6	50	0.0	21.60	612.26
7	3	0.150	4,992	749	40	21.6	50	0.0	21.60	161.74
7	6	0.070	7,072	495	50	21.3	50	0.0	21.30	105.44
		1.955		25,604					$/day	5,487
									$/year	2,002,574

SAR: Traffic Link Flows

Existing Flow Distribution
Montgomery Watson Report 1998

Node A	Node B	length	AADT	lanes	cap
1	5	0.100	20,100	1	1200
5	4	0.210	30,700	3	3600
4	7	0.300	31,200	3	3600
7	3	0.100	19,500	2	2400
7	6	0.120	11,700	2	2400
6	2	0.100	11,200	2	2400
2	6	0.100	26,400	3	3600
6	5	0.210	27,000	3	3600
5	1	0.100	16,400	1	1200
		1.340			

Existing Flow Distribution
Updated to 2000 at 1.5% growth rate

Updating factor 1.03

Node A	Node B	length	AADT	lanes	cap	length
1	5	0.100	20,703	1	1200	0.1
5	4	0.210	31,621	3	3600	0.204
4	7	0.300	32,136	3	3600	0.261
7	3	0.100	20,085	2	2400	0.1
7	6	0.120	12,051	2	2400	0.091
6	2	0.100	11,536	2	2400	0.1
2	6	0.100	27,192	3	3600	0.1
6	5	0.210	27,810	3	3600	0.142
5	1	0.100	16,892	1	1200	0.1

	length
Mt Vic LT	0.30
Mt Vic T	0.67
Mt Vic RT	0.76
Kent LT	0.34
Kent T	0.45
Kent RT	0.81
Ad LT	0.36
Ad T	0.45
Ad RT	0.59

Option H Input

Input to Economic Evaluation: Option H

year	GF	TTC	i/s delay	Adj. TTC	VOC	i/s delay	Adj. VOC
2000		2,884,929	0	2,884,929	1,974,184	0	1,974,184
2002	1.04	3,000,326	0	3,000,326	2,053,152	0	2,053,152
2005	1.10	3,173,422	0	3,173,422	2,171,603	0	2,171,603
2010	1.20	3,461,915	0	3,461,915	2,369,021	0	2,369,021
2015	1.30	3,750,408	0	3,750,408	2,566,440	0	2,566,440
2020	1.40	4,038,900	0	4,038,900	2,763,858	0	2,763,858
2025	1.50	4,327,393	0	4,327,393	2,961,276	0	2,961,276

'TTC' values above = TT costs + Congestion costs

SAR Option H

Two flyovers (Dufferin and Sussex/Cambridge), priority RT merge Sussex into Kent

Travel Time Reduction Option H

	vpd	split	vpd	Option H (Year 00) km	vkt/day	speed	h
Mt Vic LT	20,904	0.10	2,090	0.311	650	50	13
Mt Vic T		0.65	13,593	0.483	6,565	50	131
Mt Vic RT		0.25	5,221	0.353	1,843	50	37
Kent LT	27,456	0.60	16,474	0.322	5,305	50	106
Kent T		0.34	9,339	0.481	4,492	50	90
Kent RT		0.06	1,643	0.842	1,383	50	28
Ad LT	11,960	0.42	5,023	0.361	1,813	50	36
Ad T		0.53	6,344	0.439	2,785	50	56
Ad RT		0.05	593	0.861	511	40	13
	60,320		60,320		25,347		510

Network links	vkt/year	9,251,804	
	h/year		185,968
	$/year		2,882,502
Congestion	$/year		2,427
Total Cost	$/year		2,884,929

unit cost $/h 15.50

SAR Option H Congestion

Two flyovers (Dufferin and Sussex/Cambridge), priority RT merge Sussex into Kent

Option H (Year 00)

