cranbourne east
precinct structure plan

TRAFFIC ASSESSMENT AND MODELLING

CEUGP/SR8A

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1 INTRODUCTION

This draft report for the Cranbourne East Precinct Structure Plan has been prepared by Veitch Lister Consulting (VLC). VLC is responsible for the travel forecasting and road network planning elements of the Plan.

A complementary report has been prepared by PBA International that addresses public transport, walking, cycling and sustainable transport issues.

This report provides background information relevant to the planning of transport infrastructure and services for Cranbourne East. The report is structured as follows:

Section 2: Lists the key elements of Council's Transport Planning Policy, as enunciated in its C21 Strategy.

Section 3: Briefly describes the Zenith travel forecasting model that has been used to produce travel forecasts for the project. A more detailed description of the structure of the model and its "inner workings" is contained in Appendix A.

Section 4: Describes the procedures that have been used to establish a version of the Zenith model designed specifically to address the key transport issues of the project, and presents the results of the validation of the model.

Section 5: Describes the current travel patterns and demands of Casey residents, including their travel interactions with adjoining Municipalities.

Section 6: Presents the land use, transport network and other assumptions that have been adopted when using the Zenith model to produce 2031 Base Case Scenario travel forecasts. The Base Case Scenario has adopted recently released DSE population projections across Melbourne, but assumes that development will not occur at Cranbourne East. "With development" scenarios will be the focus of a later report.

Section 7: Provides the Zenith model 2031 travel demand forecasts for Casey, including demand by mode and forecast weekday traffic flows.

Section 8: Identifies some of the key transport planning issues that will need to be addressed in the planning for the Cranbourne East Growth Area.

Appendix A: Description of the Zenith Travel Forecasting Model

Appendix B: Contains the VicRoads programme of arterial road network improvements to be used for modelling purposes.

Appendix C Detailed Results of Model Validation against Traffic Counts

Subsequent reports will provide more explicit information relating to the transportation implications of alternative development scenarios for Cranbourne East.

2 TRANSPORT POLICY BACKGROUND

In 2002 the City of Casey released its C21 Strategy - A Vision for the City of Casey. The strategy presented a blueprint for the future development of this rapidly developing Municipality, which it is envisaged will ultimately accommodate over 300,000 residents.

One of the key objectives of the C21 Strategy is the creation of an Accessible City. The strategy recognised that "Accessibility to goods, services, jobs and facilities is a fundamental right of people in the community. It is a social objective not an infrastructure goal. Casey's location on Melbourne's fringe requires innovative planning if the needs of the community are to be met".

The strategy identified 10 goals aimed at achieving is Accessibility Objective, as follows:

1. Integration of land use and transport outcomes
2. Mile grid of arterial roads
3. Public transport friendly suburb design
4. A shift to public transport
5. New east-west arterial road links
6. Key regional transport links
7. Upgrade local roads
8. Casey Trail Network
9. Regional through routes
10. Safer local roads

Clearly the Planning Team must be cognisant of the above goals in the planning of Cranbourne East.

3 THE ZENITH TRAVEL FORECASTING MODEL

VLC's Zenith travel forecasting model will be used to predict the travel demands associated with the proposed development scenario for Cranbourne East, as well as assessing the implications of the proposed land use / transport strategy.

Zenith is a multi-modal model. It forecasts travel demands for all transport modes - car travel, bus, train, tram and ferry passenger demands, as well as walking and cycling - for a given land use scenario and transport network. It also predicts the level of commercial vehicle activity across the region.

The footprint of the model used in the Cranbourne East study is extensive. It covers all of metropolitan Melbourne, Geelong, Ballarat and Bendigo. The extent of the modelled transport network is shown in Figure 1. The modelled network contains almost 50,000 transport links - i.e. sections of transport network - for each of which their characteristics have to be specified (traffic carrying capacity, free-flow speed, etc.).

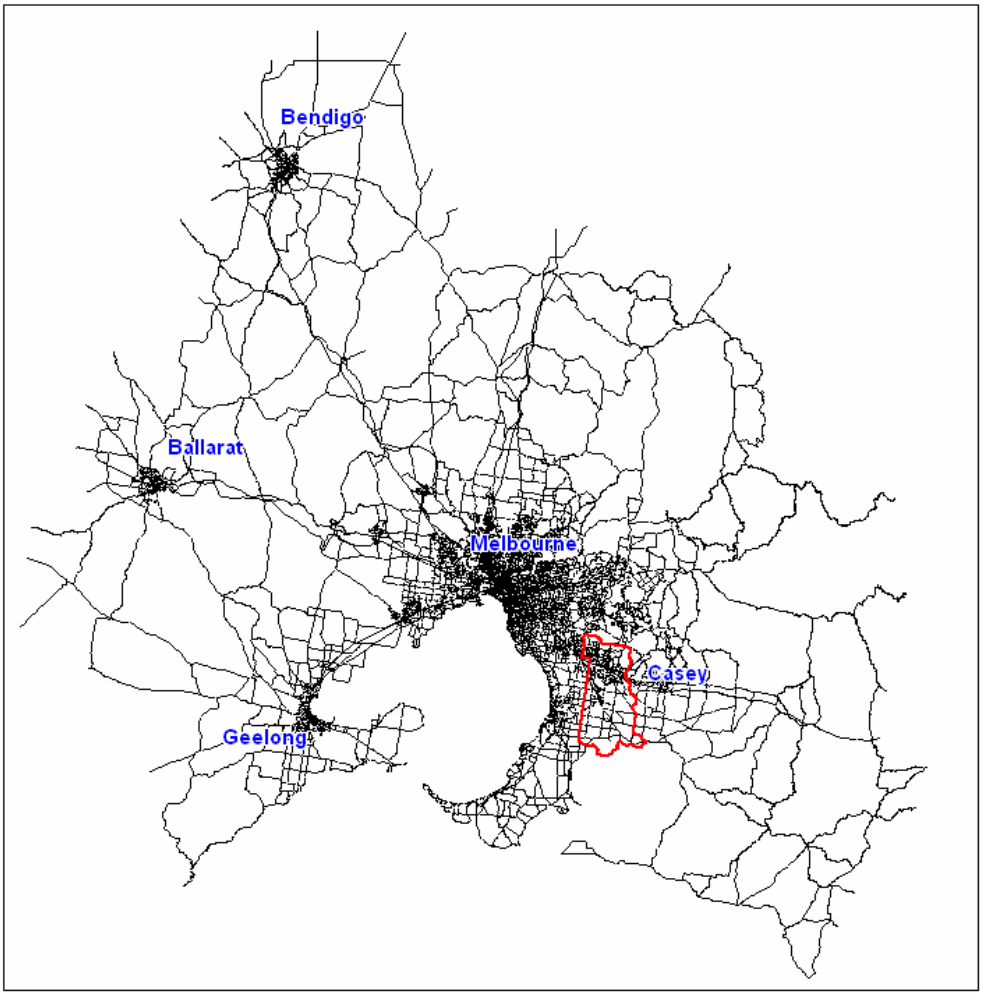
Zenith is a network simulation model that includes all freeways, arterial roads and collector roads, and all public transport routes and services that operate within the modelled area.

Travel demands are separately forecasts for 15 journey purposes. For example, commuting to work, shopping and personal business trips, travel to and from education institutions, etc. These travel demands are estimated based on the socio-economic profiles of households in various regions areas of the city (travel zones), and the distribution and scale of major trip attractors such as commercial employment areas, shopping centres, industrial areas, schools, universities, hospitals, etc.

If the specification of either the transport system or the land use input to the model is changed then the travel forecasts will also change. Consequently the model can be used to test a wide array of alternative land use/transport scenarios for an urban area, including urban growth and development scenarios looking many years into the future.

For a given land use/transport scenario the model produces traffic estimates by time of day for every road in the modelled network, the number of passengers boarding and alighting at every public transport stop and train station, as well as pedestrian/cycle flows across the transport network.

Figure 1: The Zenith Modelled Area



The model also produces a number of transport network performance indicators that are useful when comparing the economic performance of alternative land use/transport scenarios. These include:

- average trip distance (by mode);
- average trip time (by mode);
- market share (by mode);
- average network speed;
- total travel distance (by mode);
- total travel time (by mode);
- value of time spent travelling (by mode);
- total vehicle operating cost (by mode);
- public transport revenue (by mode);
- crash costs; and
- pollutant emissions.

A more detailed description of the Zenith model is provided in Appendix A.l

4 ESTABLISHING THE ZENITH MODEL FOR CASEY

4.1 Travel Zone System and Transport Networks (2006)

The standard Zenith model contains 2,519 travel zones. Each travel zone is typically an aggregation of 3 or 4 ABS census collector districts.

In order to improve the accuracy of the model in the subject area it was decided to disaggregate the travel zone system in Casey and the adjoining municipalities of Dandenong, Frankston and Cardinia to census collector district level. This resulted in the number of travel zones increasing to 3,070. The adopted travel zone system within Casey is shown in Figure 2.

The major benefit of adopting a more fine-grained travel zone system is more accurate forecasting of traffic demand on lower order roads, and more accurate forecasts of public transport ridership and pedestrian/bicycle travel.

Having a more disaggregate travel zone system required additional local roads to be added to the modelled network, so that walking distances to the public transport system, and points at which traffic enters and leaves the arterial road network, are more accurately represented within the model.

The transport network coverage of the base year model within Casey, and the coded hourly capacities of the road network are shown in Figures 3 and 4.

The Zenith public transport networks were also checked for currency in terms of routing and service frequency.

4.2 Zonal Land Use (2005)

Zonal population and employment for the base year model are reflective of Casey in the year 2005. ABS estimates of 2006 population by census collector district were not released in time for inclusion in the current study.

The base year (2005) population and employment by Casey SLAs is presented in Table 1.

Figure 2: The Adopted Travel Zone System in Casey

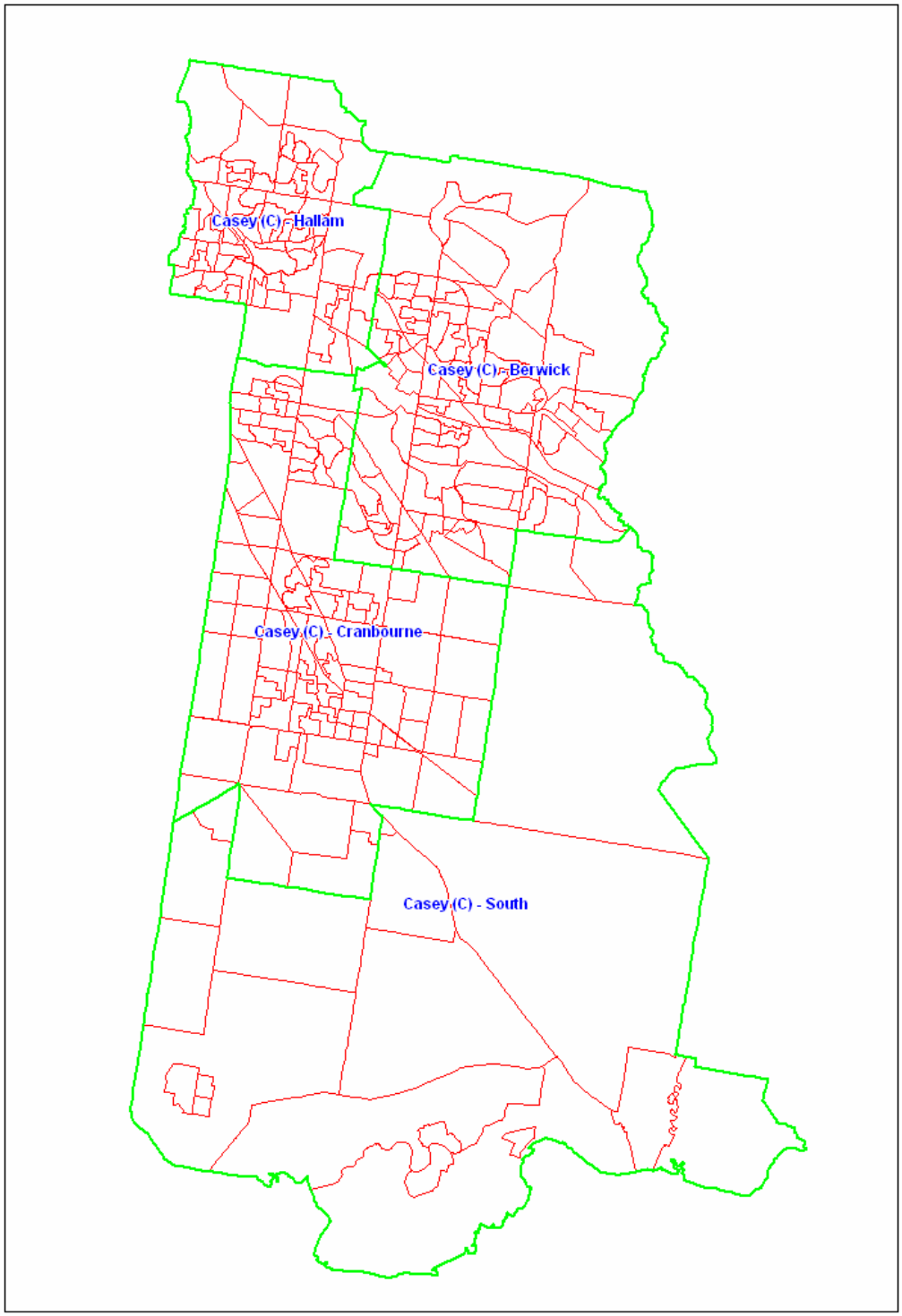


Figure 3: Hourly Road Capacities in Northern Portion of Cranbourne (2005 Base Case Model)

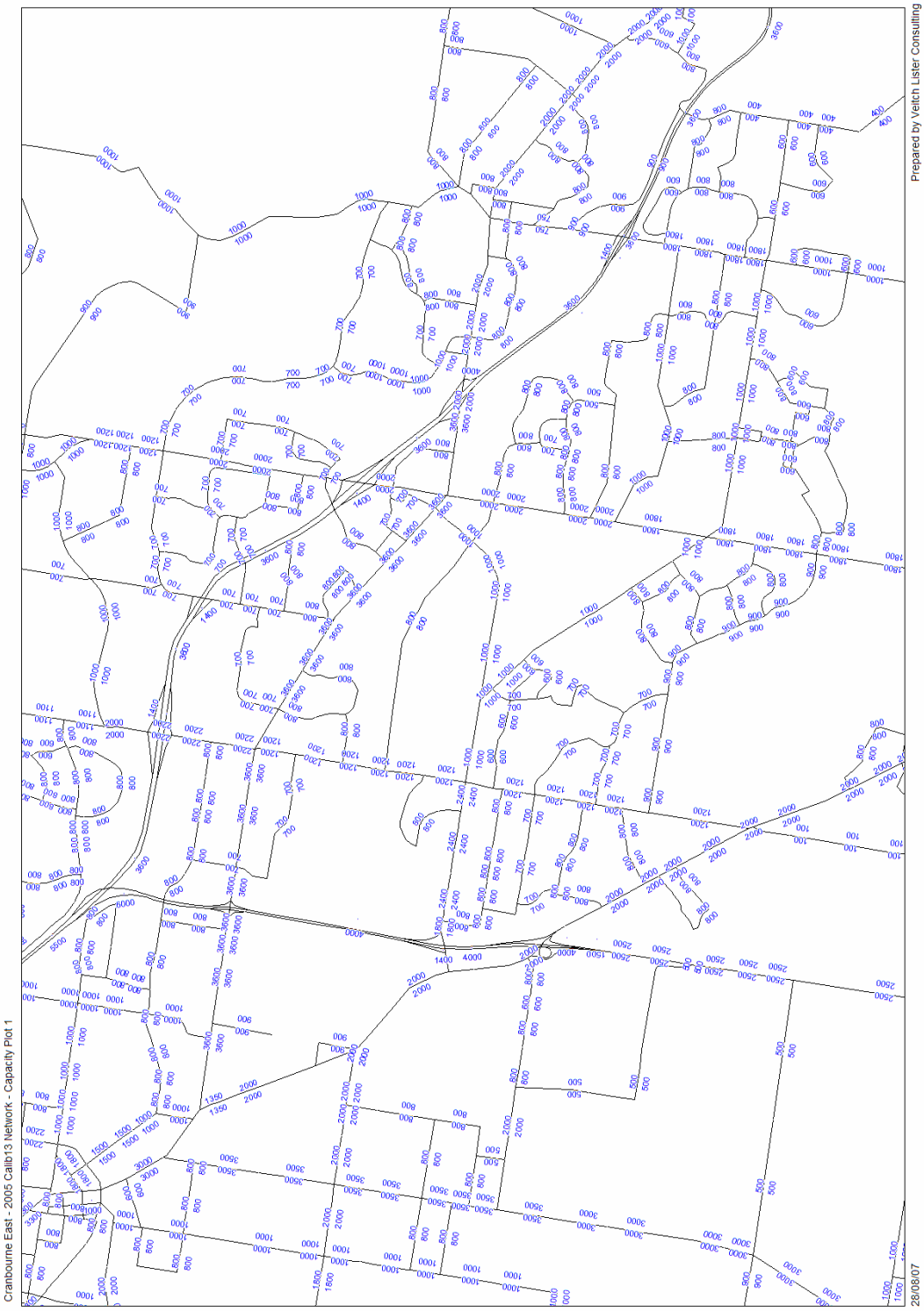


Figure 4: Hourly Road Capacities in Southern Portion of Cranbourne (2005 Base Case Model)

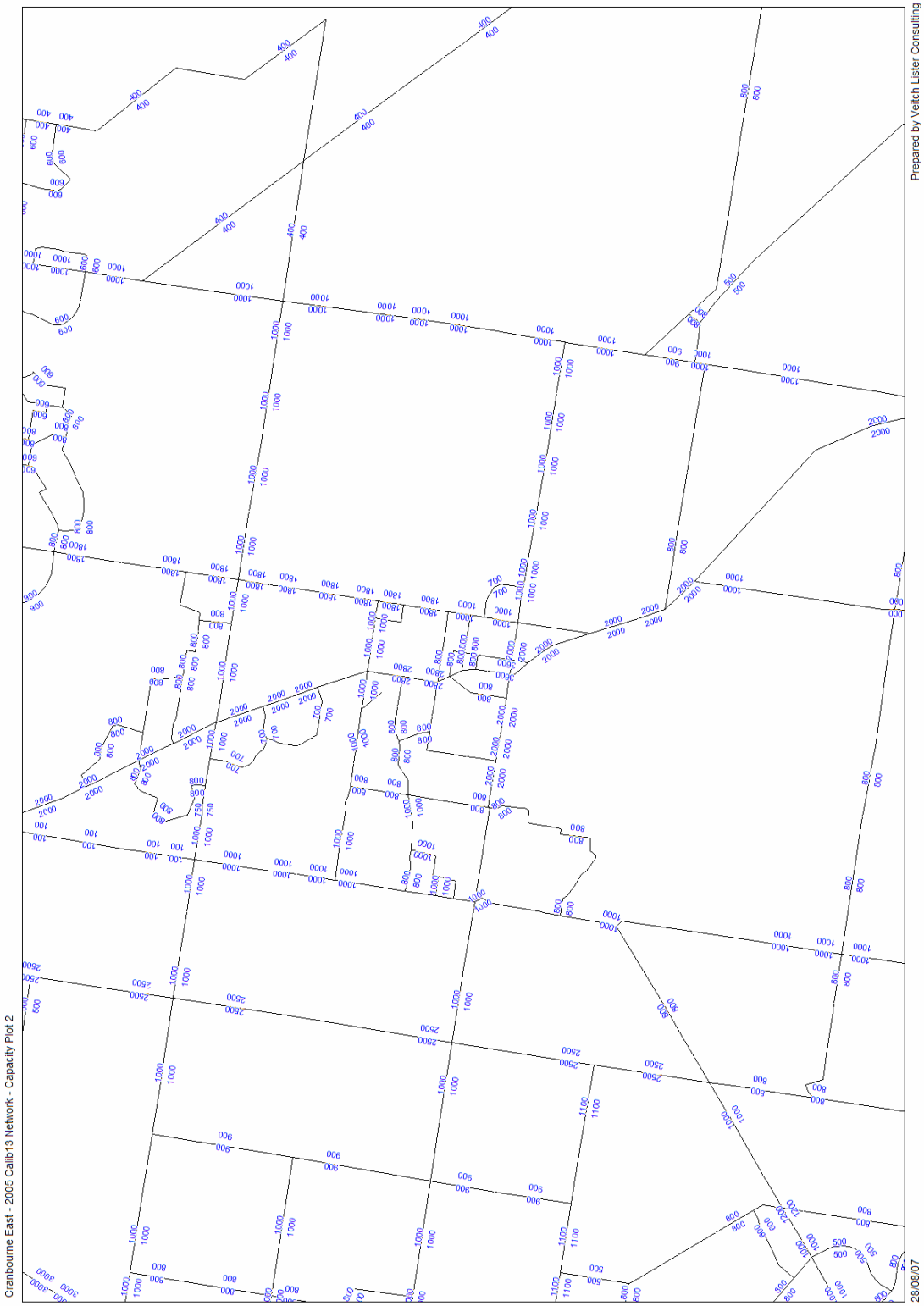


Table 1: Zonal Population and Employment in Casey by SLA (2005)

SLA	Population	Employment
Casey (C) - South	12,177	2.621
Casey (C) - Cranbourne	63,820	8,729
Casey (C) - Hallam	49,661	9,467
Casey (C) - Berwick	86,312	14,511
Total	**211,970**	**35,328**

4.3 Validation of the 2005 Base Case Model

A traffic count database was established for the purposes of validating the base case (2005) Zenith model. Initially the database contained some 1,200 traffic counts supplied by VicRoads and about a dozen counts supplied by Casey City Council. On inspection it was found that most of the VicRoads counts were rather old, some dating back to the late 1990s.

