

Traffic and Transport Assessment

350 Barrabool Road, Wandana
Heights

CG150119

Prepared for
Villawood Properties Pty Ltd

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Contact Information

Cardno Victoria Pty Ltd
Trading as Cardno
ABN 47 106 610 913

Level 4
501 Swanston Street
Melbourne
Victoria 3000 Australia

Telephone: (03) 8415 7777
Facsimile: (03) 8415 7788
International: +61 3 8415 7777

victoria@cardno.com.au
www.cardno.com

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1 Introduction

Cardno has been engaged by Villawood Properties Pty Ltd to undertake a traffic engineering assessment of the proposed residential subdivision located at 350 Barrabool Road, Wandana Heights.

In the course of preparing this report, the subject site and its environs have been inspected, and plans of the proposal and relevant background information have been examined.

2 Background and Existing Conditions

2.1 Site Location

As shown within Figure 2-1, the subject site is located on the south side of Barrabool Road in Wandana Heights, with the Princess Freeway running along the site's western boundary. The subject site is irregular in shape, with a frontage of approximately 500 metres to Barrabool Road, a depth of approximately 500 metres and an overall site area of approximately 19 hectares.

The subject site is currently accessible via the Barrabool Road and Cityview Drive Intersection, where a "Type C" channelised intersection provides fully directional access. An existing water storage facility is located within the subject site, and is accessible via a paved access road connecting to Cityview Drive.

Land use to the north and east is typically residential in nature, with agricultural and rural land uses to the west of the site. Figure 2-2 shows an aerial photograph of the site.

Figure 2-1 Site Location

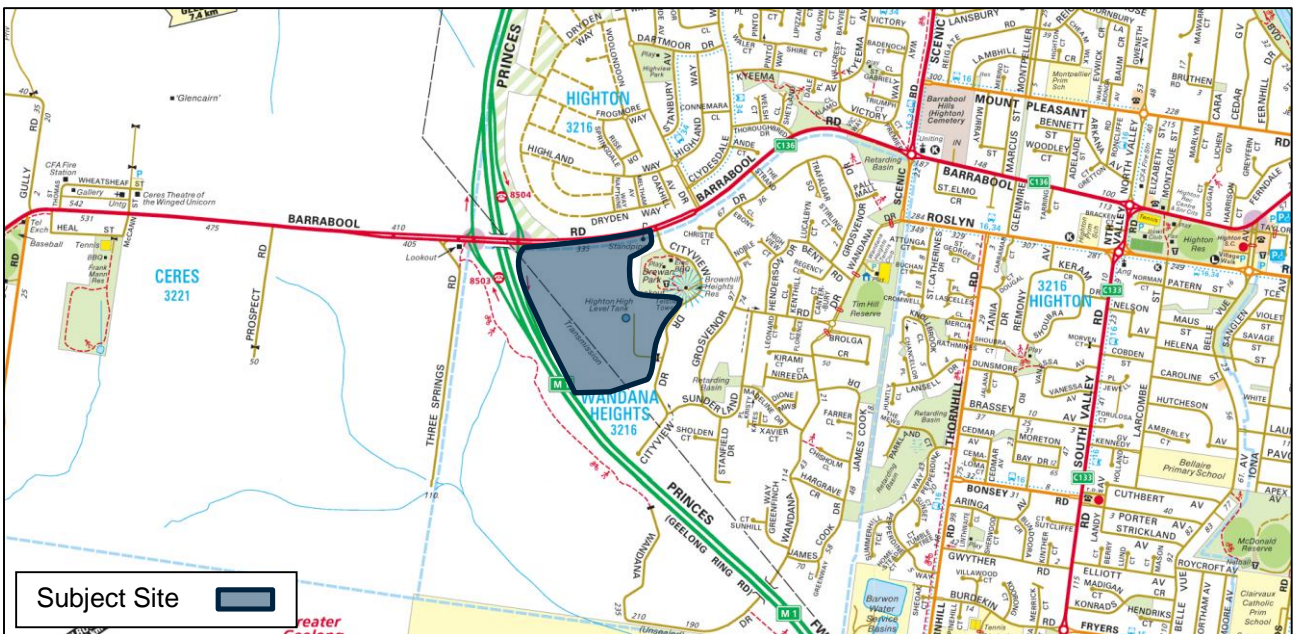


Figure 2-2 Aerial Photograph



2.2 Road Network

2.2.1 Barrabool Road

Barrabool Road operates as an arterial road, aligned in an east-west direction providing a connection to the Princess Highway to the west and High Street in Belmont to the east, where it continues as Barwon Heads Road. In the vicinity of the site, Barrabool Road currently operates as a two-way, two lane road with on-road bicycle lanes in either direction. Barrabool Road operates at a posted speed limit of 60 km/h.