unit cost $/h 4.50

Node A	Node B	length	AADT	peak vol	peak h	lanes	cap	vol/cap	$/veh-h	km/h	$/day
1	6	0.033	20,904	1,881	3	2	2400	0.78	1.26	50	5
6	5	0.089	2,090	188	3	1	1200	0.16		50	0
5	4	0.189	13,073	1,177	3	2	2400	0.49		50	0
4	9	0.187	13,603	1,224	3	2	2400	0.51		50	0
9	3	0.174	6,666	600	3	1	1200	0.50		50	0
9	2a	0.252	6,937	624	3	2	2400	0.26		50	0
2a	2b	0.1	593	53	3	1	1200	0.04		50	0
2b	7	0.132	28,049	2,524	3	3	3600	0.70	0.02	50	0
7	5	0.16	10,982	988	3	2	2400	0.41		50	0
7	1	0.19	17,066	1,536	3	2	2400	0.64		40	0
6	8	0.19	18,814	1,693	3	2	2400	0.71	0.08	50	2
8	2a	0.13	5,221	470	3	1	1200	0.39		50	0
8	3	0.26	13,593	1,223	3	2	2400	0.51		50	0
		2.086									7

Cost Option H $/year **2,427**

SAR Option H VOC

Two flyovers (Dufferin and Sussex/Cambridge), priority RT merge Sussex into Kent

Option H (Year 00)

									NAASRA	counts/km 50
					speed	speed	roughness		total	total cost
Node A	Node B	length	AADT	vkt	km/h	c/km	counts	c/km	c/km	$
1	6	0.033	20,904	690	50	21.3	50	0.0	21.30	146.93
6	5	0.089	2,090	186	50	21.3	50	0.0	21.30	39.63
5	4	0.189	13,073	2,471	50	21.3	50	0.0	21.30	526.27
4	9	0.187	13,603	2,544	50	21.3	50	0.0	21.30	541.83
9	3	0.174	6,666	1,160	50	21.3	50	0.0	21.30	247.07
9	2a	0.252	6,937	1,748	50	21.3	50	0.0	21.30	372.34
2a	2b	0.1	593	59	50	21.3	50	0.0	21.30	12.63
2b	7	0.132	28,049	3,702	50	21.3	50	0.0	21.30	788.62
7	5	0.16	10,982	1,757	50	21.3	50	0.0	21.30	374.28
7	1	0.19	17,066	3,243	40	21.6	50	0.0	21.60	700.41
6	8	0.19	18,814	3,575	50	21.3	50	0.0	21.30	761.39
8	2a	0.13	5,221	679	50	21.3	50	0.0	21.30	144.56
8	3	0.26	13,593	3,534	50	21.3	50	0.0	21.30	752.77
		2.086		25,347					$/day	5,409
									$/year	1,974,184

SAR: Traffic Link Flows

Option I Flow Distribution
Montgomery Watson Report 1998

Node A	Node B	length	AADT	lanes	cap
1	6	0.066	20,100	2	2400
6	7	0.069	18,100	2	2400
6	5	0.067	2,000	1	1200
5	4	0.198	2,000	1	1200
5	7	0.069	1,600	1	1200
4	5	0.200	1,600	1	1200
4	11	0.188	11,500	2	2400
11	3	0.164	4,800	1	1200
11	9	0.182	6,800	2	2400
9	2	0.064	11,200	3	3600
9	12	0.051	600	1	1200
9	4	0.373	10,800	2	2400
2	9	0.076	10,800	2	2400
2	12	0.093	15,800	2	2400
12	1	0.246	18,400	2	2400
7	8	0.084	19,700	2	2400
8	9	0.060	5,000	2	2400
8	10	0.050	14,700	2	2400
10	3	0.195	14,700	2	2400
		2.495			

Option I Flow Distribution
Updated to 2000 at 1.5% growth rate

Updating factor 1.04

Node A	Node B	length	AADT	lanes	cap
1	6	0.066	20,904	2	2400
6	7	0.069	18,824	2	2400
6	5	0.067	2,080	1	1200
5	4	0.198	2,080	1	1200
5	7	0.069	1,664	1	1200
4	5	0.200	1,664	1	1200
4	11	0.188	11,960	2	2400
11	3	0.164	4,992	1	1200
11	9	0.182	7,072	2	2400
9	2	0.064	11,648	3	3600
9	12	0.051	624	1	1200
9	4	0.373	11,024	2	2400
2	9	0.076	11,024	2	2400
2	12	0.093	16,432	2	2400
12	1	0.246	17,056	2	2400
7	8	0.084	20,488	2	2400
8	9	0.060	5,200	2	2400
8	10	0.050	15,288	2	2400
10	3	0.195	15,288	2	2400