Because of the high rate of development occurring in Casey and the adjoining Municipalities in recent years, it was decided to cull any traffic counts older than 2004 from the model validation database, This resulted in a total of 153 counts being available for validation of the model.

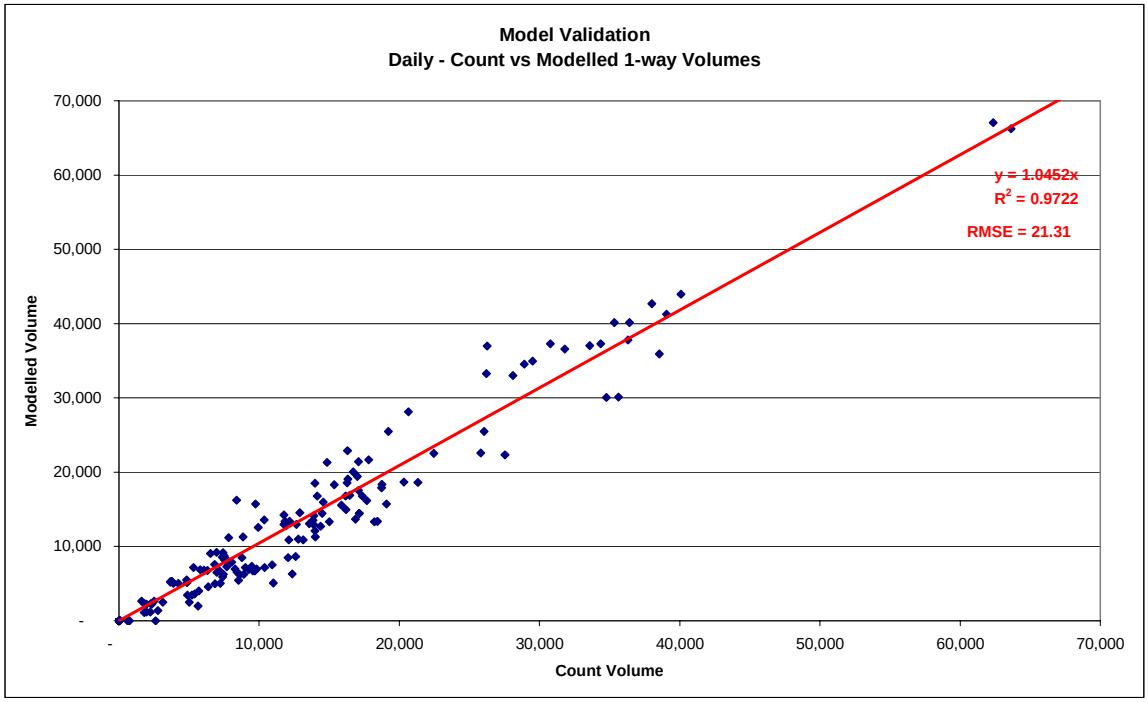
A scatter-plot of modelled traffic volumes against the counts, and an R-squared regression line of best fit, are presented in Figure 5.

There is a high correlation between the modelled traffic volumes and the counts (R-squared correlation of 0.972). The Route Mean Squared Error (%) is 21.3%.

VicRoads requirements for satisfactory model validation stipulate that the R-squared correlation coefficient should exceed 0.9, and the RMSE% should be less than 30%. The Cranbourne version of the Zenith model exceeds these validation criteria on both counts.

The model is probably performing somewhat better than it first appears, as some of the VicRoads counts are Scram counts and do not detect “free-left turners”, thereby resulting in low counts.

Figure 5: Modelled Traffic Volumes Versus Counts (2005 modelled)



On average the modelled volumes exceed the counts by 4 percent. This is probably due to the high proportion of 2004 counts in the model validation database and the model using a 2005 land use.

5 CURRENT TRAVEL PATTERNS AND DEMANDS

5.1 Travel Patterns and Mode Choice of Casey Generated Travel

The Zenith Travel model has been used to assess current (2005) travel patterns and demands across Melbourne relevant to the City of Casey.

In order to display the travel information a 12 sector system has been defined, as shown in Figures 6 and 7.

Tables 2 and 3 contain the Zenith travel demand estimates for travel between and within the 12 sectors.

The main points to emerge from this information are as follows:

1. On a typical weekday there are about 336,000 journeys made by Casey residents commencing at their home, and a similar number returning to their home (refer Table 2(a)). These journeys are made by a variety of travel modes.
2. 60% of the journeys made from home by residents of Casey (about 204,000 journeys) are made to destinations within the Municipality, while the balance (approximately 132,000 journeys) is to destinations external to the Municipality (Table 2(a)).
3. Of the journeys made to external destinations, the overwhelming majority are to Greater Dandenong (34 percent of external journeys) and the inner eastern suburbs of Melbourne (33 percent).
4. Very few external journeys are made to the City of Melbourne (only 4 percent of external journeys) because of the distance and travel time involved.
5. There are also significant travel interactions with the Frankston and Knox sectors.
6. Each weekday there are about 69,000 journeys made by residents living outside the Municipality that have their destination in Casey (refer Table 2(a)). In other words, for every two journeys made by Casey residents to an external destination there is one journey into the Municipality made by an external resident.

Figure 6: Sectors for Travel Pattern Analysis

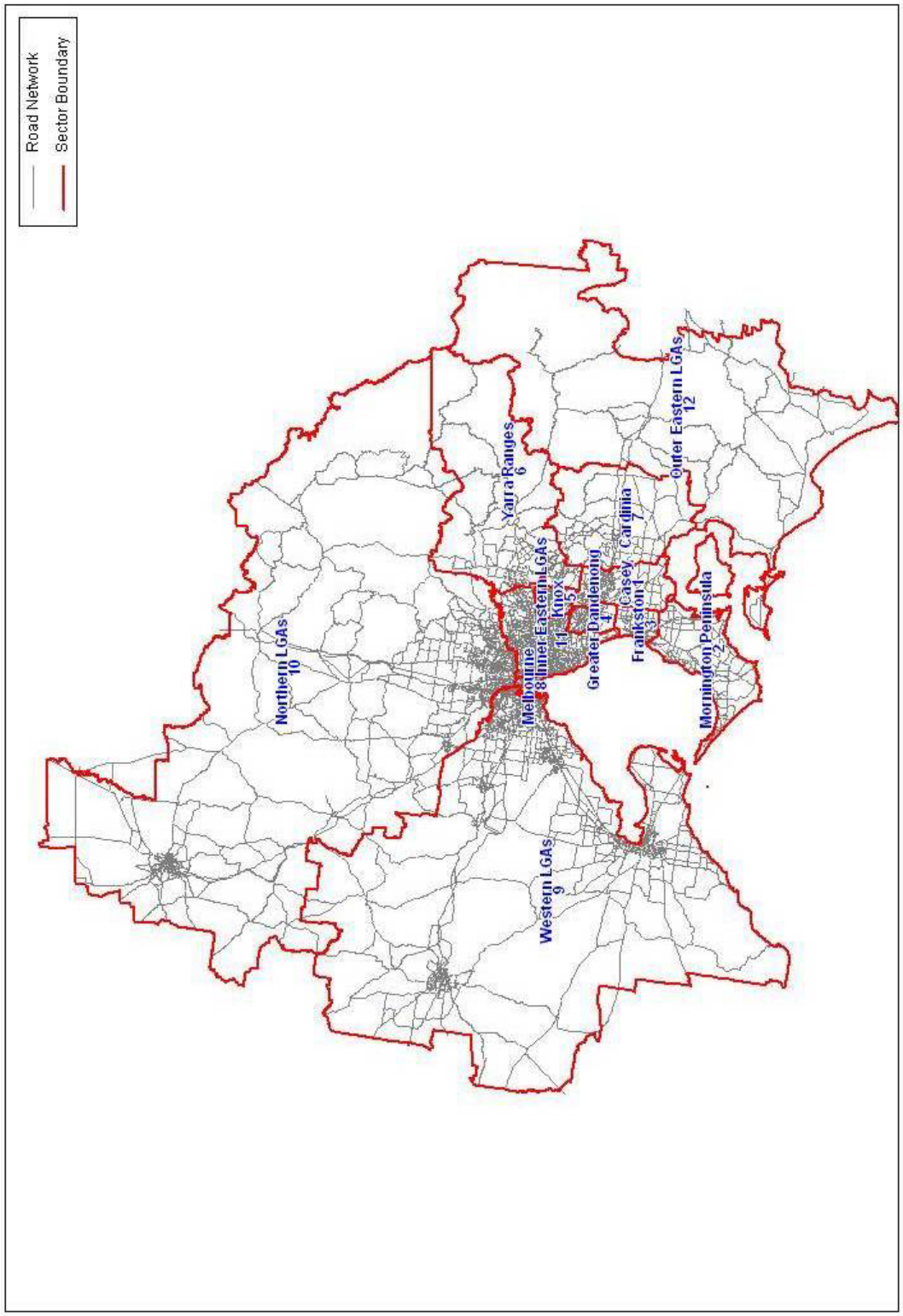


Figure 7: Sectors for Travel Pattern Analysis Focused on Casey

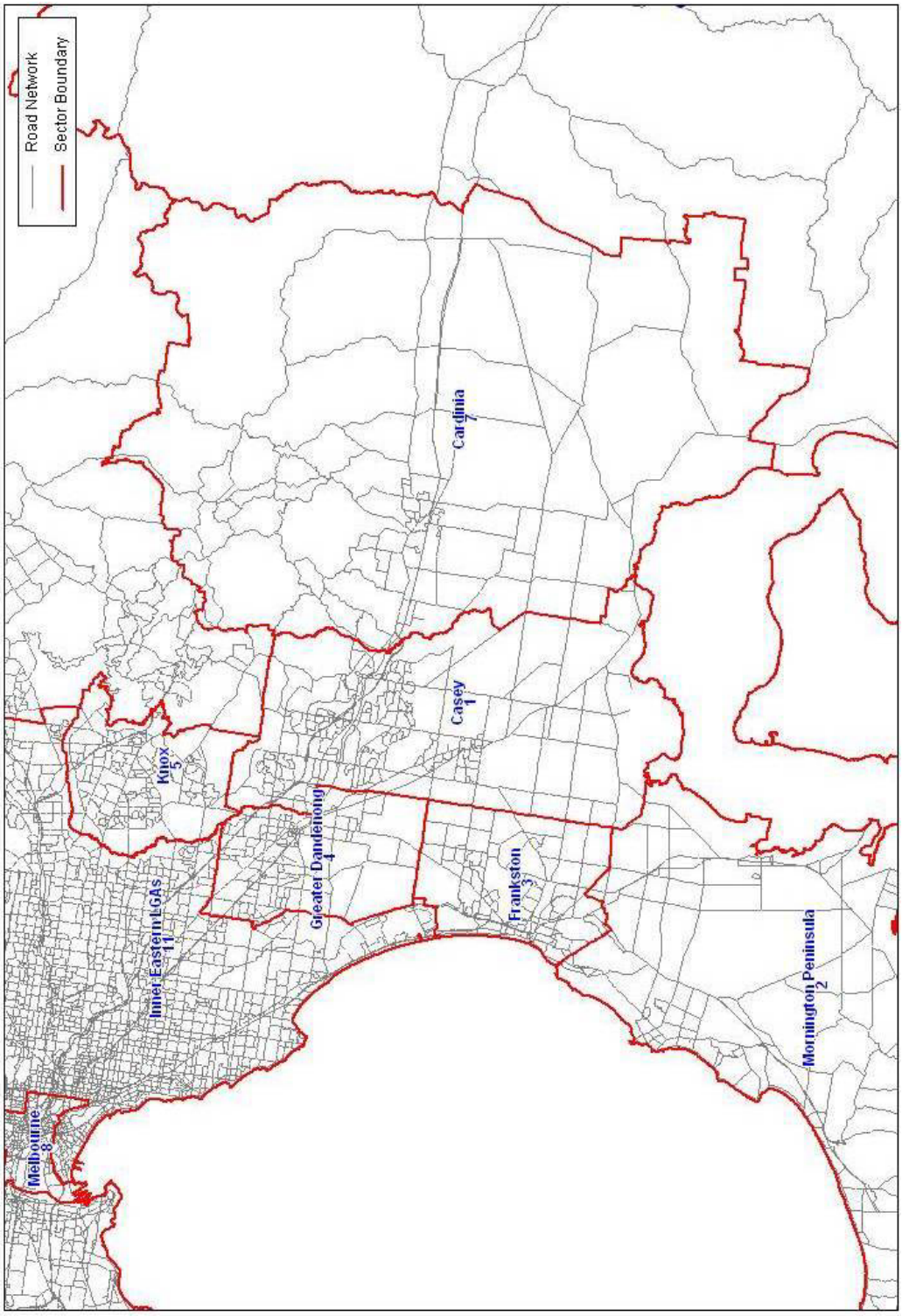


Table 2: Destination of Trips Made by Casey Residents (2005)

(a) Total Person Trips Commencing at the Home – All Journey Purposes

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	**204,271**	**3,513**	**13,633**	**44,963**	**9,183**	**1,837**	**5,871**	**5,098**	**1,474**	**1,935**	**44,040**	**919**	**336,009**

(b) Total Person Trips Commencing at the Home – Work Trips

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	**20,645**	**1,363**	**3,871**	**14,490**	**3,536**	**668**	**1,536**	**3,316**	**536**	**654**	**18,823**	**79**	**69,517**

(c) Total Person Trips Commencing at the Home – Secondary and Tertiary Education Travel

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	**5,824**	**258**	**1,316**	**2,778**	**429**	**244**	**201**	**524**	**217**	**367**	**4,961**	**23**	**17,142**

(d) Total Person Trips Commencing at the Home –Other Home Based Travel

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	**59,578**	**509**	**2,627**	**5,983**	**1235**	**222**	**1099**	**67**	**88**	**167**	**3,723**	**20**	**75,318**

(e) Total Person Trips Commencing at the Home – All Purposes by Car

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	**168,109**	**3415**	**13,019**	**42,208**	**8936**	**1748**	**5515**	**2974**	**1361**	**1730**	**41,405**	**186**	**290,606**

(f) Total Person Trips Commencing at the Home – All Purposes by Public Transport

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	**4,300**	**98**	**609**	**1,833**	**242**	**91**	**137**	**2124**	**112**	**205**	**2,621**	**5**	**12,377**

(g) Total Person Trips Commencing at the Home – All Purposes by Walking and Cycling

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	**31,862**	**1**	**13**	**918**	**5**	**0**	**219**	**0**	**0**	**0**	**8**	**0**	**33,026**

Table 3: Origins of External Residents Travelling to Casey (2005)

(a) Total Person Trips Commencing at the Home – All Journey Purposes

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
204,271	*4,503*	*11,081*	*13,792*	*5,090*	*3,698*	*14,071*	*158*	*817*	*1,457*	*11,764*	*2,312*	*273,014*	*1*

(b) Total Person Trips Commencing at the Home – Work Trips

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
20,645	*1,714*	*3,098*	*1,801*	*1,320*	*1,096*	*3,330*	*16*	*163*	*230*	*3,348*	*660*	*37,421*	*1*

(c) Total Person Trips Commencing at the Home – Secondary and Tertiary Education Travel

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
5,824	*319*	*746*	*598*	*376*	*245*	*933*	*24*	*110*	*89*	*967*	*229*	*10,460*	*1*

(d) Total Person Trips Commencing at the Home – Other Home Based Travel

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
59,578	*528*	*2,038*	*2,552*	*977*	*579*	*2,972*	*0*	*70*	*87*	*1,516*	*242*	*71,139*	*1*

(e) Total Person Trips Commencing at the Home – All Purposes by Car

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
168,109	*4,395*	*10,668*	*13,116*	*4,923*	*3,622*	*13,427*	*139*	*786*	*1,429*	*11,312*	*2,285*	*234,211*	*1*

(f) Total Person Trips Commencing at the Home – All Purposes by Public Transport

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
4,300	*107*	*394*	*446*	*159*	*74*	*413*	*19*	*32*	*28*	*445*	*28*	*6,445*	*1*

(g) Total Person Trips Commencing at the Home – All Purposes by Walking and Cycling

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
31,862	*0*	*15*	*236*	*8*	*0*	*231*	*0*	*0*	*0*	*2*	*0*	*32,354*	*1*

7 Journeys into the Municipality generated by external residents are from fairly widespread origins - but mainly from the inner eastern suburbs of Melbourne (Sector 11), Dandenong (Sector 4), Cardinia (Sector 7) and Frankston (Sector 3).

8 When work journeys are examined a completely different pattern emerges relative to the total travel market described above (refer Tables 2(b) and 3(b)). Only 30 percent of Casey's resident workforce travel to work destinations within the Municipality. Currently 70 percent are employed externally. The main external employment destinations for the resident workforce are:

- The inner eastern suburbs of Melbourne (39%)
- Dandenong (30%)
- Frankston (8%)
- Knox (7%) and
- City of Melbourne (7%)

9 Workers living outside the Municipality and travelling to Casey for work are mainly residents of Frankston, Cardinia, Dandenong and the inner eastern suburbs of Melbourne (Table 3(b)).