Figure 2-3 shows Barrabool Road looking west adjacent to the subject site.

Figure 2-3 Barrabool Road looking west adjacent to the subject site



2.2.2 Cityview Drive

Cityview Drive is a local road extending south from Barrabool Road. It is configured with a 2 lane 6.6 metre carriageway within a 20 metre road reserve. No provision is made for on-street parking along Cityview Drive.

Figure 2-4 shows Cityview Drive looking north adjacent to the subject site.

Figure 2-4 Cityview Drive looking north adjacent to the subject site

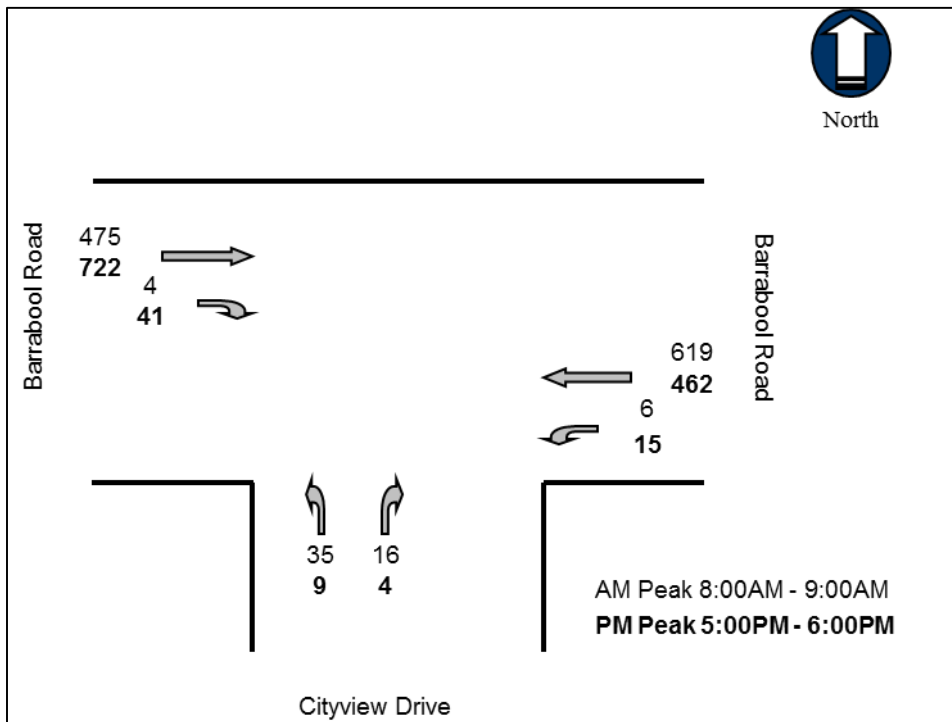


2.3 Traffic Volumes

To understand existing traffic conditions in the vicinity of the site, turning movement surveys were undertaken by Trans Traffic Surveys on behalf of Cardno at the intersection of Barrabool Road and Cityview Drive. These surveys were undertaken on Wednesday 18th February 2015, from 7:00am - 9:00am, and from 4:00pm - 7:00pm.

The results of the surveys indicate that the AM and PM peak hours are 8:00am – 9:00pm and 5:00pm – 6:00pm respectively, as shown in Figure 2-5 below.

Figure 2-5 Existing Traffic Volumes (AM/PM Peaks)



The survey results indicate that Barrabool Road currently carries 1,139 vehicles on average during the peak hours, while Cityview Drive carries 32 vehicles on average during the peak hours. Assuming that peak hour traffic volumes comprise 10% of daily traffic volumes, Barrabool Road would carry in the order of 11,000 vehicles per day, while Cityview Drive would carry in the order of 300 vehicles per day.

2.4 Existing Intersection Operation

The operation of the intersection of Barrabool Road and Cityview Drive was analysed using SIDRA Intersection to assess the operation of each intersection. This computer package, originally developed by the Australian Road Research Board, provides information about the capacity of an intersection in terms of a range of parameters, as described below:

Degree of Saturation (D.O.S.) is the ratio of the volume of traffic observed making a particular movement compared to the maximum capacity for that movement. Various values of degree of saturation and their rating are shown in Table 2-1.