Option I Movements year 2000

	length	AADT	
Mt Vic LT	0.331	2090	
Mt Vic T	0.464	13593	20904
Mt Vic RT	0.343	5221	
Kent LT	0.339	16474	
Kent T	0.449	9339	27456
Kent RT	1.047	1643	
Ad LT	0.352	5023	
Ad T	0.434	6344	11960
Ad RT	0.667	593	

SAR: Option I INTANAL Model Results

Traffic flows updated to 2000 at 2% growth rate

Cambridge Sussex Ellice Intersection

file	year	delay (h)	fuel (l)	AADT Cambridge	AADT Ellice	Delay ($)	VOC ($)	Total ($)
I02	2002	27,043	181,745	17,492	5,050	414,000	167,000	581000
I05	2005	29,107	195,474	18,665	5,387	445,000	180,000	625000
I10	2010	32,202	216,203	20,369	5,882	492,000	199,000	691000
I15	2015	35,516	236,129	22,062	6,363	542,000	218,000	760000
I20	2020	39,131	256,431	23,762	6,859	597,000	236,000	833000
I25	2025	42,720	278,509	25,467	7,352	651,000	256,000	907000

Note 1 Roundabout outside schools ignored in INTANAL analysis. Would have very small impact

Input to Economic Evaluation: Option I

year	GF	TTC	Ellice i/s Delay	School r/a Delay	input Adjusted TTC	VOC	Ellice i/s VOC	School r/a VOC	input Adjusted VOC
2000	1.00	2,947,106			2,947,106	1,967,587			1,967,587
2002	1.04	3,064,990	414,000	0	3,478,990	2,046,290	167,000	0	2,213,290
2005	1.10	3,241,816	445,000	0	3,686,816	2,164,345	180,000	0	2,344,345
2010	1.20	3,536,527	492,000	0	4,028,527	2,361,104	199,000	0	2,560,104
2015	1.30	3,831,238	542,000	0	4,373,238	2,557,862	218,000	0	2,775,862
2020	1.40	4,125,948	597,000	0	4,722,948	2,754,621	236,000	0	2,990,621
2025	1.50	4,420,659	651,000	0	5,071,659	2,951,380	256,000	0	3,207,380

'TTC' values above = TT costs + Congestion costs

SAR Option I

Flyover (Buckle), signal for RT Sussex into Kent, Kent RT via Sussex, Rugby and Dufferin

Travel Time Reduction Option I

				Option I (Year 00)			
	vpd	split	vpd	km	vkt/day	speed	h
Mt Vic LT	20,904	0.10	2,090	0.331	692	40	17
Mt Vic T		0.65	13,588	0.464	6,305	50	126
Mt Vic RT		0.25	5,226	0.343	1,793	50	36
Kent LT	27,456	0.60	16,474	0.339	5,585	50	112
Kent T		0.34	9,335	0.449	4,191	50	84
Kent RT		0.06	1,647	1.047	1,725	40	43
Ad LT	11,960	0.42	5,023	0.352	1,768	50	35
Ad T		0.53	6,339	0.434	2,751	50	55
Ad RT		0.05	598	0.667	399	35	11
	60,320		60,320		25,208		520

Network links	vkt/year	9,200,894	
	h/year		189,676
	$/year	2,947,106	2,939,982
Congestion	$/year		7,124
Total Cost	$/year		2,947,106

unit cost $/h 15.50

SAR Option I Congestion

Flyover (Buckle), signal for RT Sussex into Kent, Kent RT via Sussex, Rugby and Dufferin