10 Residents of Casey make about 11,300 secondary and tertiary education trips each weekday to education institutions situated outside the Municipality. The daily migration of students living externally travelling into the Municipality is much lower (about 4,600 journey each day).

11 The private motor vehicle is the dominant travel mode for Casey residents, accounting for 86.5 percent of all journeys. Public transport only accounts for 3.7 percent of journeys, while 9.8 percent of journeys are made by walking or cycling.

12 Public transport's role is however higher for the journey to work and for secondary/tertiary education travel.

13 For travel within the Municipality public transport's role is currently extremely minor, accounting for only 2.1 percent of the travel market; however, this does not include journeys made by school bus.

14 Not surprisingly the market in which public transport is the most competitive is for travel to the City of Melbourne, accounting for 42 percent of travel.

It is evident from the above that the travel patterns generated by Casey is very diverse in terms of travel destination. It is also clear that greater commitment to public transport initiatives, and more innovative transport/land use planning solutions will be required if the role of public transport is to be significantly increased - particularly in the near term.

5.2 2005 Weekday Traffic Demand

The Zenith model weekday traffic volume forecasts from the 2005 Base Year model are presented in Figures 8 and 9.

Points where the current road network is under pressure are indicated in the volume/capacity diagrams shown in Figures 10 and 11.

Figure 8: Zenith 2005 Weekday Traffic Forecasts (vehicles per day)

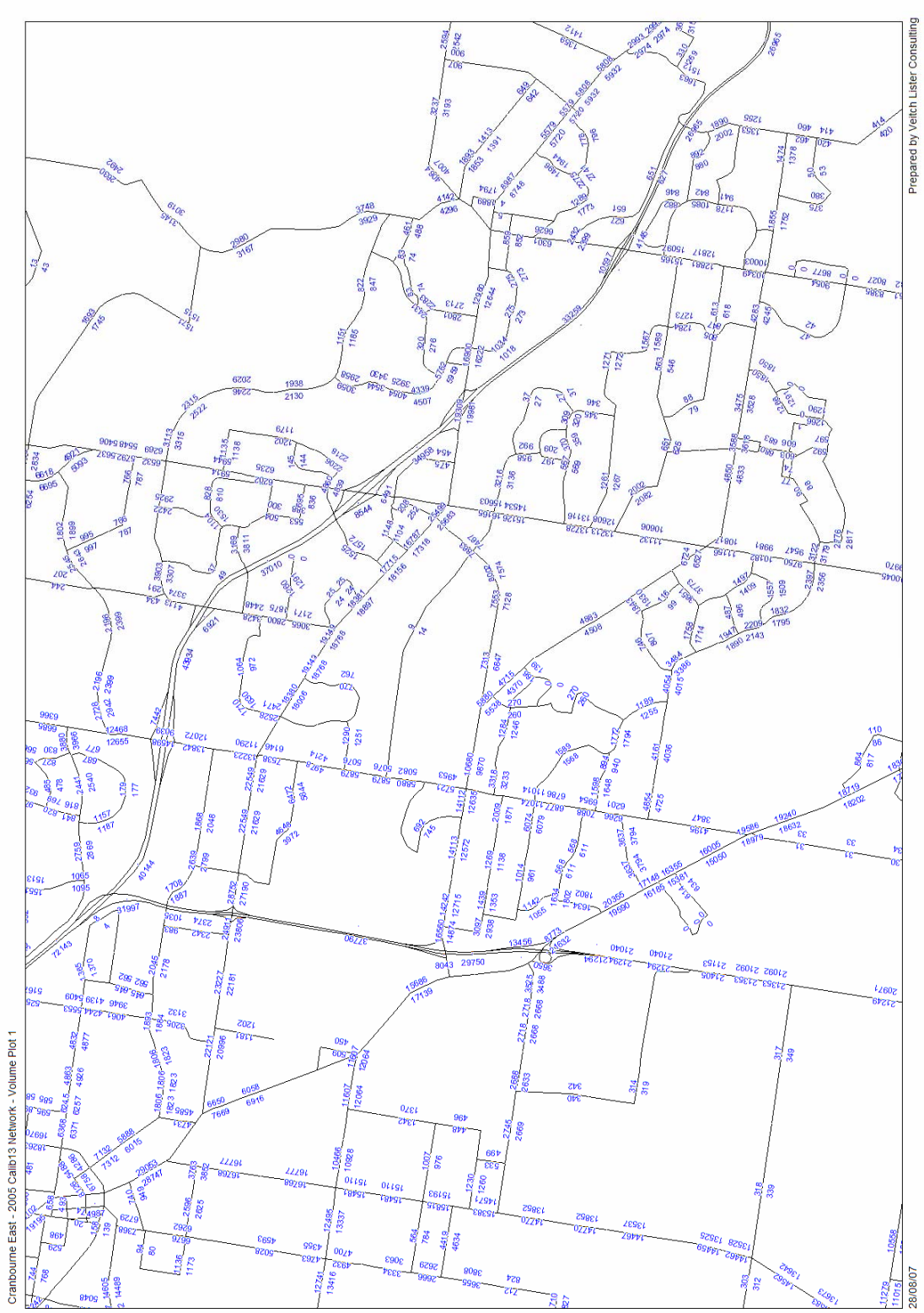


Figure 9: Zenith 2005 Weekday Traffic Forecasts (vehicles per day)

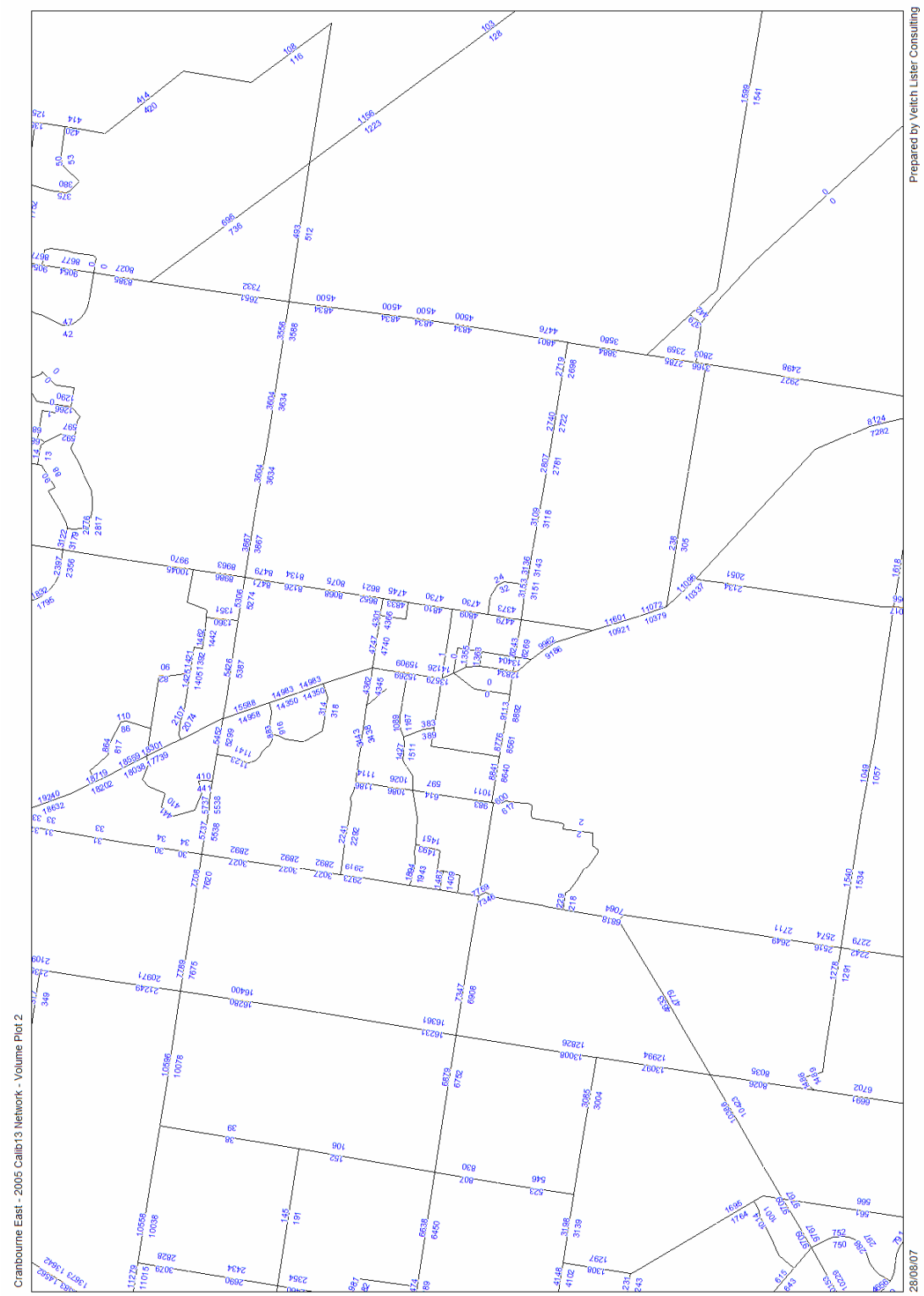


Figure 10: Modelled Volume/Capacity Ratios within Cranbourne (2005)

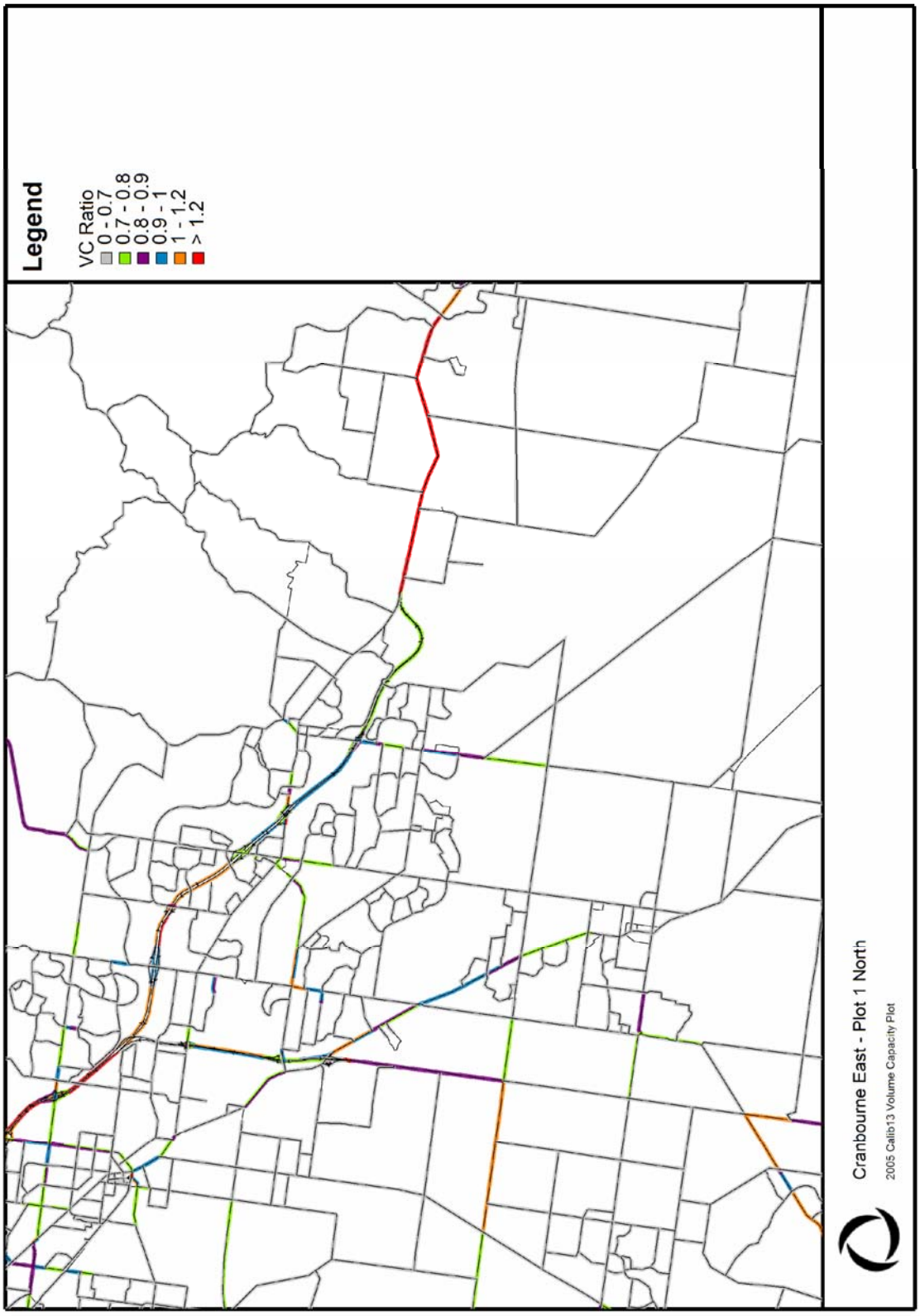
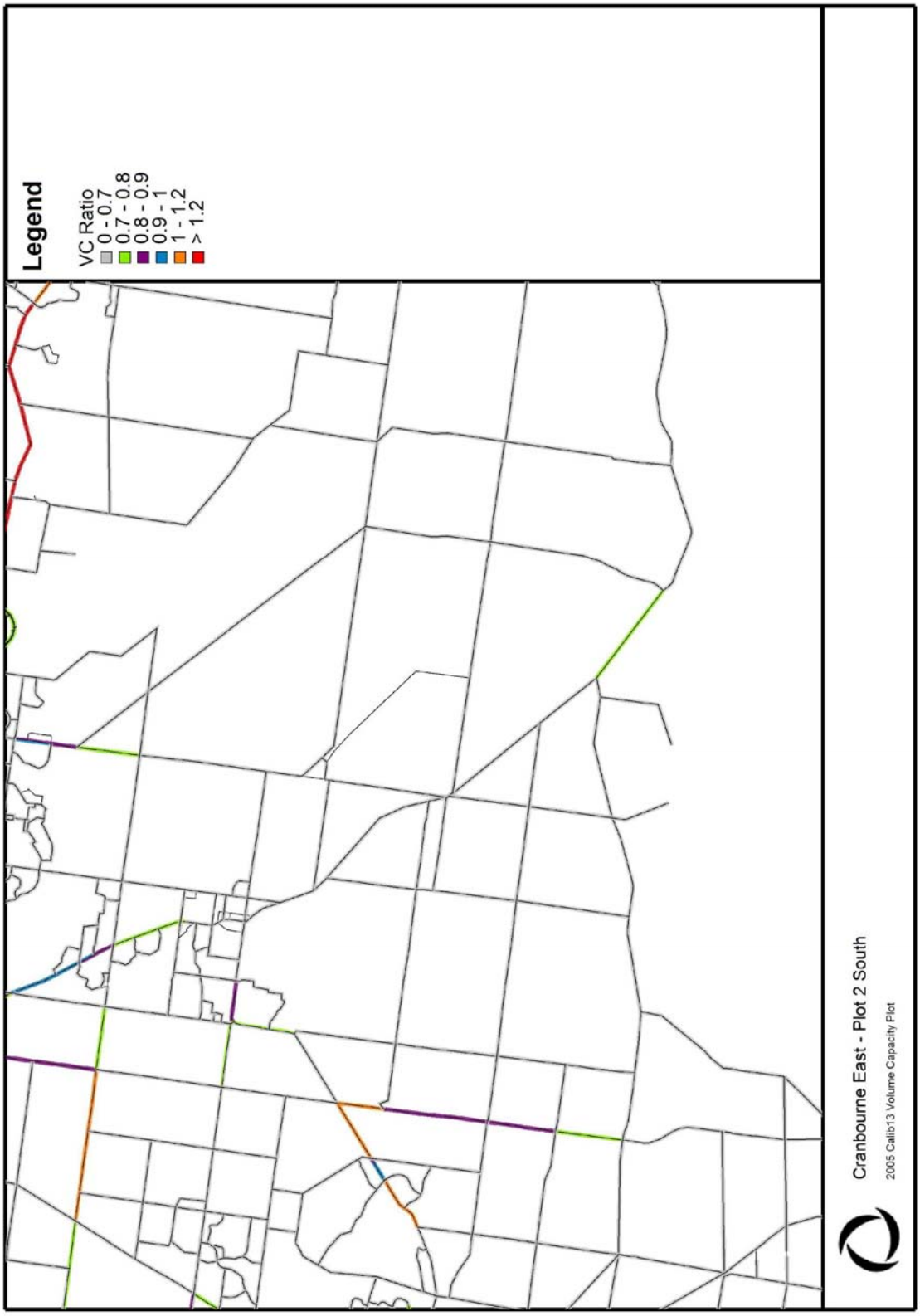


Figure 11: Modelled Volume/Capacity Ratios within Cranbourne (2005)



6 2031 LAND USE AND NETWORK ASSUMPTIONS

6.1 2031 Land Use

VLC has updated DSE 2031 population and employment projections across the modelled area in consultation with the City of Casey for the establishment of a 2031 Base Case Model. This model includes the proposed development of Cranbourne West, as set out in the Cranbourne West Urban Growth Plan, but does not include the development of Cranbourne East. Development scenarios for Cranbourne East will be the subject of subsequent reports.

Within Casey the updated projections translate into the 2031 population and employment totals by SLA as shown in Table 4.

Table 4: 2031 DSE Population and Employment Projections

SLA	2005 Population	2005 Employment	2031 Population	2031 Employment
Casey (C) - South	12,177	2,621	37,957	8,749
Casey (C) - Cranbourne	63,820	8,729	136,182	29,238
Casey (C) - Hallam	49,661	9,467	58,258	15,194
Casey (C) - Berwick	86,312	14,511	109,714	24,479
Total	211,970	35,328	342,111	77,660
% Increase from 2005			**61%**	**119%**
Note: Cranbourne projection includes future ultimate development at Cranbourne West				

6.2 Transport Network Assumptions

The VicRoads traffic modelling unit has prepared a hypothetical programme of works to upgrade the arterial road system across Melbourne. While some projects in the programme are under construction, committed, or at an advanced stage of planning and design, many elements of the programme have no official status. It must therefore be regarded as very much a draft programme.

The intention of the programme is to identify a "likely road network scenario" to be used for future year travel modelling. It aim is to provide a degree of realism when modelling long term land use/transport scenarios. Modelling the future without improvements to the transport system can result in significant (and unrealistic) distortions in the travel patterns predicted by the models.

The VicRoads draft arterial road upgrading programme is detailed in Appendix B. All the projects listed in the programme have been coded into the 2031 Base Case transport network used in the Zenith modelling for Cranbourne East.