Table 2-1 Rating of Degrees of Saturation

D.O.S.	Rating
Up to 0.6	Excellent
0.6 to 0.7	Very Good
0.7 to 0.8	Good
0.8 to 0.9	Fair
0.9 to 1.0	Poor
Above 1.0	Very Poor

It is considered acceptable for some critical movements in an intersection to operate in the range of 0.9 to 1.0 during the high peak periods, reflecting actual conditions in a significant proportion of suburban signalised intersections.

The **95th Percentile (95%ile) Queue** represents the maximum queue length, in metres, that can be expected in 95% of observed queue lengths in the peak hour; and

Average Delay is the delay time, in seconds, which can be expected over all vehicles making a particular movement in the peak hour.

The results of the SIDRA Intersection analysis of the existing traffic conditions are summarised in Table 2-2 and Table 2-3, with the intersection layout shown in Figure 2-6.

Figure 2-6 SIDRA Intersection Layout

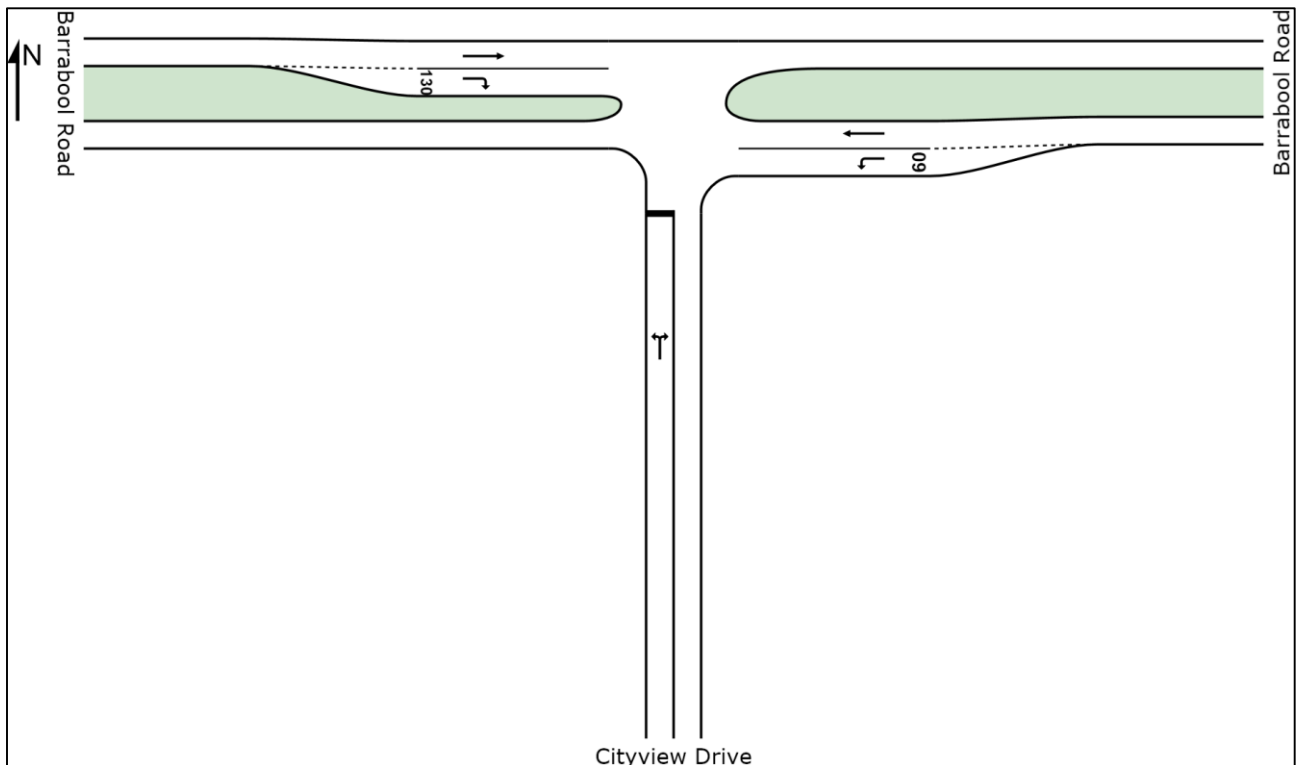


Table 2-2 SIDRA Intersection Analysis Summary: Barrabool Road / Cityview Drive (Existing Traffic Conditions – Morning Peak)

Leg	Movement	Degree of Saturation	95th%ile Queue (metres)	Average Delay (seconds)
South: <i>Cityview Drive</i>	Left	0.148	3.5	16.7
	Right	0.148	3.5	16.4
East: <i>Barrabool Road</i>	Left	0.003	0.0	5.6
	Through	0.341	0.0	0.0
West: <i>Barrabool Road</i>	Through	0.261	0.0	0.0
	Right	0.005	0.1	8.4