Option I

unit cost $/h 4.50

Node A	Node B	length	AADT	peak vol	peak h	lanes	cap	vol/cap	$/veh-h	km/h	$/day
1	6	0.066	20,904	1,881	3	2	2400	0.78	1.26	50	9
6	7	0.069	18,824	1,694	3	2	2400	0.71	0.09	50	1
6	5	0.067	2,080	187	3	1	1200	0.16		50	0
5	4	0.198	2,080	187	3	1	1200	0.16		50	0
5	7	0.069	1,664	150	3	1	1200	0.12		40	0
4	5	0.200	1,664	150	3	1	1200	0.12		40	0
4	11	0.188	11,960	1,076	3	2	2400	0.45		50	0
11	3	0.164	4,992	449	3	1	1200	0.37		50	0
11	9	0.182	7,072	636	3	2	2400	0.27		50	0
9	2	0.064	11,648	1,048	3	3	3600	0.29		50	0
9	12	0.051	624	56	3	1	1200	0.05		50	0
9	4	0.373	11,024	992	3	2	2400	0.41		50	0
2	9	0.076	11,024	992	3	2	2400	0.41		50	0
2	12	0.093	16,432	1,479	3	2	2400	0.62		50	0
12	1	0.246	17,056	1,535	3	2	2400	0.64		50	0
7	8	0.084	20,488	1,844	3	2	2400	0.77	1.02	50	10
8	9	0.060	5,200	468	3	2	2400	0.20		50	0
8	10	0.050	15,288	1,376	3	2	2400	0.57		50	0
10	3	0.195	15,288	1,376	3	2	2400	0.57		50	0
		2.495									20

Cost Option 4 $/year 7,124

SAR Option I VOC

Flyover (Buckle), signal for RT Sussex into Kent, Kent RT via Sussex, Rugby and Dufferin

Option I (Year 00)

									NAASRA	counts/km 50
					speed	speed	roughness		total	total cost
Node A	Node B	length	AADT	vkt	km/h	c/km	counts	c/km	c/km	$
1	6	0.066	20,904	1,380	50	21.3	50	0.0	21.30	293.87
6	7	0.069	18,824	1,299	50	21.3	50	0.0	21.30	276.66
6	5	0.067	2,080	139	40	21.6	50	0.0	21.60	30.10
5	4	0.198	2,080	412	30	22.2	50	0.0	22.20	91.43
5	7	0.069	1,664	115	40	21.6	50	0.0	21.60	24.80
4	5	0.200	1,664	333	30	22.2	50	0.0	22.20	73.88
4	11	0.188	11,960	2,248	50	21.3	50	0.0	21.30	478.93
11	3	0.164	4,992	819	40	21.6	50	0.0	21.60	176.84
11	9	0.182	7,072	1,287	50	21.3	50	0.0	21.30	274.15
9	2	0.064	11,648	745	50	21.3	50	0.0	21.30	158.79
9	12	0.051	624	32	40	21.6	50	0.0	21.60	6.87
9	4	0.373	11,024	4,112	50	21.3	50	0.0	21.30	875.85
2	9	0.076	11,024	838	50	21.3	50	0.0	21.30	178.46
2	12	0.093	16,432	1,528	50	21.3	50	0.0	21.30	325.50
12	1	0.246	17,056	4,196	50	21.3	50	0.0	21.30	893.70
7	8	0.084	20,488	1,721	50	21.3	50	0.0	21.30	366.57
8	9	0.060	5,200	312	50	21.3	50	0.0	21.30	66.46
8	10	0.050	15,288	764	50	21.3	50	0.0	21.30	162.82
10	3	0.195	15,288	2,981	50	21.3	50	0.0	21.30	634.99
		2.495		25,261					$/day	5,391
									$/year	1,967,587

SAR: Traffic Link Flows

Option J Flow Distribution
Montgomery Watson Report 1998

Node A	Node B	length	AADT	lanes	cap
1	6	0.066	20,100	2	2400
6	7	0.069	18,100	2	2400
6	5	0.067	2,000	1	1200
5	4	0.198	2,000	1	1200
5	7	0.069	100	1	1200
4	5	0.200	100	1	1200
4	11	0.248	11,500	2	2400
11	3	0.135	4,800	1	1200
11	9	0.125	6,800	2	2400
9	2	0.064	11,200	3	3600
9	10	0.055	1,600	1	1200
9	12	0.051	600	1	1200
9	4	0.373	9,000	2	2400
2	9	0.076	10,600	2	2400
2	12	0.093	15,800	2	2400
12	1	0.246	16,400	2	2400
7	8	0.084	18,100	2	2400
8	9	0.060	5,000	2	2400
8	10	0.050	13,100	2	2400
10	3	0.195	14,700	2	2400
		2.524			