Projects in the programme within Casey that VicRoads considers likely to be implemented by 2031 are as follows:

By 2009

- Berwick-Cranbourne Road duplication - Greaves Road to Pound Road
- Cranbourne-Frankston Road duplication - Scott Street to Hall Road
- Hallam Road duplication - Hallam Bypass to James Cook Drive
- Narre Warren-Cranbourne Road duplication - Centre Road to Pound Road

By 2011

- Narre Warren-Cranbourne Road duplication - Pound Road to Thompsons Road
- Western Port Highway duplication - Cranbourne-Frankston Road to North Road

By 2014

- Berwick-Cranbourne Road duplication - Ballarto Road to South Gippsland Highway
- Berwick-Cranbourne Road duplication - Pound Road to Ballarto Road
- Hallam Road duplication - Princes Highway to Pound Road
- Hallam Road duplication - Fordholm Road to South Gippsland Highway
- Hallam Road duplication - Pound Road to Fordholm Road
- Thompsons Road widening - Western Port Highway to Evans Road

By 2019

- Berwick-Cranbourne Road duplication - High Street to Kangan Road
- Hallam Road North Duplication - Heatherton Road to James Cook Drive
- Thompsons Road widening - Evans Road to South Gippsland Highway
- Thompsons Road widening - South Gippsland Highway to Narre Warren-Cranbourne Road
- Thompsons Road widening - South Gippsland Highway to Berwick-Cranbourne Road

By 2021

- Heatherton Road duplication - Hallam North Road to Belgrave-Hallam Road

By 2031

- Cranbourne-Frankston Road duplication - Western Port Highway to Hall Road
- Narre Warren-Cranbourne Road duplication - Thompsons Road to South Gippsland Highway
- Narre Warren North Road duplication - Ernst Wanke Road to Heatherton Road
- Thompson Road duplication - Western Port Highway to Evans Road
- Thompson Road duplication - Evans Road to South Gippsland Highway

- Thompson Road duplication - Narre Warren-Cranbourne Road to Berwick-Cranbourne Road
- Thompson Road duplication - South Gippsland Highway to Narre Warren-Cranbourne Road

In relation to the proposal to duplicate Berwick-Cranbourne (Clyde) Road between Ballarto Road and South Gippsland Highway, VicRoads' current investigations into alignment changes have not been considered.

The Department of Infrastructure's future intentions with respect to upgrading of the public transport system were also included in the 2031 Base Case Zenith model. These included:

- Increased train frequencies and additional express running made possible by the third-tracking of key sections of the rail network.
- Increased tram frequencies
- Increased bus frequencies
- Smart Bus initiatives

These have also been included in the 2031 Base Case Scenario transport network.

6.3 Other Assumptions

There are a range of other modelling assumptions that influence travel behaviour. A conservative approach has been adopted with respect to these, for example:

- Petrol prices have been assumed to remain at current levels (in real terms)
- Parking prices have been assumed to remain at current levels (in real terms)
- Public transport fares have been assumed to remain at current levels (in real terms)

7 2031 TRAVEL FORECASTS (BASE CASE SCENARIO)

7.1 2031 Travel Demands and Patterns

Table 5 shows the Zenith model's 2031 prediction of the amount of weekday travel generated by residents of Casey for the Base Case Scenario. This scenario has used DSE projections of population and employment across the modelled area, with the exception of Cranbourne East, which under this scenario is assumed not to develop.

The Base Case Scenario therefore provides a base against which the impact of development at Cranbourne East can be gauged. Scenarios that include development at Cranbourne East will be the subject of a further report.

Referring to Table 5, which provides 2031 predictions of the travel destinations of Casey residents, the main points to note are as follows (refer to Figures 6 and 7 for sector definitions):

1. The Zenith model predicts that residents of Casey in 2031 will make about 576,000 journeys commencing at their home each weekday (refer Table 5(a)). This is 69 percent higher than in 2005, and does not include any travel associated with future development at Cranbourne East.
2. about 64% of the journeys made from home by residents of Casey (about 360,000 journeys) are made to destinations within the Municipality, while the balance (approximately 205,000 journeys) are to destinations external to the Municipality This level of travel self-containment is similar to the present day.
3. Of the journeys made to external destinations, the overwhelming majority are to Greater Dandenong (32 percent of external journeys) and the inner eastern suburbs of Melbourne (29 percent).
4. As for the 2005 situation, very few external journeys are made to the City of Melbourne (only 3.6 percent of external journeys).
5. Travel interaction with Frankston is expected to nearly double by 2031, while interaction with Cardinia will treble.
6. By 2031 the number of journeys made by residents living outside the Municipality that have their destination in Casey (refer Table 6(a)) is expected to increase from 68,000 each weekday (2005) to 135,000.

Table 5: Destination of Trips Made by Casey Residents (2031)

(a) Total Person Trips Commencing at the Home – All Journey Purposes

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	***362,125***	***5,176***	***25,257***	***65,871***	***16,471***	***2,749***	***17,937***	***7,323***	***1,726***	***2,318***	***60,073***	***264***	***567,290***

(b) Total Person Trips Commencing at the Home – Work

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	***40,774***	***2,042***	***6,976***	***21,709***	***6,093***	***1,040***	***4,698***	***4,172***	***657***	***706***	***25,033***	***93***	***113,993***

(c) Total Person Trips Commencing at the Home – Secondary and Tertiary Education Travel

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	***11,084***	***270***	***1,460***	***2,773***	***391***	***257***	***823***	***1,149***	***163***	***478***	***6,039***	***20***	***24,907***

(d) Total Person Trips Commencing at the Home –Other Home Based Travel

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	***95,190***	***630***	***4,556***	***7,722***	***2,095***	***318***	***3,902***	***142***	***95***	***192***	***4,922***	***40***	***119,804***

(e) Total Person Trips Commencing at the Home – All Purposes by Car

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	***302,692***	***5,067***	***24,465***	***62,154***	***16,138***	***2,627***	***17,252***	***4,365***	***1,643***	***2,053***	***56,606***	***259***	***495,321***

(f) Total Person Trips Commencing at the Home – All Purposes by Public Transport

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	***9,476***	***108***	***754***	***2,506***	***325***	***116***	***463***	***2,958***	***84***	***265***	***3,453***	***4***	***20,512***

(g) Total Person Trips Commencing at the Home – All Purposes by Walking and Cycling

	To												
From	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
1	***49,967***	***1***	***35***	***1,210***	***16***	***0***	***219***	***0***	***0***	***0***	***8***	***0***	***51,456***

Table 6: Origins of External Residents Travelling to Casey (2031)

(a) Total Person Trips Commencing at the Home – All Journey Purposes

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
362,125	8,154	21,917	23,112	8,573	5,585	38,004	291	1,570	2,958	20,035	4,293	496,617	*1*

(b) Total Person Trips Commencing at the Home – Work

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
40,774	3,046	5,067	2,750	1,990	1,487	9,495	53	365	477	5,596	1,253	72,353	*1*

(c) Total Person Trips Commencing at the Home – Secondary and Tertiary Education Travel

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
11,084	692	1,459	952	621	358	2,549	37	187	153	1,536	357	19,985	*1*

(d) Total Person Trips Commencing at the Home – Other Home Based Travel

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
95,190	886	4,384	3,597	1,506	854	7,392	12	108	162	2,415	481	116,987	*1*

(e) Total Person Trips Commencing at the Home – All Purposes by Car

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
302,692	7,897	21,016	21,928	8,275	5,440	36,468	259	1,514	2,905	19,214	4,236	431,844	*1*

(f) Total Person Trips Commencing at the Home – All Purposes by Public Transport

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
9,476	257	851	828	288	142	1,297	32	55	52	818	59	14,155	*1*

(g) Total Person Trips Commencing at the Home – All Purposes by Walking and Cycling

	From												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*Total*	*To*
49,967	0	44	360	8	0	246	0	0	0	7	0	50,632	*1*

7 Journeys into the Municipality generated by external residents are from fairly widespread origins - but the largest influx is from Cardinia, followed by Dandenong and Frankston (sectors 7, 4 and 3 respectively).

8 In 2031 the Zenith Base Case Scenario model predicts that 36 percent of resident workers will be employed locally (up from 30 percent in 2005). The predicted main external employment destinations for the resident workforce in 2031 are:

- The inner eastern suburbs of Melbourne (34%)
- Dandenong (30%)
- Frankston (10%)
- Knox (8%)
- Cardinia (6%), and
- City of Melbourne (6%)

9 The private motor vehicle is predicted to remain the dominant mode of travel for Casey residents in 2031, accounting for 87.3 percent of all journeys (86.7 percent in 2005). Public transport's share of the travel market declines slightly under the Base Case Scenario, from 3.7 percent of journeys in 2005 to 3.6% in 2031. This is not really surprising as the Base Case Scenario does not include any revolutionary change to, or restructuring of, the public transport system in Casey.

The 2031 Base Case Scenario model run suggests that the travel market generated by Casey will become even more diverse in the future. This has ramifications in terms of how we might plan, configure and deliver public transport services in the future.

7.2 2031 Traffic Demand (Base Case Scenario)

Figures 12 and 13 present the Zenith model's weekday (24-hour) traffic forecasts for the 2031 Base Case Scenario. The resultant volume/capacity ratio plots in Figures 14 and 15 pinpoint where the road network will be under duress.

Figure 12: 2031 Weekday Traffic Forecasts (Base Case Scenario)

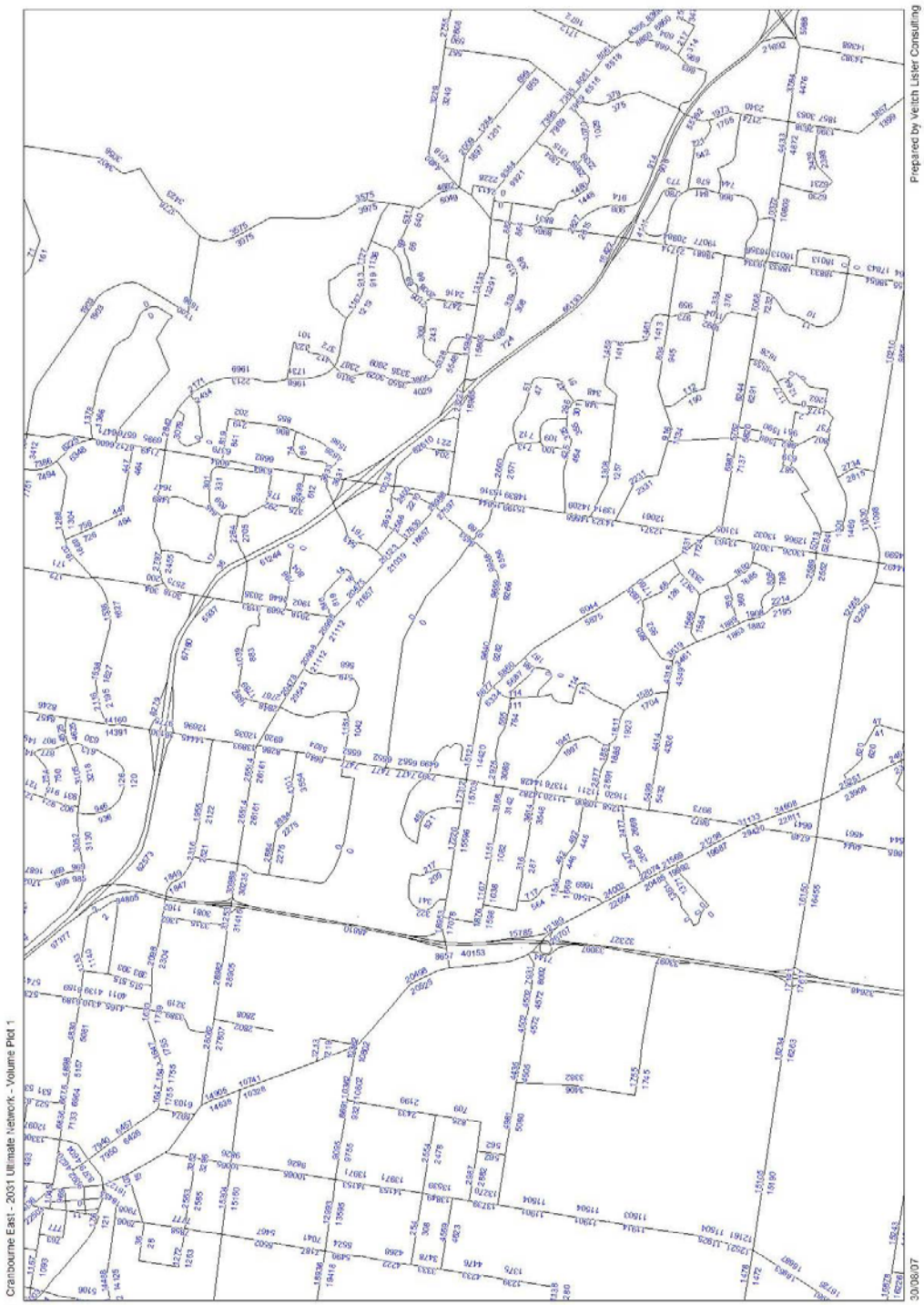


Figure 13: 2031 Weekday Traffic Forecasts (Base Case Scenario)

Figure 14: 2031 Volume/Capacity Ratio Plot (Base Case Scenario)

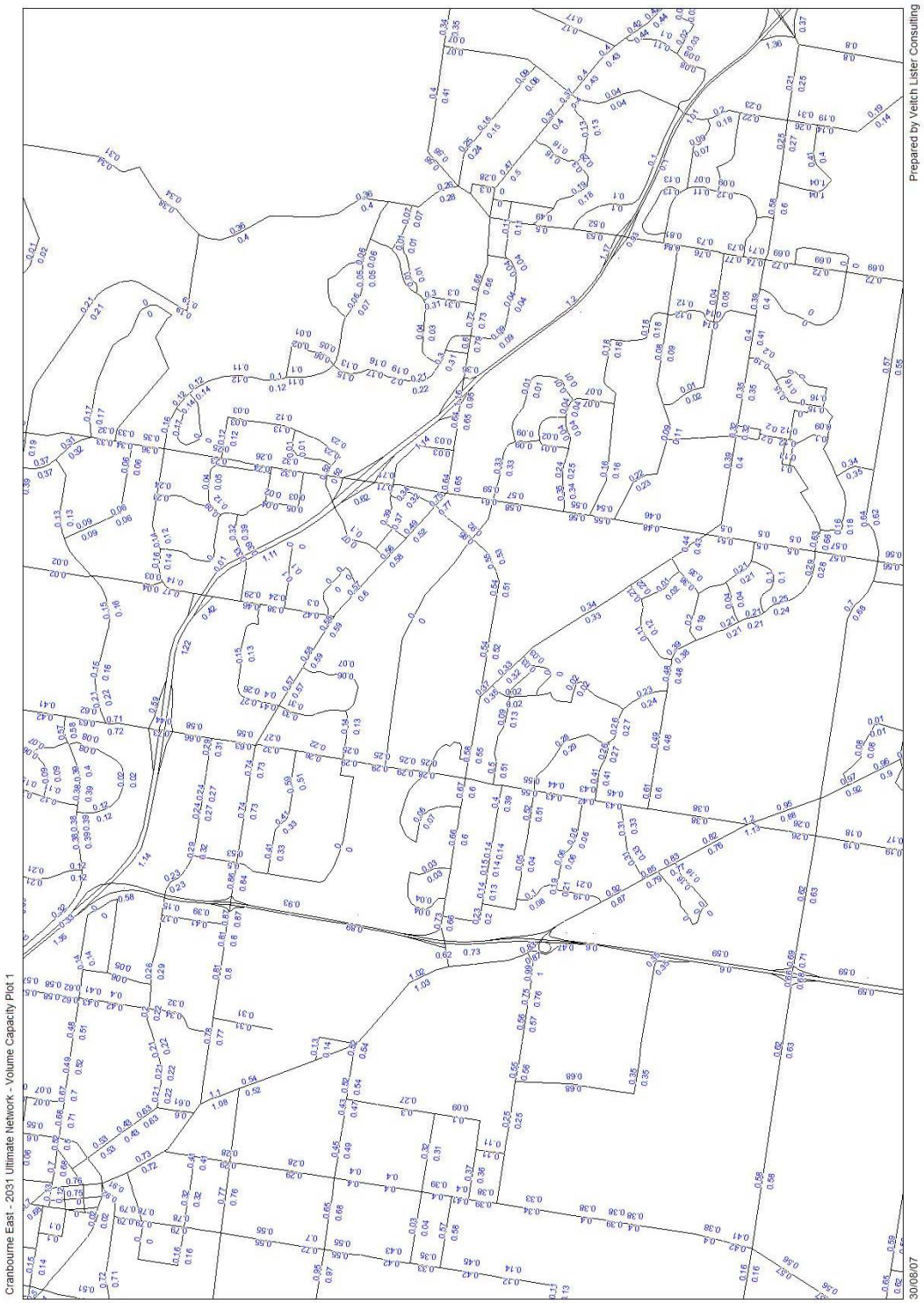


Figure 15: 2031 Volume/Capacity Ratio Plot (Base Case Scenario)

8 ANTICIPATED TRAFFIC GROWTH (2005 – 2031)

A series of key screenlines on the periphery of Casey have been identified so as to gauge the likely level of traffic growth that will occur on the approaches to the Municipality in the period 2005 to 2031. The screenlines are shown in Figure 16.

Forecast traffic growth on the screenlines for the 2031 Base Case Scenario is presented in Table 7.

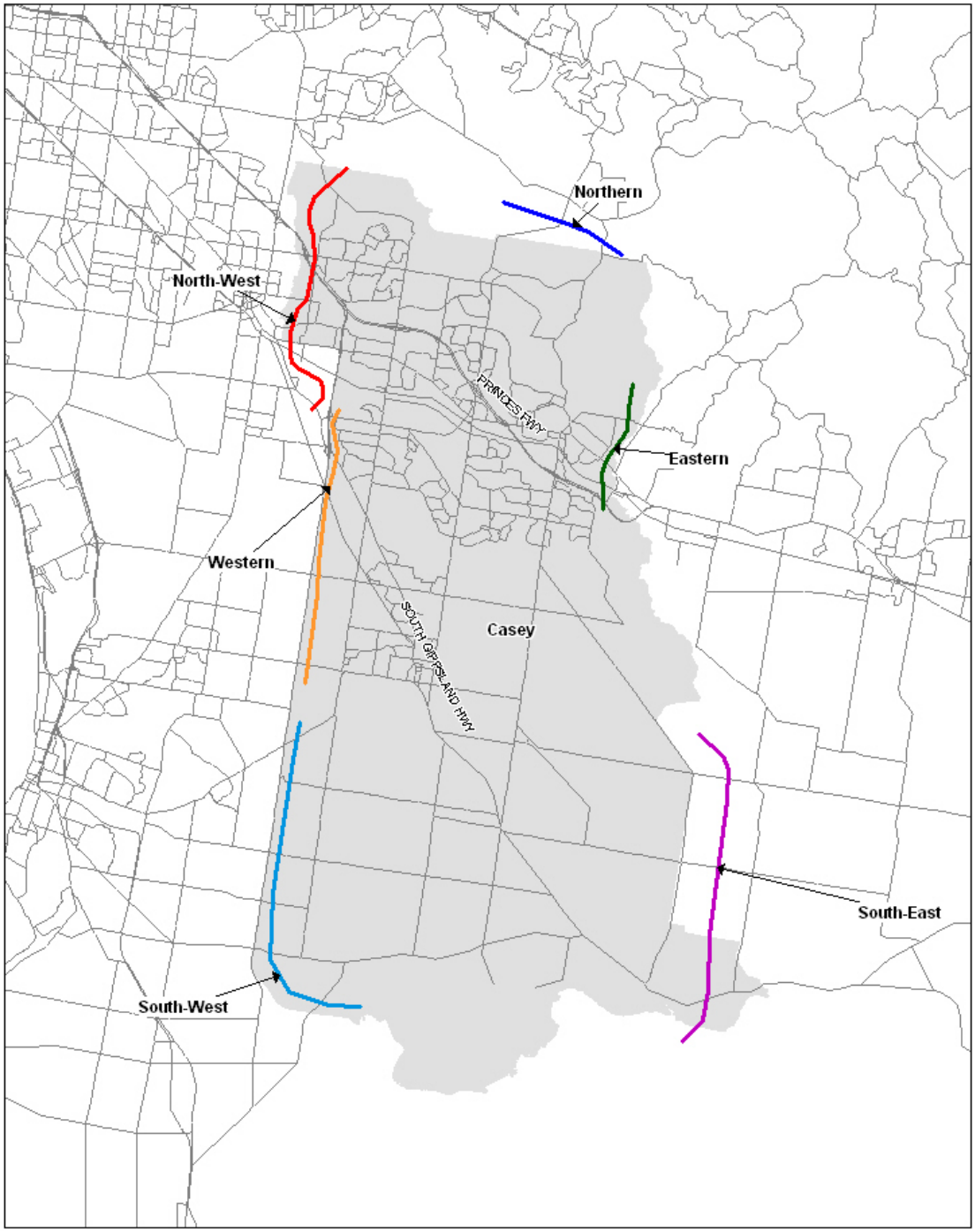
Table 7: Traffic Growth (2005-2031) at Casey External Screenlines

Screenline	2005	2031	% Growth
North-West	239,380	281,980	17.8
South-West	29,180	48,370	65.8
West	104,060	170,730	64.1
North	16,630	28,820	73.3
East	75,660	166,370	219.9
South-East	20,920	31.240	49.3
All Screenlines	**485,830**	**727,510**	**49.7**

The main points to note from Table 7 are as follows:

1. The screenlines in combination essentially form a cordon around Casey. By 2031 the total traffic expected to cross this cordon each day is expected to increase by 70 percent.
2. The largest percentage and absolute increase in traffic is on the Eastern screenline, due to large scale of planned development in Cardinia.
3. Traffic on the Western and South-Western Screenlines increases substantially, due to increasing interaction with Frankston and Mornington.