Table 2-3 SIDRA Intersection Analysis Summary: Barrabool Road / Cityview Drive (Existing Traffic Conditions – Evening Peak)

Leg	Movement	Degree of Saturation	95th%ile Queue (metres)	Average Delay (seconds)
South: <i>Cityview Drive</i>	Left	0.038	0.9	16.2
	Right	0.038	0.9	15.9
East: <i>Barrabool Road</i>	Left	0.009	0.0	5.6
	Through	0.254	0.0	0.0
West: <i>Barrabool Road</i>	Through	0.397	0.0	0.1
	Right	0.041	1.2	7.5

As shown in the above analysis, the intersection operates within the excellent category with limited queues and delays experienced by motorists.

3 Proposed Development

3.1 General

Based on the development plan prepared by Mesh Planning, it is proposed to develop the site for the purposes of a residential subdivision, comprising a total of 180 lots. The existing water storage facility is proposed to be retained, as shown within Figure 3-1.

Figure 3-1 Development Plan



3.2 External Access

The intersection of Barrabool Road and Cityview Drive will provide the main access point to the subdivision, while an internal road connection to the east (via Cityview Drive) will provide additional travel routes for the subject site. No changes are proposed to the Barrabool Road / Cityview Drive intersection.

3.3 Internal Road Layout

The internal road network will comprise a main north – south connector road (existing Cityview Drive), with access streets branching off the western side of Cityview Drive providing access to the majority of the proposed dwellings.

3.4 Bicycle and Pedestrian Links

Footpaths will be provided on either side of the main internal access streets to provide for pedestrian links through the site, connecting to Cityview Drive.

Pedestrian and bicycle links will be created in the active open areas located within the subdivision.

4 Traffic Considerations

4.1 Traffic Generation

Surveys were undertaken in April 2010 by Cardno at the Westleigh Gardens Estate on Princes Highway to the west of the Werribee Town Centre. The results of this survey indicate a daily traffic generation rate of 8.7 vehicle movements per dwelling. During the commuter peak hours, residential traffic generation is typically equal to 10% of the daily traffic generation, equating to 0.87 vehicle movements per dwelling.

The Westleigh Gardens Estate is serviced by a local bus route, however does not have any local facilities such as shops or schools within walking distance, and therefore many residents are dependent on car travel for such trips.

Based on the above, the proposed residential subdivision when fully developed, could generate traffic at 0.87 movements during the peak hours, with an average daily traffic generation of 8.7 vehicle movements.

Application of this rate to the proposed 180 lots equates to approximately 157 peak hour traffic movements, and approximately 1566 daily vehicle movements.

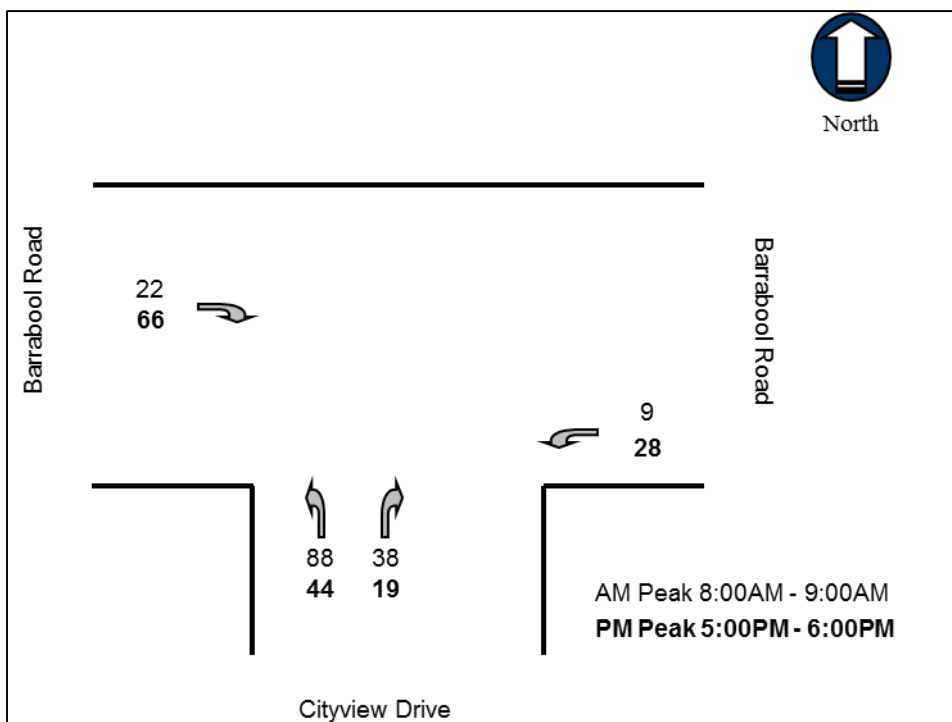
4.2 Development Traffic Distribution

Studies of residential developments indicate that during the morning peak hour approximately 20% of movements are arrivals and 80% departures, whilst during the evening peak hour 60% of movements are arrivals and 40% departures.