Option J Flow Distribution
Updated to 2000 at 1.5% growth rate

Updating factor 1.04

Node A	Node B	length	AADT	lanes	cap
1	6	0.066	20,904	2	2400
6	7	0.069	18,824	2	2400
6	5	0.067	2,080	1	1200
5	4	0.198	2,080	1	1200
5	7	0.069	104	1	1200
4	5	0.200	104	1	1200
4	11	0.248	11,960	2	2400
11	3	0.135	4,992	1	1200
11	9	0.125	7,072	2	2400
9	2	0.064	11,648	3	3600
9	10	0.055	1,664	1	1200
9	12	0.051	624	2	2400
9	4	0.373	9,360	2	2400
2	9	0.076	11,024	2	2400
2	12	0.093	16,432	2	2400
12	1	0.246	17,056	2	2400
7	8	0.084	18,824	2	2400
8	9	0.060	5,200	2	2400
8	10	0.050	13,624	2	2400
10	3	0.195	15,288	2	2400

Option J Movements year 2000

	length	AADT	
Mt Vic LT	0.331	2090	
Mt Vic T	0.464	13593	20904
Mt Vic RT	0.343	5221	
Kent LT	0.339	16474	
Kent T	0.449	9339	27456
Kent RT	0.326	1643	
Ad LT	0.383	5023	
Ad T	0.437	6344	11960
Ad RT	0.670	593	

SAR: Option J INTANAL Model Results

Traffic flows updated to 2000 at 2% growth rate

Cambridge Sussex Ellice Intersection

file	year	delay (h)	fuel (l)	AADT Cambridge	AADT Ellice	Delay ($)	VOC ($)	Total ($)
J02	2002	27,182	181,754	17,477	5,050	416,000	167,000	583,000
J05	2005	29,234	196,150	18,660	5,387	447,000	181,000	628,000
J10	2010	32,522	216,363	20,368	5,882	497,000	199,000	696,000
J15	2015	35,833	236,169	22,071	6,363	547,000	217,000	764,000
J20	2020	39,459	256,912	23,772	6,859	602,000	236,000	838,000
J25	2025	43,457	278,798	25,466	7,352	661,000	256,000	917,000

Note 1 Roundabout outside schools ignored in INTANAL analysis. Would have very small impact

Input to Economic Evaluation: Option J

year	GF	TTC	Ellice i/s Delay	Adjusted TTC	VOC	Ellice i/s VOC	Adjusted VOC
2000	1.00	2,795,976		2,795,976	1,888,482		1,888,482
2002	1.04	2,907,815	416,000	3,323,815	1,964,021	167,000	2,131,021
2005	1.10	3,075,573	447,000	3,522,573	2,077,330	181,000	2,258,330
2010	1.20	3,355,171	497,000	3,852,171	2,266,178	199,000	2,465,178
2015	1.30	3,634,769	547,000	4,181,769	2,455,026	217,000	2,672,026
2020	1.40	3,914,366	602,000	4,516,366	2,643,675	236,000	2,879,675
2025	1.50	4,193,964	661,000	4,854,964	2,832,723	256,000	3,088,723