Figure 16: Casey External Screenlines



9 SOME KEY CONSIDERATIONS

This section of the report discusses some of the key transport issues raised at the first workshops, as well as further issues that have emerged as a result of the analysis presented earlier in this report.

Transport planning issues fall into two broad categories.

1. Land use/transport issues internal to the site; and
2. External issues.

9.1 Internal Issues

As Cranbourne East is essentially a greenfield site, the planning team has considerable flexibility in terms of identifying an appropriate distribution and intensity of land use, and the transport infrastructure and services needed to support it. These will be addressed in the next phase of the study.

Clearly, within site network of collector roads, bus routes and connections to the peripheral arterial road network will need to be tailor-made for the types of land use envisaged for the site.

Precisely how the identification of an optimal strategy for promoting pedestrian, cycle and public transport usage will evolve will also depend heavily on the types on land use.

A further issue that will have a significant influence on the proposed street layout is the need to consider the development of rail infrastructure through the study area.

9.2 External Issues

Most external issues cannot be addressed independently from the broader planning issues in Casey. However, how some issues are addressed will have specific implications for the development of Cranbourne East.

Other key external transport issues include:

- Identifying the most appropriate role for Evans Road, which runs north-south along the eastern boundary of the site.
- The possible removal of railway level crossing in close proximity to the site.
- How best to configure the road system to encourage community cohesion with existing communities immediately to the east.
- Identifying appropriate reservation widths for transport corridors should buses running in their own right-of-way, or transit lanes, be found to be an important element of the optimal land use/transport strategy for the area.
- Undertaking works to enable rail frequencies on the Cranbourne rail line to be increased substantially. The line is currently single track and will at leat require passing loops id train frequencies are to be increased significantly.

APPENDIX A:

Description of the Zenith Travel Forecasting Model

A1. Introduction

This Appendix describes the current extent of the Zenith model, its structure and capabilities, as well as the nature of the outputs it can produce.

A2. Current Extent of the Model

The Zenith Travel Forecasting Model simulates transport networks and travel behaviour throughout Melbourne. In terms of geographical coverage it comprises of two parts:

1. The core modelled area; and
2. a buffer area.

The core modelled area, essentially the Melbourne Statistical Division is modelled in great detail. All arterial, sub-arterial and collector roads are included in the simulation network, as well as every train line, train station, bus route, bus stop, ferry service and inter-city coach service. Rail services (eg. Geelong) which interact significantly with the MSD are also included in the network descriptions.

Travel patterns are generated at a fine-grained census collector district level. In other words, the model predicts travel demands from each of 5,000 discrete areas of the region (called travel zones) to every other discrete area. These travel patterns are predicted for each journey purpose - i.e. work, education, shopping, recreation, etc.

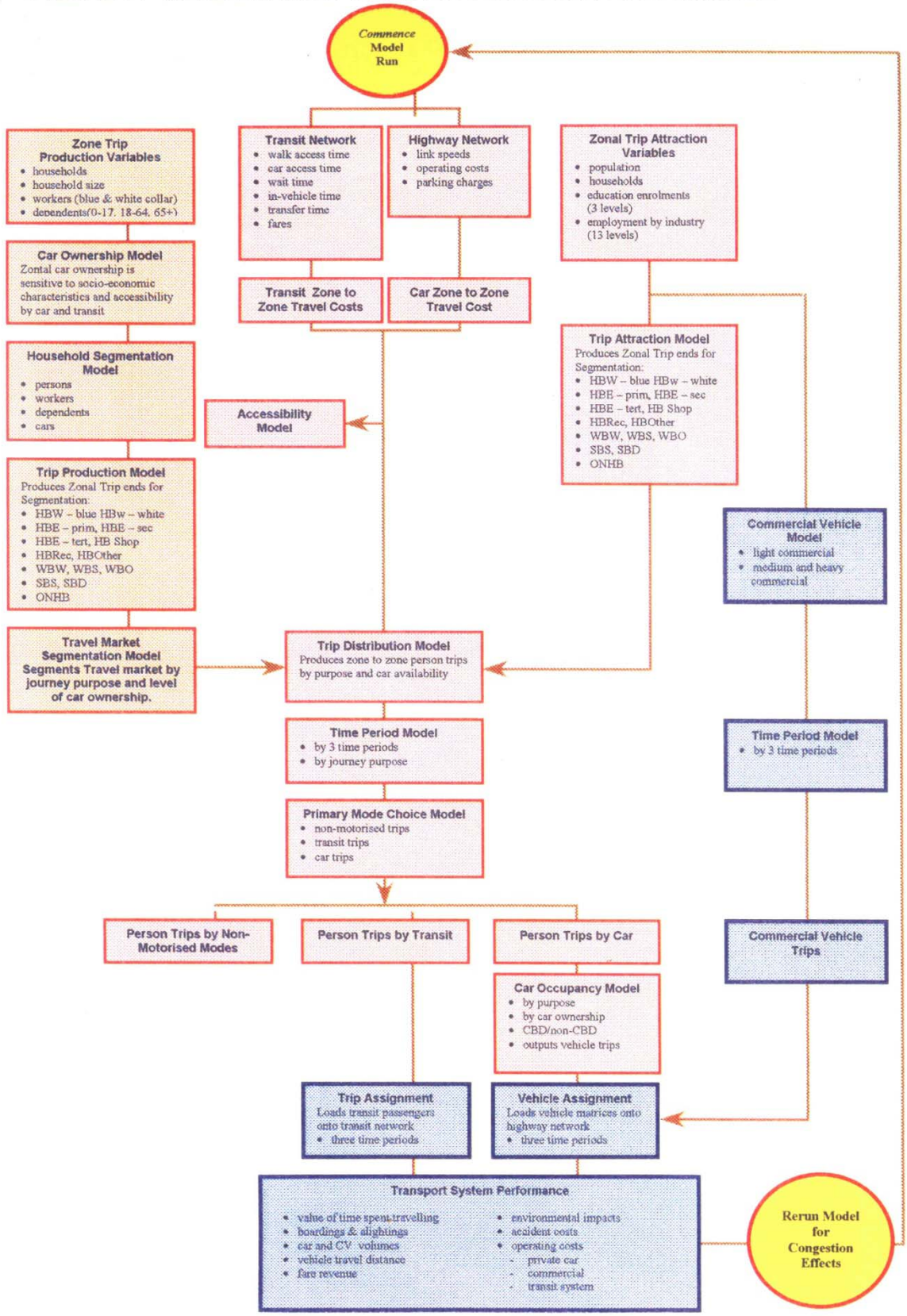
Within the buffer area, the simulation considers both the land use and the transportation system at a much coarser level. The purpose of the “buffer” is to improve the predictive capability of the model in terms of travel between the MSD and adjoining areas.

The model is by far the most comprehensive travel simulation system currently being used in Australia, and is at the “leading edge” in terms of world development of such models. It is being used by VLC to produce very detailed travel forecasts for both road and public transport networks for a number of the most significant transport infrastructure investments ever contemplated in Australia.

A3. Outline of Model Structure

The basic model structure is depicted in Figure 1. In simple terms, the model has the following basic components:

FIGURE 1: INTEGRATED TRAVEL FORECASTING MODEL



- Road and rail infrastructure networks (including system capacities and operating speeds);
- Transit service networks (routes) and frequency/fare details;
- Details of land uses in discrete areas of the city - called travel zones;
- Travel patterns (expressed as numbers of trips made between origin and destination travel zone pairs by various modes - the tables reflecting these travel desires are called trip matrices);
- Algorithms to interrogate the model's output and produce a range of transport system performance indicators.

The integrated model's outputs are derived by assigning trips to the road and public transport networks based on minimising travel cost (usually expressed in terms of travel time, fares, parking charges and vehicle operating costs). Travel times are adjusted in the model to reflect levels of congestion caused by traffic and the perceived dislike of and walking and waiting when travelling by public transport..

The following section describes how the travel matrices are derived.

A4. Production of Travel Matrices (Trip Tables)

The Zenith travel forecasting model simulates people's travel behaviour based on observed travel behaviour. The model incorporates the following components in generating travel matrices:-

- a trip production model (a model of how often households of various types decide to make trips for different purposes);
- a trip attraction model (which produces a measure of how attractive a destination will be in satisfying travel desires);
- a trip distribution model (which uses the outputs of the trip production and attraction models to produce estimates of zone to zone travel for each travel market segment);
- a mode choice model (which estimates whether people will choose to travel by car, transit or non-motorised modes);
- a vehicle occupancy model (which converts person trips made by car into vehicle trips)
- a time period model (which allocates trips to parts of the day).

Each of the above modules is briefly described in the following sub-sections.

A4.1 The Trip Production Model

The trip production model estimates the frequency that households of different types make trips for various purposes. The model is run for each travel zone (in this case each Census Collector District or CCD). Because they display very different characteristics, home based and non-home based trips are modelled separately.

Home Based Travel

The home based trip production model derives travel demands in each zone based on the following demographic variables:-

- households in a zone;
- average household size;
- numbers of blue and white collar workers;
- numbers of dependants aged 0-17, 18-64, 65 and over; and
- level of car ownership.

For a 1996 base year these variables can be obtained from the census. When the model is run in "forecast mode", they are predicted by the household segmentation and car ownership models.

The home based trip production model produces separate trip production estimates for the following categories of travel.

- home based work - blue collar;
- home based work - white collar;
- home based education - pre-school and primary;
- home based education – secondary;
- home based education – tertiary;
- home based shopping and personal business;
- home based social and recreation; and
- home based other.

In order to increase the accuracy of the subsequent trip distribution and mode choice models, the above trip purposes are further disaggregated by the level of household car ownership (0, 1, 2, 3+) using a travel market segmentation model.

Non-Home Based Travel

Because of the far more complex relationships that exist for non-home based travel, a more complex array of variables (17 in total) is used to produce measures of zonal trip production. These are:

- zonal population;
- households;
- pre and primary school enrolments;
- secondary enrolments;
- equivalent full time tertiary enrolments; and
- employment in 12 industry categories (retail, manufacturing, public administration, personal services, etc.).

Again the model generates separate zonal trip forecasts for each trip purpose:

- work based work (WBW);
- work based shopping (WBS);

- work based other (WBO);
- shopping based shopping (SBS);
- shopping based other (SBO); and
- other non-home based travel (ONHB).

A4.2 The Trip Attraction Model

Once trips have been "produced" there is a need for a model that generates measures as to how attractive each zone is as a potential destination. This is the trip attraction model.

The model uses multiple regression to relate the reported zonal trip attractions to the 17 zonal variables described previously for non-home based trip productions.

A4.3 Trip Distribution Model

The next step in the process is to distribute the trips produced in each travel zone across the available destinations. This is performed by the trip distribution model which uses a process that emulates gravity - i.e. as a possible destination becomes more costly to reach, then it is less likely to be chosen as a destination. Similarly, if a shopping centre is expanded then it becomes more attractive as a destination, and will therefore attract more shopping trips.

The trip distribution model is run separately for each travel market segment.

A4.4 Mode Choice Model

Once the likely travel patterns have been established by the trip distribution model, a series of mode choice logit curves are used to determine which mode of travel will be chosen - based on the relative attractiveness of each mode in terms of "perceived generalised cost".

Perceived generalised cost comprises of:-

- in car travel time;
- in transit vehicle travel time;
- transit access time (walking or car);
- transit waiting time (which is a function of service frequencies);
- transit transfer times;
- transit fares;
- car operating costs;
- parking charges; and
- modal perceptions.

The mode choice model is run for each travel market segment (i.e. trip purpose and car ownership level), and is applied in an hierarchical sequence as depicted in Figure 1.

The first step in the sequence is to predict motorised and non-motorised (i.e. walk and cycling) modes of travel. Motorised modes are then divided between car and public

transport travel. Travel by public transport is then further subdivided into trips that access the system by walking, and those who choose to use a car.

Whether transit travellers choose to use a bus, train or tram is then determined during the transit assignment process.

A4.5 Car Occupancy Model

For travel by public transport a person trip is a trip. By car, however, several people may travel in the same car. It is therefore necessary to convert person trips made by car to vehicle trips using the car occupancy model. The occupancy varies by journey purpose, level of household car availability and whether the journey is being made to the CBD or not.

A4.6 Time Period Model

The final step in deriving travel matrices is to assign various trips between time periods. Different types of trips are usually made at different times of the day (e.g. journeys to work and school dominate travel demands in the morning peak period whereas shopping trips occur to a greater extent in the inter-peak). This task is performed by the time period model.

The time periods considered by the model are:

- midnight to 7:00am (morning off-peak);
- 7:00am to 9:00am (AM peak);
- 9:00am to 4:00pm (daytime off-peak);
- 4:00pm to 6:00pm (PM peak); and
- 6:00pm to midnight (evening off-peak).

Note that early, daytime off-peak and evening periods are assigned as one.

A4.7 Other Model Components

The model structure also includes a sub-model for the prediction of commercial vehicle travel patterns.

A5. Features of the Zenith Model

There are several features of the integrated model that distinguish it from other models that have been used in Australia in recent years. The primary objective of the new model is to provide a planning tool that is more relevant to the policy issues that planners and Governments have to address in the nineties and the next century.

Perhaps the most important features of the new model are its comprehensive simulation of public transport system options and the sensitivity of its forecasts to various pricing mechanisms (fares, fuel costs, tolls and parking charges, etc.).

The following sub-sections describe various elements and features of the model, which should provide some insight as to how it is able to overcome some of the structural deficiencies evident in models that were generally used previously.

A5.1 Fine-grained Zoning System

VLC believes that simulating access to the public transport system is as important as accurately simulating the system itself. This means that zones must be sufficiently small to allow simulation of walk access/egress as well as car access to the system. For this reason the model simulates travel between much smaller geographic units than have traditionally been used - the travel zones are defined by ABS census collector districts, which results in over 5,000 zones in Melbourne and 3,700 in South East Queensland (previous modelling exercises in Melbourne have been based on 800 – 850 zones, while SEQ models have used about 500 zones).

A5.2 Multiple Access Modes to Transit

Walking is no longer the only means of accessing the transit system - in fact at some outer suburban stations people travelling to the system by car (park-and-ride and kiss-and-ride) constitute the largest segment of rail patronage.

For this reason the integrated model is capable of simulating both walk and car access to the transit system.

A5.3 Detailed Simulation of the Transport System

The model includes an extremely detailed description of Melbourne's public transport system. All bus, tram and train routes are separately specified and all stations and stops are considered as candidate locations for boarding and alighting the system. The model also distinguishes between all stops, limited stop and express services.

As well as accurately simulating where and how people can access the transit system, the integrated model also allows travellers to travel on a bus or a tram to a station and then catch a train. Several interchanges in sequence can be modelled, and the model will also allow people to walk from a stop where they have alighted a service to another stop where they can continue their journey on another service. This capability is critical in assessing the interactions that occur between the various modes (e.g. people walking from Flinders Street Station to catch a St. Kilda Road tram).

A5.4 Highly Disaggregated Travel Market Segmentation

It has been found during previous model development that accuracy can be significantly increased by including private vehicle availability within the travel market segmentation. Households with limited private motor vehicle access are likely to display different trip destination and mode choice decision-making behaviour from those with a high level of access to private motor vehicles.

The integrated model recognises this and breaks each home-based journey purpose into 4 household car ownership levels (0, 1, 2, and 3+) to give a total of 32 home based travel market segments and six non-home based segments.

A5.5 Sophisticated Modal Choice and Trip Distribution Models

The choice of travel mode and the choice of trip destination are closely linked in the decision-making process. The model takes this into account so that changes in public transport service characteristics, for example, will be reflected in both mode choice and trip distribution.

A5.6 Realistic Simulation of Transit Passenger Journey Options

The public transport component of the model incorporates a number of processes which make the simulation of journey options particularly powerful. In essence, these processes:

- provide multiple options for zone access to and from the PT system;
- accurately reflect the range of choices available to a person once they have "entered" the PT system, for example, whether to alight a PT service at a particular stop and, if so, whether to wait for another service or walk to a different stop; and
- account for different decisions being made by people arriving at a given stop at different times.

A5.7 Sensitivity to Transport Pricing

Trip distribution, mode choice, and assignment are all influenced by the following pricing issues:

- vehicle operating costs (fuel);
- car parking charges;
- tolls; and
- public transport fares.

A5.8 Ability to Test a Wide Range of Transit Options

The model is capable of testing a wide range of transit modes and associated infrastructure and operating strategies.

In its current form the model (and the associated networks) simulates the following modes in detail:

- Trains;
- Scheduled Route Bus Services
- Tram Services

Services can be disaggregated as required (eg. by operating company, by service type etc). In this context the model is capable of simulating the effects of:

- new infrastructure and associated services;
- route restructuring;
- service frequency changes;
- fare levels;
- integration of services;
- express services; and
- transit lanes and HOV lanes.

A5.9 Sensitivity to Congestion Effects

Public transport services that use road links in the network (for example, buses or trams) are affected by congestion on these links.

The Zenith model "feeds back" private vehicle assignment results into the public transport assignment so that congested bus or tram routes take that congestion into full account. Delays due to congestion are therefore incorporated into the trip distribution and mode choice decisions in an iterative process within the model.

A5.10 Sensitivity to Transport Investment Decisions

Generally modelling carried out previously has been based on a fixed trip patterns – in other words a change to the transport system had no effect on where or how people travelled, only the route they took. In the integrated model a major investment in transport infrastructure (either road or transit) will result in:

- change in destination choice; and
- change in mode choice.

A6. Standard Model Outputs

The model produces estimates of individual link flows for travel by private and public transport and, for public transport services, boardings and alightings at individual stations or stops. Summary network performance indicators at a regional or sub-regional level are routinely available for:

- average trip distance (by mode);
- average trip time (by mode);
- market share (by mode);
- overall network volume/capacity ratio;
- average network speed;
- total travel distance (by mode);
- total travel time (by mode);
- value of time spent (by mode);
- total operating cost (by mode);
- public transport revenue (by mode);
- cost recovery by public transport mode;
- crash costs; and
- pollutant emissions.

Model outputs can be designed for individual project purposes however, because, as the proprietary owner, VLC has direct access to the software source code.