Analysis of the peak hour traffic survey results reveals that it is expected that 70% of the development traffic will have origins / destinations to the west along Barrabool Road (City via Princes Freeway), with the remaining 30% having origins / destinations to the east along Barrabool Road.

Based on the above, Figure 4-1 has been prepared to show the anticipated additional development volumes generated at the intersection of Barrabool Road and Cityview Drive.

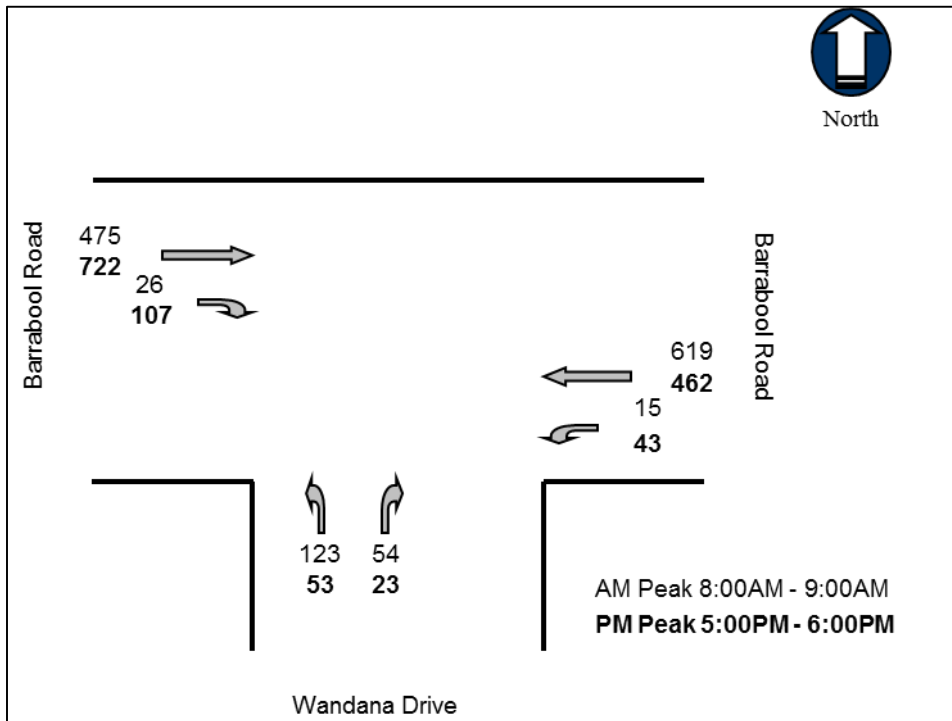
Figure 4-1 Additional Development Traffic Volumes



4.3 Combined Traffic Movements

Figure 4-2 shows these additional development traffic volumes superimposed onto the existing surveyed traffic volumes.

Figure 4-2 Combined Traffic Volumes



4.4 Development Traffic Impact

In order to determine the impact of the anticipated additional development traffic on the existing operation of the intersection, the combined volumes as shown in Figure 4-2 have been analysed using SIDRA Intersection, with the results shown below in Table 4-1 and Table 4-2.

Table 4-1 SIDRA Intersection Analysis Summary: Barrabool Road / Cityview Drive (Post Development Traffic Conditions – Morning Peak)

Leg	Movement	Degree of Saturation		95th%ile Queue (metres)		Average Delay (seconds)	
		Existing	Future	Existing	Future	Existing	Future
South: <i>Cityview Drive</i>	Left	0.148	0.520	3.5	17.8	16.7	21.7
	Right	0.148	0.520	3.5	17.8	16.4	21.5
East: <i>Barrabool Road</i>	Left	0.003	0.009	0.0	0.0	5.6	5.6
	Through	0.341	0.341	0.0	0.0	0.0	0.0
West: <i>Barrabool Road</i>	Through	0.261	0.261	0.0	0.0	0.0	0.0
	Right	0.005	0.032	0.1	0.9	8.4	8.5

Table 4-2 SIDRA Intersection Analysis Summary: Barrabool Road / Cityview Drive (Post Development Traffic Conditions – Morning Peak)