'TTC' values above = TT costs + Congestion costs

SAR Option J Congestion

Flyover (Buckle), signal for RT Sussex into Kent and RT Kent into Buckle

Option J

unit cost $/h 4.50

Node A	Node B	length	AADT	peak vol	peak h	lanes	cap	vol/cap	$/veh-h	km/h	$/day
1	6	0.066	20,904	1,881	3	2	2400	0.78	1.26	50	9
6	7	0.069	18,824	1,694	3	2	2400	0.71	0.09	50	1
6	5	0.067	2,080	187	3	1	1200	0.16		50	0
5	4	0.198	2,080	187	3	1	1200	0.16		50	0
5	7	0.069	104	9	3	1	1200	0.01		40	0
4	5	0.200	104	9	3	1	1200	0.01		40	0
4	11	0.248	11,960	1,076	3	2	2400	0.45		50	0
11	3	0.135	4,992	449	3	1	1200	0.37		50	0
11	9	0.125	7,072	636	3	2	2400	0.27		50	0
9	2	0.064	11,648	1,048	3	3	3600	0.29		50	0
9	10	0.055	1,664	150	3	1	1200	0.12		50	0
9	12	0.051	624	56	3	2	2400	0.02		50	0
9	4	0.373	9,360	842	3	2	2400	0.35		50	0
2	9	0.076	11,024	992	3	2	2400	0.41		50	0
2	12	0.093	16,432	1,479	3	2	2400	0.62		50	0
12	1	0.246	17,056	1,535	3	2	2400	0.64		50	0
7	8	0.084	18,824	1,694	3	2	2400	0.71	0.09	50	1
8	9	0.060	5,200	468	3	2	2400	0.20		50	0
8	10	0.050	13,624	1,226	3	2	2400	0.51		50	0
10	3	0.195	15,288	1,376	3	2	2400	0.57		50	0
		2.524									11

Cost Option J $/year **3,925**

SAR Option J

Flyover (Buckle), signal for RT Sussex into Kent and RT Kent into Buckle

Travel Time Reduction Option J

				Option J (Year 00)			
	vpd	split	vpd	km	vkt/day	speed	h
Mt Vic LT	20,904	0.10	2,090	0.331	692	40	17
Mt Vic T		0.65	13,588	0.464	6,305	50	126
Mt Vic RT		0.25	5,226	0.343	1,793	50	36
Kent LT	27,456	0.60	16,474	0.339	5,585	50	112
Kent T		0.34	9,335	0.449	4,191	50	84
Kent RT		0.06	1,647	0.326	537	40	13
Ad LT	11,960	0.42	5,023	0.383	1,924	50	38
Ad T		0.53	6,339	0.437	2,770	50	55
Ad RT		0.05	598	0.670	401	35	11
	60,320		60,320		24,197		494

Network links	vkt/year	8,831,799	
	h/year		180,132
	$/year	2,795,976	2,792,051
Congestion	$/year		3,925
Total Cost	$/year		2,795,976

unit cost $/h 15.50

SAR Option J VOC

Flyover (Buckle), signal for RT Sussex into Kent and RT Kent into Buckle

Option J (Year 00)

									NAASRA	counts/km 50
					speed	speed	roughness		total	total cost
Node A	Node B	length	AADT	vkt	km/h	c/km	counts	c/km	c/km	$
1	6	0.066	20,904	1,380	50	21.3	50	0.0	21.30	293.87
6	7	0.069	18,824	1,299	50	21.3	50	0.0	21.30	276.66
6	5	0.067	2,080	139	40	21.6	50	0.0	21.60	30.10
5	4	0.198	2,080	412	30	22.2	50	0.0	22.20	91.43
5	7	0.069	104	7	40	21.6	50	0.0	21.60	1.55
4	5	0.200	104	21	30	22.2	50	0.0	22.20	4.62
4	11	0.248	11,960	2,966	50	21.3	50	0.0	21.30	631.78
11	3	0.135	4,992	674	40	21.6	50	0.0	21.60	145.57
11	9	0.125	7,072	884	50	21.3	50	0.0	21.30	188.29
9	2	0.064	11,648	745	50	21.3	50	0.0	21.30	158.79
9	10	0.055	1,664	92	40	21.6	50	0.0	21.60	19.77
9	12	0.051	624	32	40	21.6	50	0.0	21.60	6.87
9	4	0.373	9,360	3,491	50	21.3	50	0.0	21.30	743.64
2	9	0.076	11,024	838	50	21.3	50	0.0	21.30	178.46
2	12	0.093	16,432	1,528	50	21.3	50	0.0	21.30	325.50
12	1	0.246	17,056	4,196	50	21.3	50	0.0	21.30	893.70
7	8	0.084	18,824	1,581	50	21.3	50	0.0	21.30	336.80
8	9	0.060	5,200	312	50	21.3	50	0.0	21.30	66.46
8	10	0.050	13,624	681	50	21.3	50	0.0	21.30	145.10
10	3	0.195	15,288	2,981	50	21.3	50	0.0	21.30	634.99
		2.524		24,259					$/day	5,174
									$/year	**1,888,482**