Typical model outputs and possible presentation formats, are illustrated in the following pages:

- **Table A1** summarises network wide performance indicators. These relate to all public transport modes, private vehicle and commercial vehicle travel. The example cited in Table A1 relates to an analysis of future public transport patronage in South East Queensland in the context of various land use scenarios and pricing regimes.
- **Figure A2** indicates peak period boardings, alightings and resultant line loadings for the Ipswich line in Brisbane.
- **Figure A3** indicates a possible boarding/alighting/loading profile for a possible heavy rail service in the Scoresby Corridor of Melbourne, by time of day.
- **Figure A4** summarises similar data for a possible tram connection between Huntingdale and Rowville in Melbourne's eastern suburbs.
- **Figure A5** shows the destination of walk access/walk egress trips which boarded at Spencer Street Station in 2000.
- **Figure A6** shows the boarding station of rail trips alighting at Spencer Street Station.
- **Figure A7** shows the origins and destinations of private vehicle trips on the Pacific Highway just south of Robina Town Centre. This form of presentation is much clearer than many alternatives and can be produced for any link in the modelled network without the need for additional model runs.

As we noted earlier the form of presentation is easily customised to meet the needs of particular projects and different target audiences.

Table A1: Performance Indicators Summary for Sensitivity Tests

Network Performance Indicators	Base Year Run47j	Year 2011 Base - 47j (DCILGP Medium Series)	Year 2011 (RFGM 2000)	Year 2011 Sens-01 (CBD Parking up 30%)	Year 2011 Sens-02 (Car Fuel Price up 50%)	Year 2011 Sens-03 (QR-BCC Equal Fare)	Year 2021 Base - 47j (DCILGP Extrapolated Medium Series)
Public Transport							
Total Public Transport System Patronage (Boardings per day)							
• Queensland Rail	170,031	214,320	231,559	261,758	260,779	215,701	250,111
• Brisbane Transport Buses	166,234	226,271	234,885	260,258	250,006	249,270	245,550
• Private Operator Buses	108,287	162,435	166,458	172,959	179,455	166,477	187,358
• All Other	14,823	31,176	32,360	32,520	34,450	31,945	35,791
Total	**459,375**	**634,202**	**665,262**	**727,495**	**724,690**	**663,393**	**718,810**
Passenger Km (000's per day)							
• Queensland Rail	2,901	3,807	4,203	4,769	5,084	3,872	4,526
• Brisbane Transport Buses	1,291	1,809	1,873	2,165	2,033	2,015	1,957
• Private Operator Buses	992	1,512	1,556	1,685	1,738	1,580	1,724
• All Other	187	211	229	234	279	229	264
Total	**5,371**	**7,340**	**7,860**	**8,854**	**9,134**	**7,697**	**8,471**
Passenger Hours (per day)							
• Queensland Rail	65,143	83,824	92,023	105,686	108,860	84,906	99,140
• Brisbane Transport Buses	40,967	55,376	58,100	65,700	62,122	62,424	61,497
• Private Operator Buses	25,965	39,280	40,617	43,579	44,946	41,261	46,662
• All Other	5,623	7,016	7,580	7,633	8,535	7,524	8,729
Total	**137,698**	**185,496**	**198,321**	**222,598**	**224,464**	**196,115**	**216,028**
No. of Passenger Interchanges (per day)	42,902	87,353	93,483	98,700	110,401	92,507	104,865
No. of Passenger Trips (per day)	416,473	546,849	571,779	628,795	614,289	570,886	613,945
Revenue($ per day)							
• Queensland Rail	$310,193	$366,060	$398,635	$453,607	$460,064	$421,351	$427,464
• Brisbane Transport Buses	$284,921	$357,378	$370,081	$417,438	$393,973	$356,151	$385,845
• Private Operator Buses	$213,004	$290,452	$297,442	$313,584	$322,815	$299,510	$332,544
• All Other	$46,449	$59,766	$62,981	$63,899	$69,531	$62,559	$70,833
Total	**$854,566**	**$1,073,656**	**$1,129,139**	**$1,248,529**	**$1,246,382**	**$1,139,570**	**$1,216,685**
Walk and Cycle Trips (per day)	1,768,745	2,181,472	2,240,505	2,291,830	2,255,781	2,239,817	2,438,099
Private/Commercial Vehicles							
Person Trips (000's per day)							
• Private Vehicle **	8,201	10,878	11,163	11,054	11,105	11,164	12,576
• Commercial Vehicle **	324	466	477	477	477	477	541
Vehicle Trips (000's per day)							
• Private Vehicle **	5,608	7,480	7,675	7,593	7,633	7,677	8,660
• Commercial Vehicle **	324	466	477	477	477	477	541
Person Kilometres (000's per day)							
• Private Vehicle ^	84,933.2	116,250.8	120,298.1	118,758.7	118,182.1	120,445.3	135,144.8
• Commercial Vehicle ^	3,705.3	5,547.2	5,681.1	5,675.8	5,678.3	5,680.8	6,566.4
Vehicle Kilomtres (000's per day)							
• Private Vehicle ^	58,115.0	79,981.4	82,754.5	81,629.5	81,285.0	82,856.0	93,104.6
• Commercial Vehicle ^	3,705.3	5,547.2	5,681.1	5,675.8	5,678.3	5,680.8	6,566.4
Person Hours (000's per day)							
• Private Vehicle ^	1,563.8	2,219.2	2,333.3	2,270.9	2,268.6	2,337.9	2,730.9
• Commercial Vehicle ^	66.7	103.6	108.1	106.8	107.2	108.1	127.0
Vehicle Hours (000's per day)							
• Private Vehicle ^	1,070.5	1,527.7	1,606.1	1,561.8	1,561.2	1,609.2	1,882.9
• Commercial Vehicle ^	66.7	103.6	108.1	106.8	107.2	108.1	127.0
Operating Costs ($000's per day)							
• Private Vehicle ^	$13,433	$18,458	$19,105	$18,835	$18,766	$19,128	$21,509
• Commercial Vehicle ^	$957	$1,434	$1,470	$1,468	$1,469	$1,470	$1,699
Number of Accidents (per day)							
• Fatal ^	1.3	1.7	1.8	1.7	1.8	1.8	2.0
• Injury ^	30.2	40.2	41.6	41.1	41.0	41.6	47.0
• Property ^	31.2	41.6	43.0	42.4	42.3	43.0	48.6
Accident Costs ($000's per day)	$2,290.7	$3,044.7	$3,153.5	$3,100.7	$3,101.6	$3,156.5	$3,543.6
Emmissions (tonnes per day)							
• Carbon Monoxide ^	678.68	965.20	1,011.02	986.97	986.08	1,012.78	1,175.98
• Hydro-Carbons ^	252.11	351.26	365.74	359.56	358.46	366.33	420.21
• Oxides of Nitrogen ^	63.67	87.78	90.74	89.63	89.23	90.85	102.35

Note : ** - Values contain Intrazonal Trips
^ - Values do NOT contain Intrazonal Trips

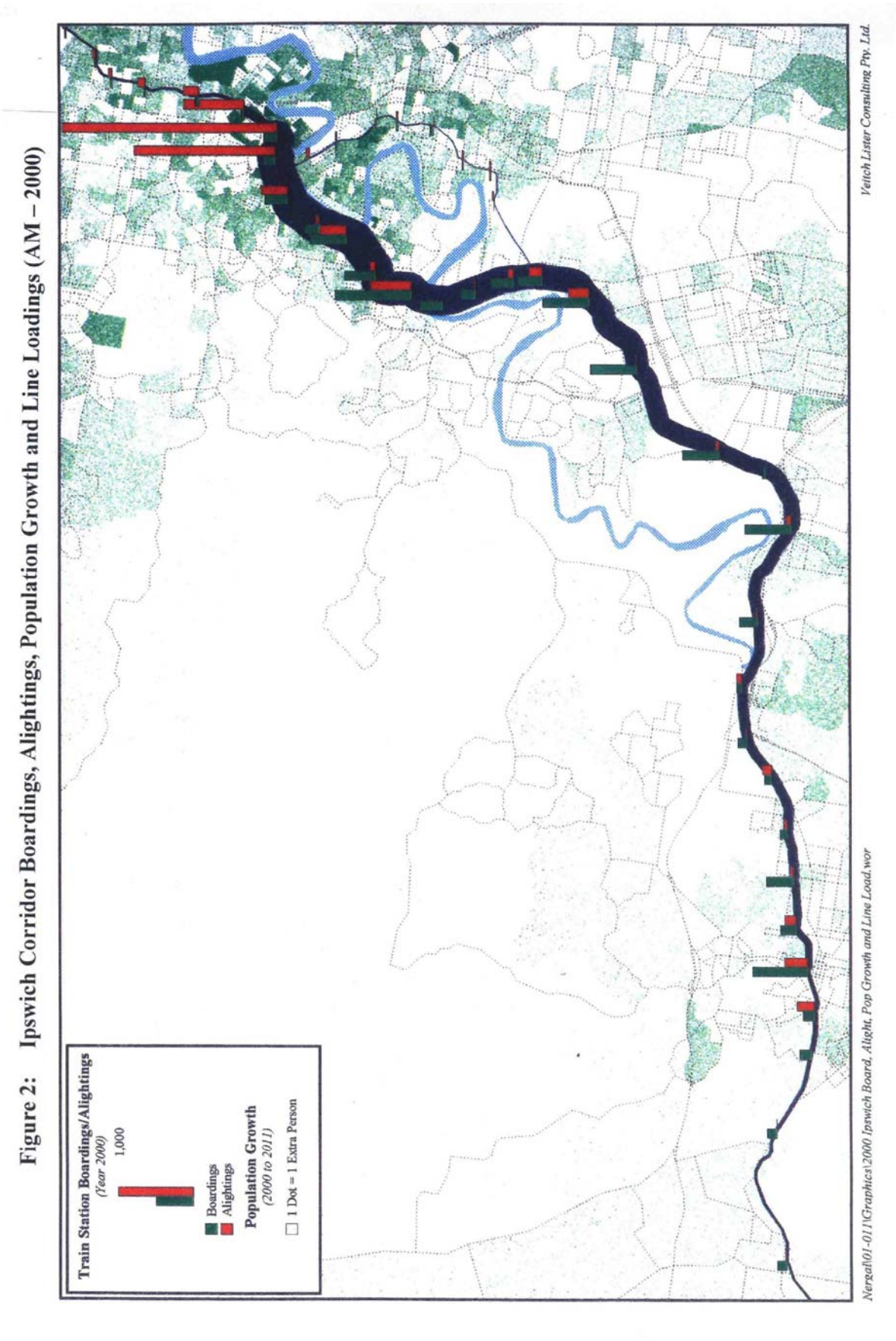
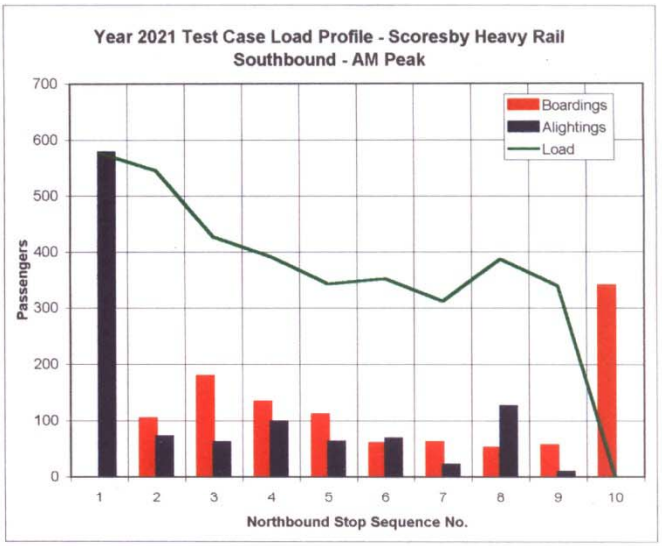
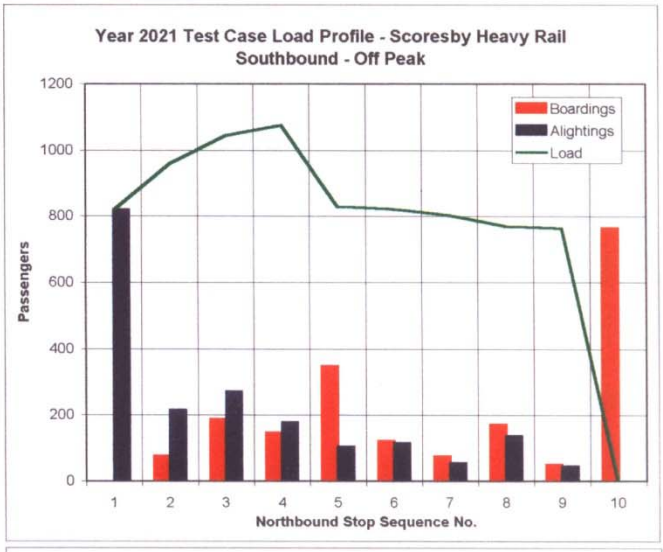


Figure 2: Ipswich Corridor Boardings, Alightings, Population Growth and Line Loadings (AM – 2000)

Figure 3: Year 2021 Test 2 Load Profiles – ScorRail_SB

NB Stop Sequ.	Stop Name	Node_ID
1	Dandenong Stn	14263
2	Yarraman Stn	14069
3	Princes Highway Station	19349
4	Police Road Station	19350
5	Wellington Road Station	19351
6	Ferntree Gully Road Station	19352
7	High Street Road Station	19353
8	Burwood Hwy Station	19354
9	Canterbury Road Station	19355
10	Heatherdale Stn	14292





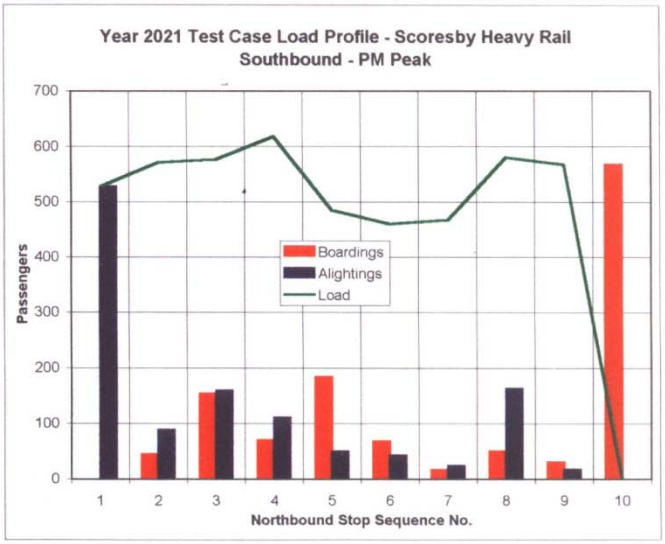
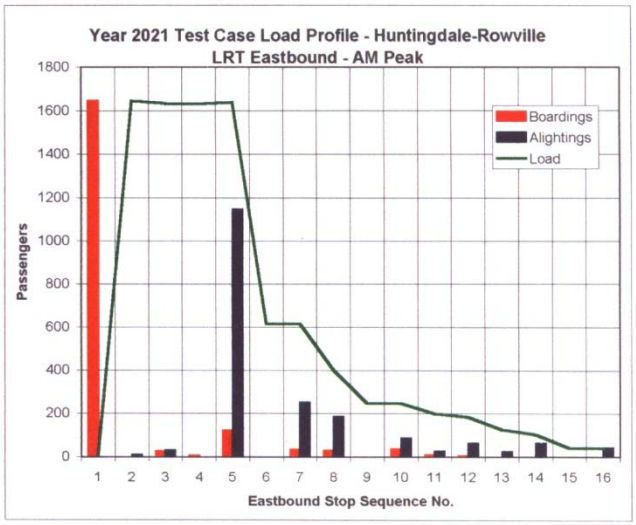
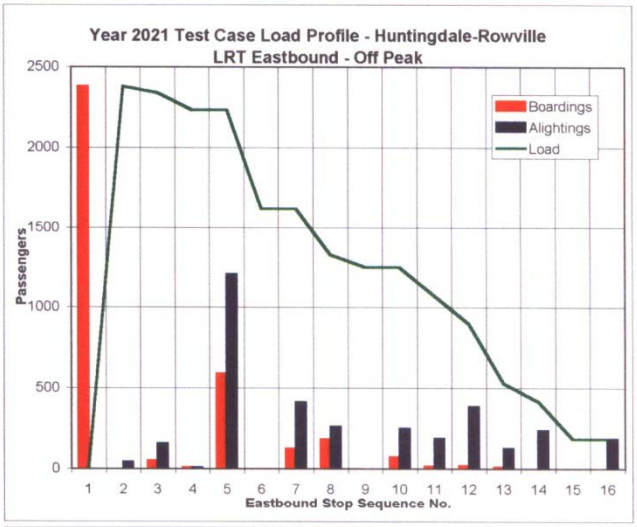
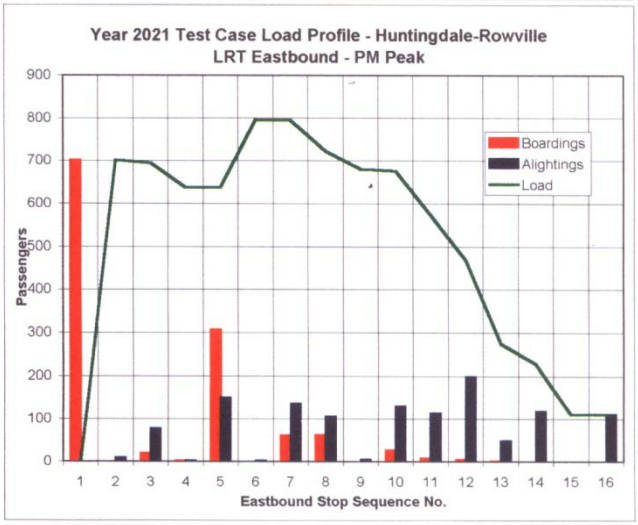


Figure 4: Year 2021 Test 2 Load Profiles – Hunt_Row_EB

Stop Sequence	Stop Name	Node_ID
1	Monash (C)	19336
2	Monash (C)	19337
3	Monash (C)	19338
4	Monash (C)	19339
5	Monash (C)	19340
6	Monash (C)	19341
7	Monash (C)	16557
8	Monash (C)	19342
9	Monash (C)	19343
10	Monash (C)	19344
11	Monash (C)	19345
12	Monash (C)	19346
13	Knox (C)	19347
14	Knox (C)	16637
15	Knox (C)	16641
16	Knox (C)	16532