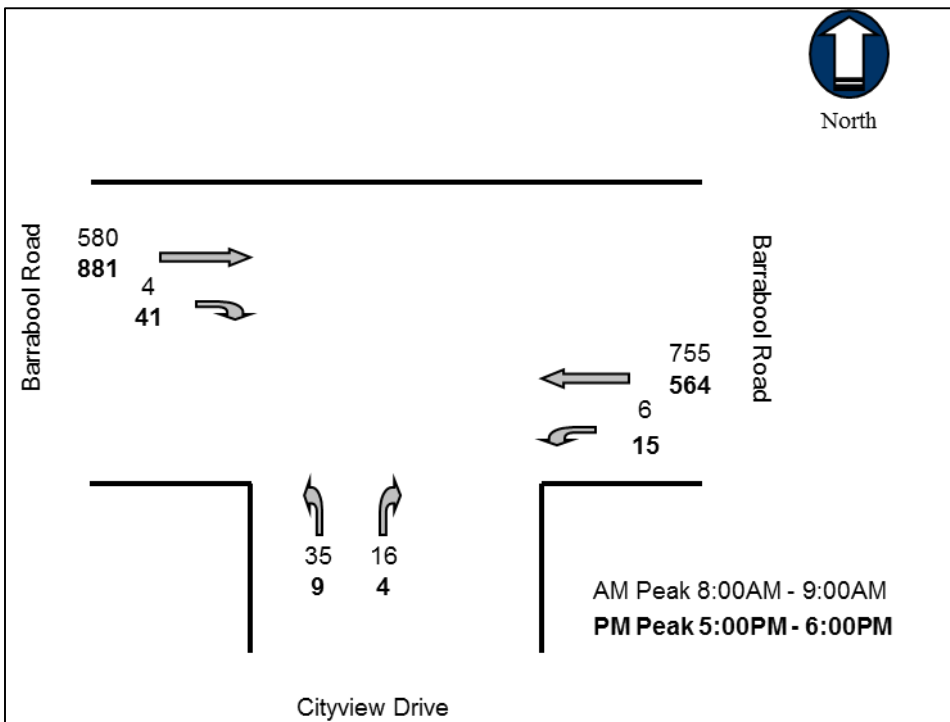
Leg	Movement	Degree of Saturation		95th%ile Queue (metres)		Average Delay (seconds)	
		Existing	Future	Existing	Future	Existing	Future
South: <i>Cityview Drive</i>	Left	0.038	0.243	0.9	6.0	16.2	18.5
	Right	0.038	0.243	0.9	6.0	15.9	18.3
East: <i>Barrabool Road</i>	Left	0.009	0.025	0.0	0.0	5.6	5.6
	Through	0.254	0.254	0.0	0.0	0.0	0.0
West: <i>Barrabool Road</i>	Through	0.397	0.397	0.0	0.0	0.1	0.1
	Right	0.041	0.110	1.2	3.4	7.5	7.8

As indicated within Table 4-1 and Table 4-2, the intersection continues to operate under ‘excellent’ conditions with marginal increases to queues and delays. It is evident that the intersections possess adequate capacity to accommodate increasing traffic flows in the future.

4.5 Year 2025 Traffic Growth

For analysis purposes, a 10 year forecast has been adopted in predicting future through volumes along Barrabool Road adjacent to the subject site. Review of VicRoads annual average daily traffic (AADT) data for Barrabool Road in the vicinity of the subject site reveals that there has not been a substantial growth in through traffic volumes. Notwithstanding, a 2% annual growth rate has been applied to provide a conservative assessment when calculating future Year 2025 through traffic flows, as shown within Figure 4-3.