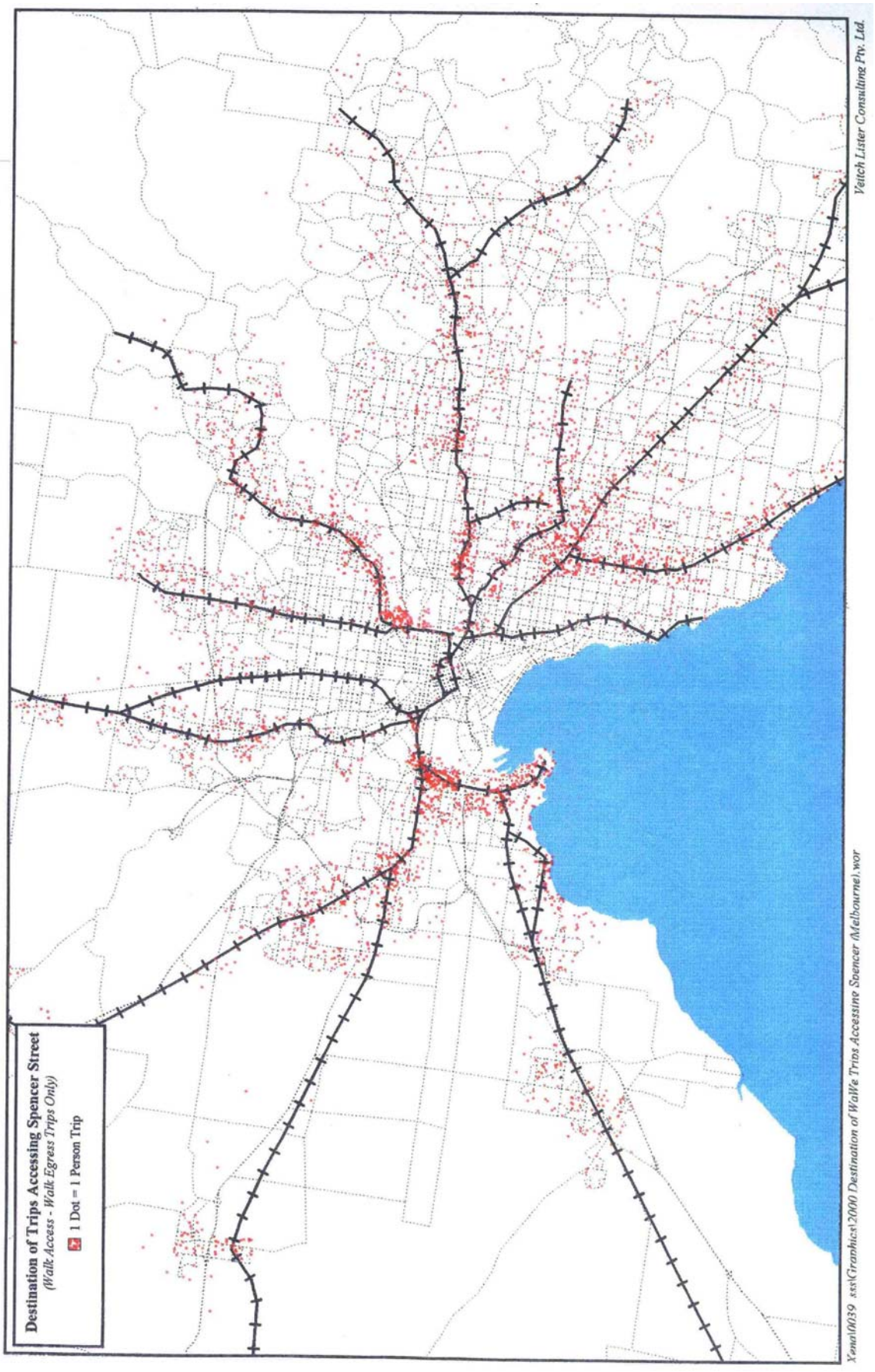


Figure 5: Destination of Walk Access – Walk Egress Trips Boarding at Spencer Street Station in the Year 2000

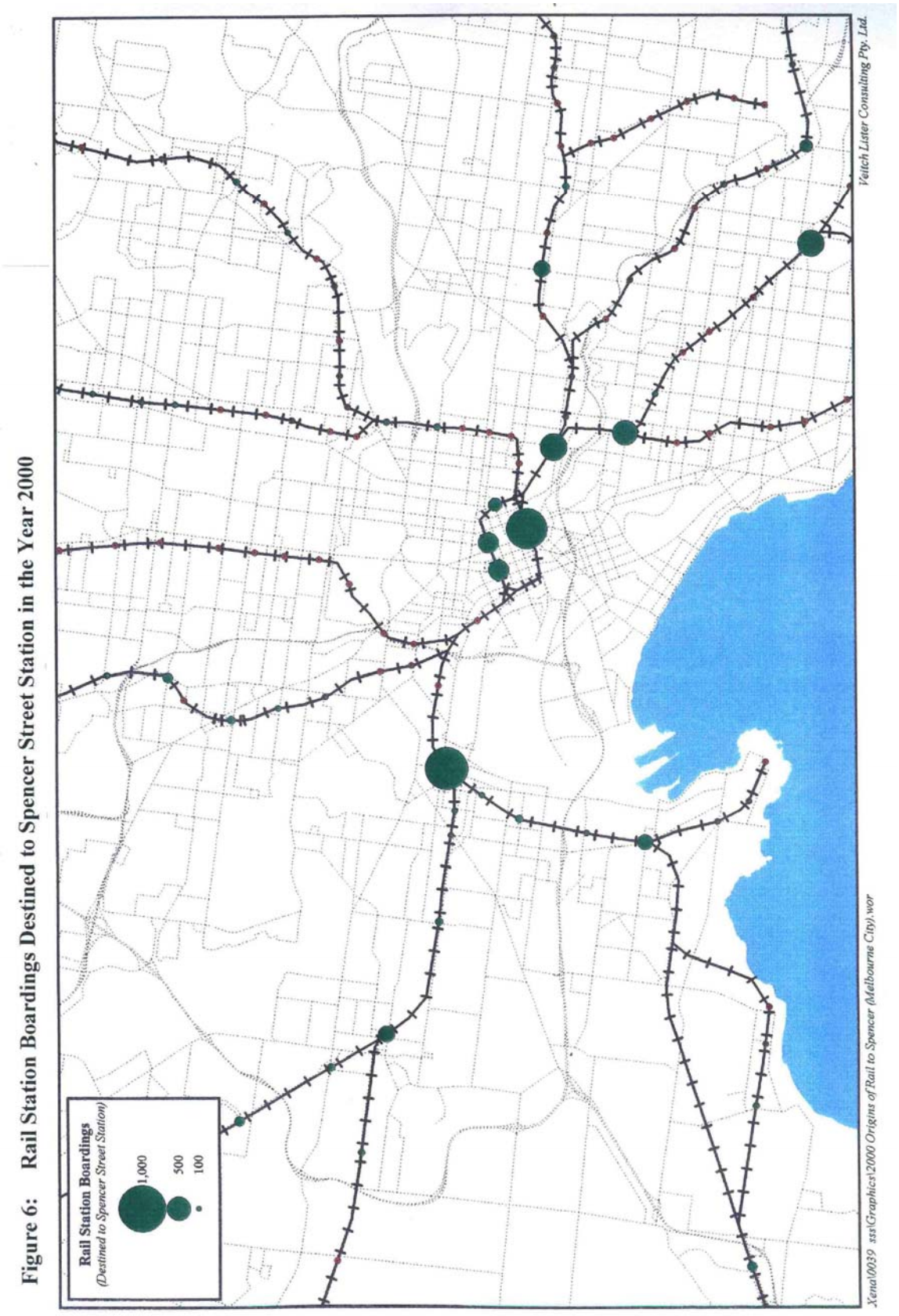


Figure 6: Rail Station Boardings Destined to Spencer Street Station in the Year 2000

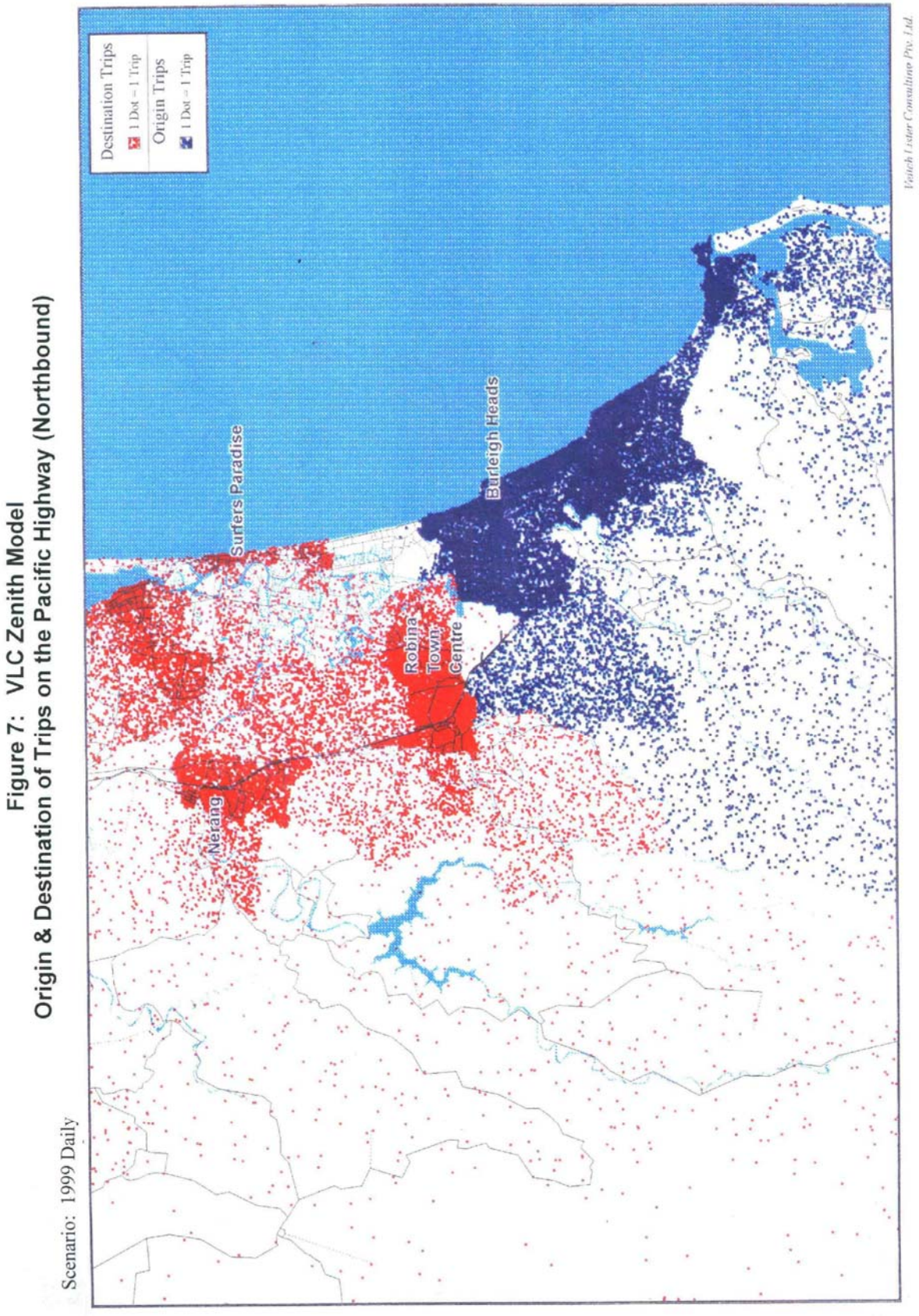


Figure 7: VLC Zenith Model
Origin & Destination of Trips on the Pacific Highway (Northbound)

APPENDIX B:

VicRoads Arterial Road Upgrading Projects for Long Term Traffic Modelling

Period Ending	Project	LGA
2008/09		
	Major Projects	
	Mitcham Frankston Motorway (Eastlink) (under construction)	
	Pakenham Bypass	
	Tullamarine/Calder Freeway Interchange (under construction	Moonee Valley
	Western Freeway, Leakes Road interchange	
	Arterial Road Improvements	
	Anderson Street, Duplication - Cobden Cr to Lilydale-Monbulk Rd	Yarra Ranges
	Berwick-Cranbourne Rd, Duplication - Greaves Road to Pound Road	Casey
	Boardwalk Bvd, new link - Dunnings Rd to Sneydes Rd (4 lanes divided)	Wyndham
	Burwood Highway, third lane widening - Mountain Hwy to Stud Rd	Knox City
	Canterbury Rd, Duplication & Widening - Bayswater Rd to Dorset Rd (widen 4 lanes undivided to 6 lanes divided)	Maroondah
	Cheltenham Rd, Third Lane Widening - Springvale Rd to Chandler Rd	Greater Dandenong
	Childs Road, duplication and extension - High St to Edgars Rd	Whittlesea
	Cranbourne-Frankston Rd, Duplication - Scott St to Hall Rd	Casey
	Cranbourne-Frankston Rd, Duplication - Warrandyte Rd to Centre Rd	Frankston
	Dandenong Southern Bypass (Dingley Reservation), new link - Perry Rd to South Gippsland Hwy (4 lanes divided)	Greater Dandenong
	Derrimut Road, Duplication - Hogans Rd to Sayers Rd	Wyndham
	Edgars Road Extension, Childs Rd to Cooper St (4 lanes divided)	Whittlesea
	Ferntree Gully Rd, Third Lane Widening - Cootamundra Dve to Jells Rd	Monash
	Fitzgerald Rd, Duplication - Swann Dr to Middle Rd	Brimbank
	Greens Road , duplication - Perry Rd to Hammond Rd	Greater Dandenong
	Greensborough Hwy (Plenty Road Bridge Upgrade), Widening to 6 lanes, Plenty River to Diamond Ck Rd	Banyule, Nillumbik
	Hallam Rd, Duplication - Hallam Bypass to James Cook Dve	Casey
	Kings Rd, Duplication - Melton Hwy to Taylors Rd	Brimbank
	Mickleham Road, Duplication - Alanbrae Terrace to Barrymore Road	Hume
	Middleborough Rd, Rail grade separation	Whitehorse
	Moorooduc Hwy, Widening - Towerhill Rd to Frankston - Flinders Rd (widen to 6 lanes)	Frankston
	Narre Warren-Cranbourne Rd, Duplication - Centre Rd to Pound Rd	Casey
	Palmers Road, South Link - Dunnings Road to Sayers Road (4 lanes divided)	Wyndham
	Plenty Rd, Duplication - McDonalds Rd to Gordons Rd	Whittlesea
	Plenty Rd, Duplication - Centenary Dve to McDonalds Rd	Whittlesea
	Plenty Rd, Widen to 6 lanes - MRR to McKimmies Rd	Whittlesea
	Somerton Road, Duplication - Hume Hwy to West of Rail Crossing	Hume
	South Road Extension, new link - Warrigal Hwy to Old Dandenong Rd (2 lanes undivided) (Old Dandenong Rd truncated)	Kingston
	Taylors Rd, Rail Underpass - Sydenham Rd to East Esplanade (4 lanes divided)	Brimbank
	Thompsons Rd, Widening - Dandenong Valley Hwy to Western Port Hwy	Frankston, Greater Dandenong

Period Ending	Project	LGA
	Wellington Rd, Duplication - Taylors Lane to Napoleon Rd	Knox
2010/2011		
	Major Projects	
	Calder Fwy, Interchanges - Sunshine Av (1/2 diamond, westerly oriented) & Kings Rd (full diamond), 4 lane Calder-Melton	Brimbank
	Calder Fwy, Widen to 6 lanes, Keilor Park Dve to Melton Hwy	Brimbank
	Docklands Hwy, Grade Separation - (Footscray Rd) Rail West Of Citylink	Docklands
	E14, New Link, Somerton Rd to Craigieburn Rd (2 lanes undivided)	Hume
	Hume Freeway, Full interchange at Donnybrook Rd	Hume
	Monash Freeway widening (one additional lane in each direction)	
	West Gate Bridge (reversible lanes)	
	Western Freeway, Deer Park Bypass (2 lanes in each direction)	Brimbank, Melton
	High Development Order (2)	
	Arterial Road Improvements	
	Childs Road, duplication and extension - High St to Edgars Rd	Whittlesea
	Cranbourne-Frankston Rd, Duplication - Centre Rd to Western Port Hwy	Frankston
	Edgars Rd, New Link, Cooper St to O'Herns Rd (2 lanes undivided)	Whittlesea
	Findon Rd, New Link & Widening to 4 Lanes - Civic Dve to Plenty Rd (4 lanes divided)	Whittlesea
	Leakes Rd, Construction - Derrimut Rd to Fitzgerald Rd (2 lanes undivided)	Wyndham
	Metropolitan Ring Road, Duplication & Widening - Plenty Rd to Greensborough Hwy (6 lanes divided)	Banyule, Nillumbik
	Narre Warren-Cranbourne Rd, Duplication - Pound Rd to Thompsons Rd	Casey
	Plummer Street, Extension(New Link)/Widening - Graham St to Todd Rd (2 lanes undivided)	Port Phillip
	Western Port Hwy, Duplication - Cranbourne-Frankston Rd to North Rd	Casey, Frankston
2013/2014		
	Major Projects	
	E6, New Link - Findon Rd to Bridge Inn Rd (4 lanes divided)	Whittlesea
	Arterial Road Improvements	
	Berwick-Cranbourne Rd, Duplication - Ballarto Rd to South Gippsland Hwy	Casey
	Berwick-Cranbourne Rd, Duplication - Pound Rd to Ballarto Rd	Casey
	Boronia Rd, Third Lane Widening - Mountain Hwy to Stud Rd	Knox
	Bridge Inn Rd, Duplication - Plenty Rd to Yan Yean Rd	Whittlesea
	Doncaster-Eltham Rd, Duplication - (Fitzsimons La) Homestead Rd to Main Rd	Nillumbik
	Hallam Rd, Duplication - Princes Hwy to Pound Rd	Casey
	Hallam Rd, Duplication - Fordholm Rd to South Gippsland Hwy	Casey
	Hallam Rd, Duplication - Pound Rd to Fordholm Rd	Casey
	High Street Rd, Duplication - Mowbray Dve to Burwood Hwy	Knox
	Main Rd, New Link - Local Bypass St. Albans (4 lanes divided)	Brimbank
	Maroondah Highway Deviation at Lilydale (4 lanes divided)	Yarra Ranges

Period Ending	Project	LGA
	Metropolitan Ring Road, Third Lane Widening - Edgars Rd to Plenty Rd	Whittlesea
	Plenty Rd, Duplication - Wilton Vale Rd to Masons Rd	Whittlesea
	Thompsons Rd, Widening - Western Port Hwy to Evans Rd	Casey
2018/2019		
	Major Projects	
	Dingley Arterial East (Springvale Rd to Perry Rd) (4 lanes divided)	
	Dingley Arterial West (Springvale Bypass to Warrigal Rd) (4 lanes divided) (includes duplication of South Rd Ext)	
	E6, New Link - Metropolitan Ring Rd to Findon Rd (4 lanes divided)	Whittlesea
	Arterial Road Improvements	
	Berwick-Cranbourne Rd, Duplication - High St to Kangan Rd	Casey
	Bridge Inn Rd, Duplication - E6 to Plenty Rd	Whittlesea
	Bridge Inn Rd, Duplication - Plenty Rd to Yan Yean Rd	Whittlesea
	Buckley St, Intersection Works - Sunshine Rd to Hyde St	Maribyrnong
	Burwood Hwy, Third Lane Widening - Scoresby Rd to Ferntree Gully Rd	Knox
	Cheltenham Rd, New Link - Hammond Rd to Stud Rd (4 lanes divided)	Greater Dandenong
	Edgars Rd, Duplication - Cooper St to O'Herns Rd	Whittlesea
	Edgars Rd, New Link, 4 lanes, O'Hearns Rd to Craigieburn Rd	Whittlesea
	Governor Rd, Duplication - Boundary Rd to Springvale Rd	Kingston
	Hallam North Rd, Duplication - Heatherton Rd to James Cook Dve	Casey
	Reynolds Rd, Duplication - Springvale Rd to Tindalls Rd Donvale	Manningham
	Springvale Rd, Duplication - Mitcham Rd to Reynolds Rd	Manningham
	Springvale Rd, Third Lane Widening - Cheltenham Rd To Hutton Rd	Kingston, Greater Dandenong
	Springvale Rd, Third Lane Widening - Hutton Rd to Mornington Peninsula Fwy	Kingston, Greater Dandenong
	Thompsons Rd, Widening - Evans Rd to South Gippsland Hwy (2 lanes undivided)	Casey
	Thompsons Rd, Widening - South Gippsland Hwy to Narre Warren - Cranbourne Rd	Casey
	Thompsons Rd, Widening - Narre Warren Cranbourne Rd to Berwick - Cranbourne Rd	Casey
	Wellington Rd, Duplication - Lysterfield Rd to Belgrave-Hallam Rd	Yarra Ranges
2020/2021		
	Major Projects	
	Frankston Bypass - Northern Link (4 lanes divided MFP to Dandenong-Frankston Rd)	
	Arterial Road Improvements	
	Bayswater Rd, Upgrade To 4 Lanes - Canterbury Rd to Mt Dandenong Rd	Maroondah
	Boundary Rd, Duplication - Fitzgerald Rd to Raymond Rd	Brimbank
	Calder Park Dr, Duplication - Calder Fwy to Melton Hwy	Brimbank
	Calder Park Dr, Duplication - Melton Hwy to Taylors Rd	Brimbank
	Calder Park Dr/Westwood Dr, Road Extension - Western Hwy to Taylors Rd (4 lanes divided)	Melton
	Canterbury Rd, Road Widening 4 Lanes To 6 Lanes Divided - Dorset Rd to Liverpool Rd	Maroondah, Yarra Ranges