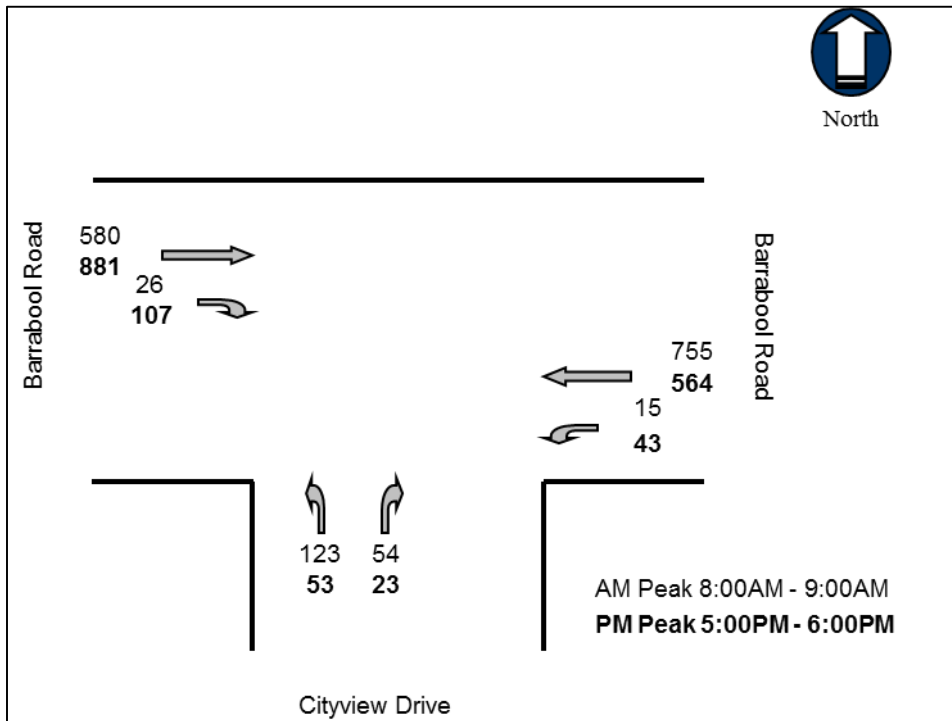
Figure 4-3 Year 2025 Projected Background Volumes



4.6 Year 2025 Combined Post Development Traffic

Figure 4-4 shows the combined traffic volumes of both compounded background traffic volumes and the projected additional development traffic volumes.

Figure 4-4 Year 2025 Anticipated Post-Development Traffic Volumes



4.7 Year 2025 Intersection Operation

To assess the 2025 future post-development operation of the intersection at Barrabool Road and Cityview Drive, the volumes shown in Figure 4-4 have been analysed using SIDRA Intersection, with these volumes combining both compounded background traffic volumes and the projected additional development traffic volumes. The results of this analysis are detailed within Table 4-3 and Table 4-4.

Table 4-3 SIDRA Intersection Analysis Summary: Barrabool Road / Cityview Drive (Year 2025 Post Development Traffic Conditions – Morning Peak)

Leg	Movement	Degree of Saturation	95th%ile Queue (metres)	Average Delay (seconds)
South: <i>Cityview Drive</i>	Left	0.782	32.5	41.2
	Right	0.782	32.5	40.9
East: <i>Barrabool Road</i>	Left	0.009	0.0	5.6
	Through	0.416	0.0	0.1
West: <i>Barrabool Road</i>	Through	0.319	0.0	0.0
	Right	0.041	1.1	9.9

Table 4-4 SIDRA Intersection Analysis Summary: Barrabool Road / Cityview Drive (Year 2025 Post Development Traffic Conditions – Evening Peak)

Leg	Movement	Degree of Saturation	95th%ile Queue (metres)	Average Delay (seconds)
South: Cityview Drive	Left	0.398	10.3	30.1
	Right	0.398	10.3	29.8
East: Barrabool Road	Left	0.025	0.0	5.6
	Through	0.310	0.0	0.0
West: Barrabool Road	Through	0.485	0.0	0.1
	Right	0.127	3.8	8.5

As indicated within Table 4-1 and Table 4-2, the intersection operates under ‘good’ conditions, indicating that the intersection at Barrabool Road and Cityview Drive can accommodate turning volumes associated with the proposed development as well as additional growth to the passing through volumes along Barrabool Road.

5 Internal Road Layout

All roads within the subdivision have been designed to provide for convenient access to individual allotments, and have generally been designed in accordance with Clause 56 of the City of Greater Geelong Planning Scheme.

The adopted design standards are illustrated below in Table 5-1, with Figure 5-2, Figure 5-3 and Figure 5-4 demonstrating typical road cross sections relating to the proposed road reserve widths within the subdivision.

Table 5-1 Typical Road Design Standards

Type	Road Reserve	Carriageway	Bicycles	Parking	Pedestrian
Connector Street	20.0 m	2 x 3.0m traffic lanes	-	-	2 x 1.5m wide footpaths
Access Street Level 2	16.0m	7.3m	-	On road (both sides)	2 x 1.5m wide footpaths
Access Street Level 1	13.5m – 14.0m	5.5m	-	On road (one side)	1.5m wide footpath on one side