Period Ending	Project	LGA
	Canterbury Rd, Third Lane Widening - Liverpool Rd to Mount Dandenong Rd	Yarra Ranges
	Dorset Rd, Duplication - Boronia Rd to Burwood Rd	Knox
	Ferntree Gully Rd, Third Lane Widening - Jells Rd to Stud Rd	Knox
	Findon Road, Plenty Rd to Gorge Rd (4 lanes divided)	Whittlesea
	Forsyth Road, Duplication - K-Mart Entrance to Wallace Ave	Wyndham
	Heatherton Rd, Duplication - Hallam North Rd to Belgrave-Hallam Rd	Casey
	Northern Arterial Route, New Link - Reynolds Rd to Maroondah Hwy (4 lanes divided)	Manning, Maroond, Yarra Ranges
	O'Herns Rd, Carriageway Upgrade - Epping Rd to Craigieburn Bypass (2 lanes undivided)	Hume
	Palmers Rd, Road Widening - Sayers Rd to Leakes Rd (4 lanes divided)	Wyndham
	Taylors Rd, Duplication - Kings Rd to Kurung Dr	Brimbank
	Taylors Rd, Duplication - Kurung Dr to Calder Park Dv	Melton
2030/2031		
	Major Projects	
	Frankston Bypass, 4 lanes divided - Dandenong-Frankston Rd to Moorooduc Hwy south of Sages Rd)	Frankston, Mornington Peninsula
	St Albans Bypass, 4 lanes divided - Station Rd to St Albans Rd	Brimbank
	E14, 4 lanes divided, New Link - Metropolitan Ring Rd to Somerton Rd	
	Arterial Road Improvements	
	Cranbourne-Frankston Rd, Duplication - Western Port Hwy to Hall Rd	Casey
	Dohertys Rd, Duplication - Cherry Lne to Grieve Pde	Hobsons Bay
	Dohertys Rd, Duplication - Hume Rd to Cherry La	Wyndham
	Epping Rd, Duplication - Memorial Av to Findon Rd	Whittlesea
	Ferntree Gully Rd, Widening 4 to 6 Lanes Divided - Scoresby Rd to Burwood Hwy	Knox
	Findon Rd, Duplication - Epping Rd to Glendale Av	Whittlesea
	Fitzgerald Rd, Duplication - Dohertys Rd to Leakes Rd	Wyndham
	Forsyth Rd, Duplication and extension, 4 lanes divided - Kmart entrance to Sayers Rd	Wyndham
	Grieve Pde, Duplication - Kororoit Ck Rd to North of Pinnacle Rd	Hobsons Bay
	Hall Rd, - McCormicks Rd to Sladen St	Frankston
	Healesville - Koo-Wee-Rup Rd, Duplication - Ballarton Rd to Manks Rd	
	Healesville - Koo-Wee-Rup Rd, Duplication - Hall Rd to Ballarto Rd	
	Healesville - Koo-Wee-Rup Rd, Duplication - Pakenham Bypass to Hall Rd	
	Healesville - Koo-Wee-Rup Rd, Manks Rd to South Gippsland Hwy	
	Kelletts Rd, Duplication - Taylors Lne to Napoleon Rd	Knox
	Kelletts Rd, Duplication - Napoleon Rd to Wellington Rd	Knox
	Kororoit Creek Rd, Duplication - Grieve Pde to Millers Rd	Hobsons Bay
	Leakes Rd, Duplication - Derrimut Rd to Fitzgerald Rd	Wyndham
	Melton Hwy, Duplication - The Regency to Ryans Lne	Melton
	Mickleham Rd, Duplication - Barrymore Rd to Somerton Rd	Hume

Period Ending	Project	LGA
	Narre Warren - Cranbourne Rd, Duplication - Thompsons Rd to South Gippsland Hwy	Casey
	Narre Warren North Rd, Duplication - Ernst Wanke Rd to Heatherton Rd	Casey
	O'Herns Rd, Duplication - Craigieburn Bypass to Epping Rd (including O'Herns Rd interchange)	Whittlesea
	Palmers Rd, Duplication - Leakes Rd to Boundary Rd	Wyndham
	Plenty Rd, Duplication - Gordons Rd to Wilton Vale Rd	Whittlesea
	Robinsons Rd/Westwood Dve, Duplication - Boundary Rd to Western Hwy	Brimbank, Melton
	Sayers Rd, Duplication - Derrimut Rd to Palmers Rd	Wyndham
	Tarneit Rd, Duplication - Heaths Rd to Hogans Rd	Wyndham
	Taylors Rd, Duplication - Gourley Rd to Calder Park Dve	Melton
	Thompsons Rd, Duplication - Western Port Hwy to Evans Rd	Casey
	Thompsons Rd, Duplication - Dandenong Valley Hwy to Western Port Hwy	Frankston, Greater Dandenong
	Thompsons Rd, Duplication - Evans Rd to South Gippsland Hwy	Casey
	Thompsons Rd, Duplication - Mitcham Frankston Freeway to Dandenong-Frankston Rd	Greater Dandenong, Frankston
	Thompsons Rd, Duplication - Narre Warren - Cranbourne Rd to Berwick-Cranbourne Rd	Casey
	Thompsons Rd, Duplication - South Gippsland Hwy to Narre Warren - Cranbourne Rd	Casey
	Vineyard Rd, Duplication - Moore Rd to future Elizabeth Dr	Hume
	Wellington Rd, Duplication - Napoleon Rd to Kelletts Rd	Knox
	Yan Yean Rd, Duplication - Kurrak Rd to Diamond Ck Rd	Nillumbik

APPENDIX C:

Model Validation

Modelled and Observed Traffic Volumes

Count Number	Road Name	Location	Weekday Count	Modelled Volume	Count Year
69	Amberley Cr	Frankston-Dandenong Rd btw & Gloma	16175	16777	2004
39	Baxter-Tooradin	Rd btw Peryman St & Gracemere	3683	5231	2004
40	Baxter-Tooradin Rd	btw Peryman St & Gracemere	3783	5274	2004
141	Baxter-Tooradin Rd	btw Peryman St and Gracemere Dr	3783	5274	2004
142	Baxter-Tooradin Rd	btw Peryman St and Gracemere Dr	3683	5231	2004
13	Belgrave-Hallam Rd	N of Princes Hwy	8842	11290	2004
105	Brady Rd	E of Gladstone Rd	5024	2510	2005
60	Browns Rd	S of Police Rd	4841	5504	2004
47	Cadles Rd	S of Hall Rd	1494	0	2004
46	Cadles Rd N	of Hall Rd	3136	2470	2004
143	Camms Rd	W of Rosalie Av	5199	3443	2005
144	Camms Rd	W of Rosalie Av	4893	3438	2005
145	Central Parkway	E of Alberton Av	1982	2241	2005
146	Central Parkway	E of Bernborough Av	1834	2292	2005
109	Centre Dandenong Rd	N of Lower Dandenong Rd	6819	7577	2006
61	Cheltenham Rd	E of Kingsclere Av	18742	17926	2004
84	Cheltenham Rd	W of Kingsclere Av	19096	15730	2006
116	Cleeland St	S of Heatherton Rd	3880	5038	2005
110	Corrigan Rd	N of Heatherton Rd	6083	6830	2006
103	Corrigan Rd	S of Lightwood Rd	7188	6702	2006
50	Cranbourne Rd	E of Mcmahons Rd	12892	14532	2004
51	Cranbourne Rd	W of Mcmahons Rd	8384	16203	2004
137	Cranbourne-Frankston Rd	btw Hall Rd and Brookland Greens Bvd	9008	7152	2005
138	Cranbourne-Frankston Rd	btw Hall Rd and Brookland Greens Bvd	9254	6896	2005
139	Cranbourne-Frankston Rd	btw Hall Rd and Scarborough Av	12057	8496	2005
140	Cranbourne-Frankston Rd	btw Hall Rd and Scarborough	12599	8651	2005

Count Number	Road Name	Location	Weekday Count	Modelled Volume	Count Year
		Av			
90	Dandenong-Frankston Rd	btw Frankston Gardens Dr & Centenary St	17080	21413	2005
91	Dandenong-Frankston Rd	btw Frankston Gardens Dr & Centenary St	17807	21683	2005
149	Evans Rd	btw Hall Rd and Navarre Dve	5331	7196	2005
147	Evans Rd	btw Railway Line and Alymer Rd	75	64	2005
148	Evans Rd	btw Thompsons Rd and Breens Rd	7409	5919	2005
153	Fairhaven St	At Number 57	449	0	2005
85	Foster St	E of Lonsdale St	15014	13322	2005
86	Foster St	W of Lonsdale St	9754	15701	2005
43	Frankston Fwy	btw Skye Rd & Beach St	26274	36988	2004
68	Frankston-Dandenong Rd	btw Amberley Cr & Gloma	17358	16768	2004
88	Frankston-Dandenong Rd	btw Hall Rd and William Rd	17097	17531	2005
89	Frankston-Dandenong Rd	btw Hall Rd and William Rd	14571	15957	2005
106	Gladstone Rd	N of Brady Rd	6370	4565	2005
7	Gleneagles Dr	btw Inverness St & Scotsburn Way	1800	1138	2004
8	Gleneagles Dr	btw Inverness St & Scotsburn Way	1981	1180	2004
18	Gloucester Av	S of High St	2612	5	2004
120	Governor Rd	W of Springvale Rd	8421	6542	2006
121	Governor Rd	W of Springvale Rd	8613	6195	2006
122	Greens Rd	btw Ordish Rd and Perry Rd	14384	12731	2005
123	Greens Rd	Greens Rd	13974	12083	2005
135	Hall Rd	300m W of Western Port Hwy	6310	6752	2006
136	Hall Rd	300m W of Western Port Hwy	5802	6879	2006
152	Hall Rd	W of Evans Rd at Number 660-665	11780	14255	2005
48	Hall Rd E	of Cadles Rd	6984	6504	2004
49	Hall Rd W	of Cadles Rd	8765	8521	2004

Count Number	Road Name	Location	Weekday Count	Modelled Volume	Count Year
14	Hallam Rd	S of Princes Hwy	10926	7538	2004
62	Hammond Rd	N of Kirkham Rd	8922	6262	2004
63	Hammond Rd	S of Kirkham Rd	7246	5028	2004
1	Heatherton Rd	E of Power Rd	15367	18301	2004
53	Heatherton Rd	E of Springvale Plaza	12791	10988	2004
112	Heatherton Rd	W of Chandler Rd	10370	13598	2005
114	Heatherton Rd	W of Gladstone Rd	9925	12548	2006
2	Heatherton Rd	W of Power Rd	16313	22888	2004
54	Heatherton Rd	W of Springvale Plaza	13159	10895	2004
19	High St	E of Gloucester Av	9817	6976	2004
23	High St	N of Sladen St	11857	13404	2004
27	High St	N of Stawell St	13895	14135	2004
28	High St	S of Stawell St	11767	12963	2004
20	High St	W of Gloucester Av	9483	7305	2004
31	High St N	of Childers St	12181	13404	2004
32	High St N	of Childers St	11932	12834	2004
33	High St N	of Lyall St	13857	13513	2004
34	High St N	of Lyall St	12665	12963	2004
115	James St	S of Heatherton Rd	2235	1170	2005
111	Kingsclear Av	N of Cheltenham Rd	5700	4023	2006
64	Kirkham Rd	E of Hammond Rd	2519	2620	2004
65	Kirkham Rd	W of Hammond Rd	1615	2641	2004
66	Lonsdale St	N of Foster St	16465	16882	2004
67	Lonsdale St	S of Foster St	20664	28151	2004
52	Mcmahons Rd	SW of Cranbourne Rd	26060	25474	2004
150	Monahans Rd	N of Sladen St	5641	1994	2004
5	Monash	Monash NW of Sthgipp/Hallam Inbound	67306	72143	2004
70	Monash Fwy	btw Police Rd and Gladstone Rd	62371	67057	2005
71	Monash Fwy	btw Police Rd and Gladstone	63624	66224	2005

Count Number	Road Name	Location	Weekday Count	Modelled Volume	Count Year
		Rd			
9	Monash Fwy	Bwtn Sth Gipp & Belg-Halm Inbound	35345	40144	2004
10	Monash Fwy	Bwtn Sth Gipp & Belg-Halm Outbound	30778	37308	2004
72	Monash Fwy	E of Belgrave Hallam Rd	40095	43934	2006
73	Monash Fwy	E of Belgrave Hallam Rd	38023	42677	2006
11	Monash Fwy	E of Belgrave Hallam Rd Inbound	36414	40144	2004
12	Monash Fwy	E of Belgrave Hallam Rd Outbound	34376	37308	2004
76	Monash Fwy	E of Narrewarren Nth Rd	29496	34958	2006
77	Monash Fwy	E of Narrewarren Nth Rd	28905	34542	2006
80	Monash Fwy	Off Ramp to Stud Rd	7740	8135	2004
78	Monash Fwy	Onramp from Heatherton Rd	7833	11192	2005
82	Monash Fwy	Onramp from Narre Warren North Rd	7363	8544	2005
83	Monash Fwy	Onramp from Princes Hwy	6533	9055	2005
81	Monash Fwy	Onramp from Stud Rd	7437	9135	2005
74	Monash Fwy	W of Narrewarren Nth Rd	33571	37010	2006
75	Monash Fwy	W of Narrewarren Nth Rd	31804	36589	2006
124	Mornington Peninsula Fwy	NW of Thompson Rd	35622	30114	2006
125	Mornington Peninsula Fwy	NW of Thompson Rd	34775	30080	2006
131	Narre-Warren Rd	S of Princess Hwy	17692	16165	2006
41	Nepean Hwy	btw Seaford Rd & Coates Walk	12364	6286	2004
42	Nepean Hwy	btw Seaford Rd & Coates Walk	11015	5103	2004
128	Nepean Hwy	N of Humphreys Rd	16275	18584	2005
129	Nepean Hwy	S of Humphreys Rd	13995	18510	2005
100	Osborne Rd	W of Royal Av	5388	3612	2006
37	Pearcedale Rd	btw Browns Rd & Waterdale Rd	2356	2242	2004

Count Number	Road Name	Location	Weekday Count	Modelled Volume	Count Year
38	Pearcedale Rd	btw Browns Rd & Waterdale Rd	2272	2279	2004
3	Power Rd	N of Heatherton Rd	4872	5134	2004
4	Power Rd	S of Heatherton Rd	4228	5033	2004
79	Princes Fwy	East Onramp from Princes Hwy	7496	8731	2005
17	Princes Fwy	East SE of Princes Hwy Outbound	26226	33259	2004
15	Princes Hwy	E of Hallam Rd	14858	21293	2004
16	Princes Hwy	NW of Webb St	14137	16787	2004
133	Princess Hwy	E of Narre-Warren Rd	16324	19101	2006
132	Princess Hwy	NW of Narre-Warren Rd	19212	25499	2006
119	Princess Hwy	W of Decor Dr	22462	22549	2006
117	Princess Hwy E	btw Dandenong/Frankston Rd and Plunkett Rd	27546	22342	2005
118	Princess Hwy E	btw Dandenong/Frankston Rd and Plunkett Rd	25816	22591	2005
113	Princess Hwy E	NW of Chandler Rd	28102	33004	2005
104	Princess Hwy E	SE of Chandler Rd	20322	18693	2005
44	Silver Av	btw Wallowa Cr & Gardenia Cr	764	0	2004
45	Silver Av	btw Wallowa Cr & Gardenia Cr	632	0	2004
24	Sladen St	E of High St	7455	6269	2004
25	Sladen St	W of High St	12108	10910	2004
96	South Gippsland Fwy	N of Pound Rd	36313	37790	2006
97	South Gippsland Fwy	N of Pound Rd	39057	41233	2006
98	South Gippsland Fwy	Onramp from Princes Hwy	6845	4966	2005
107	Springvale Bypass	NW of Rowan Rd	18428	13376	2006
108	Springvale Bypass	NW of Rowan Rd	18226	13352	2006
55	Springvale Plaza	S of Heatherton Rd	751	0	2004
102	Springvale Rd	btw Hillcrest Gr and Andrew St	17140	14442	2004
56	Springvale Rd	btw Hillcrest Gv & Andrew St	16878	13690	2004
57	Springvale Rd	btw Hillcrest Gv & Andrew St	17140	14442	2004

Count Number	Road Name	Location	Weekday Count	Modelled Volume	Count Year
58	Springvale Rd	btw Watt St & Rosalie St	16719	20034	2004
59	Springvale Rd	btw Watt St & Rosalie St	16998	19418	2004
101	Springvale Rd	S of Lightwood Rd	14491	14467	2006
29	Stawell St	E of High St	2785	1363	2004
30	Stawell St	W of High St	1576	0	2004
21	Sth Gippsland	Hwy btw Thompsons Rd & Lesden Av	16204	14958	2004
6	Sth Gippsland Fwy	S of Monash Outbound (Excl E	38547	35897	2004
35	Sth Gippsland Hwy	btw Craig Rd & Jennifer St	7683	7282	2004
36	Sth Gippsland Hwy	btw Craig Rd & Jennifer St	7547	8124	2004
22	Sth Gippsland Hwy	btw Thompsons Rd & Lesden Av	15880	15588	2004
26	Sth Gippsland Hwy	SE of Sladen St	6966	9186	2004
87	Stud Rd	S of David St	18771	18379	2006
134	Thompson Rd	300m W of South Gippsland Hwy	8527	5452	2006
126	Thompson Rd	W of Rossiter Rd	10391	7183	2006
127	Thompson Rd	W of Rossiter Rd	8286	6971	2006
151	Thompsons Rd	btw Railway Line and Lonsdale Cr	14019	11275	2006
130	Webb St	SW of Princess Hwy	8051	7863	2005
99	Westall Rd	btw Princess Hwy E and Center Rd	21324	18641	2005
92	Western Port Hwy	N of Cranbourne-Frankston Rd	13581	13097	2006
93	Western Port Hwy	N of Cranbourne-Frankston Rd	13882	12994	2006
94	Western Port Hwy	N of North Rd	9692	6691	2006
95	Western Port Hwy	N of North Rd	9547	6702	2006