Figure 5-2 Typical 20m Road Reserve Cross Section

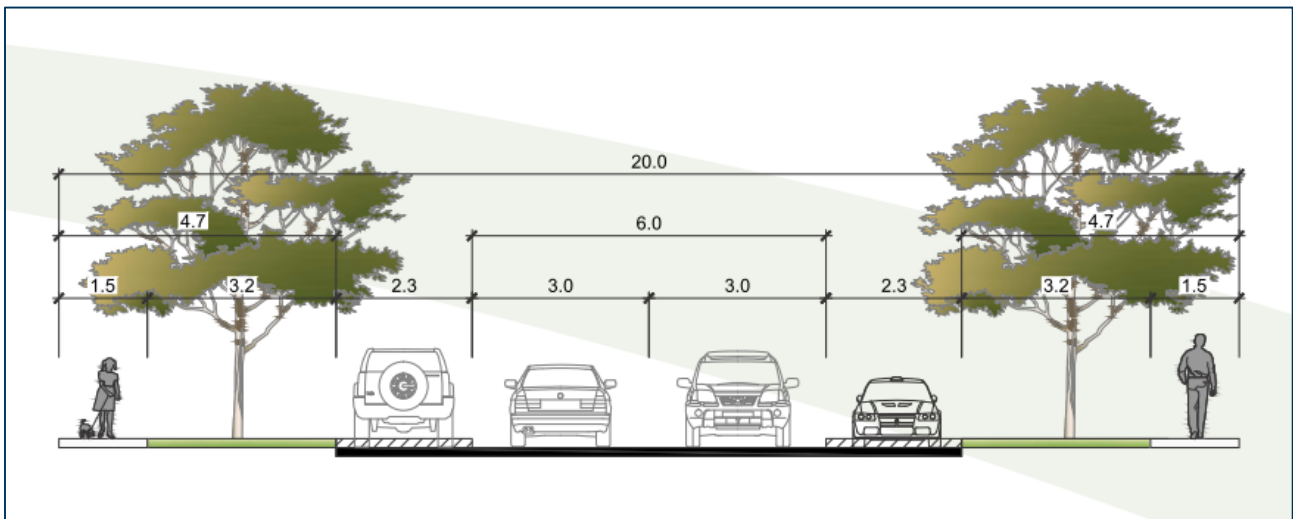


Figure 5-3 Typical 16m Road Reserve Cross Section

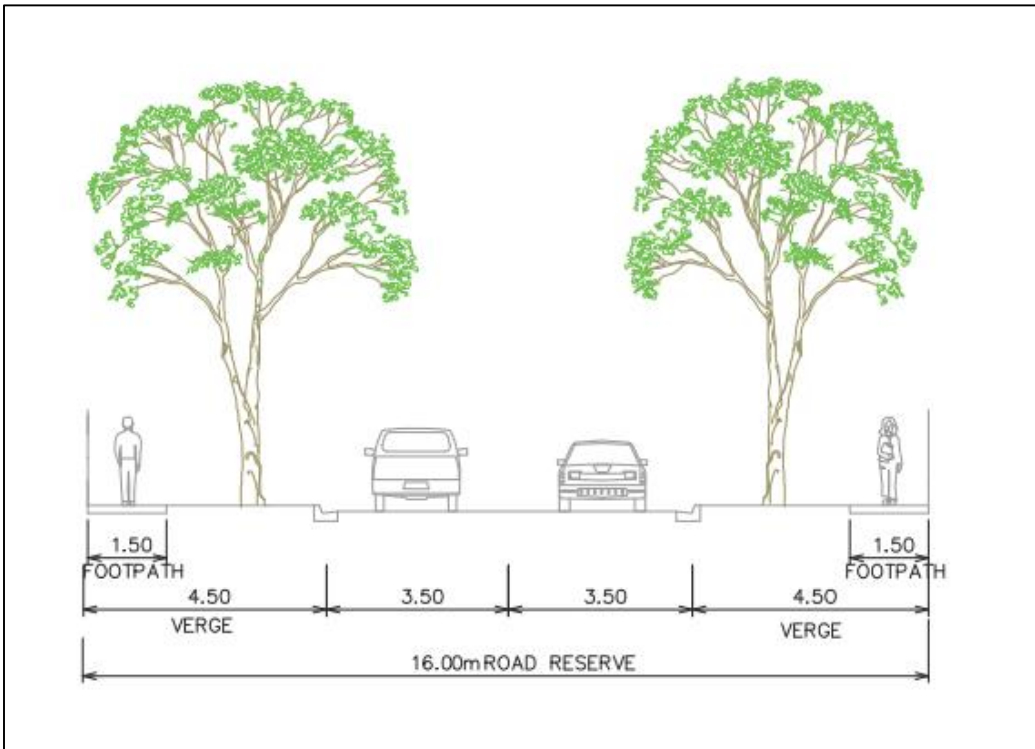
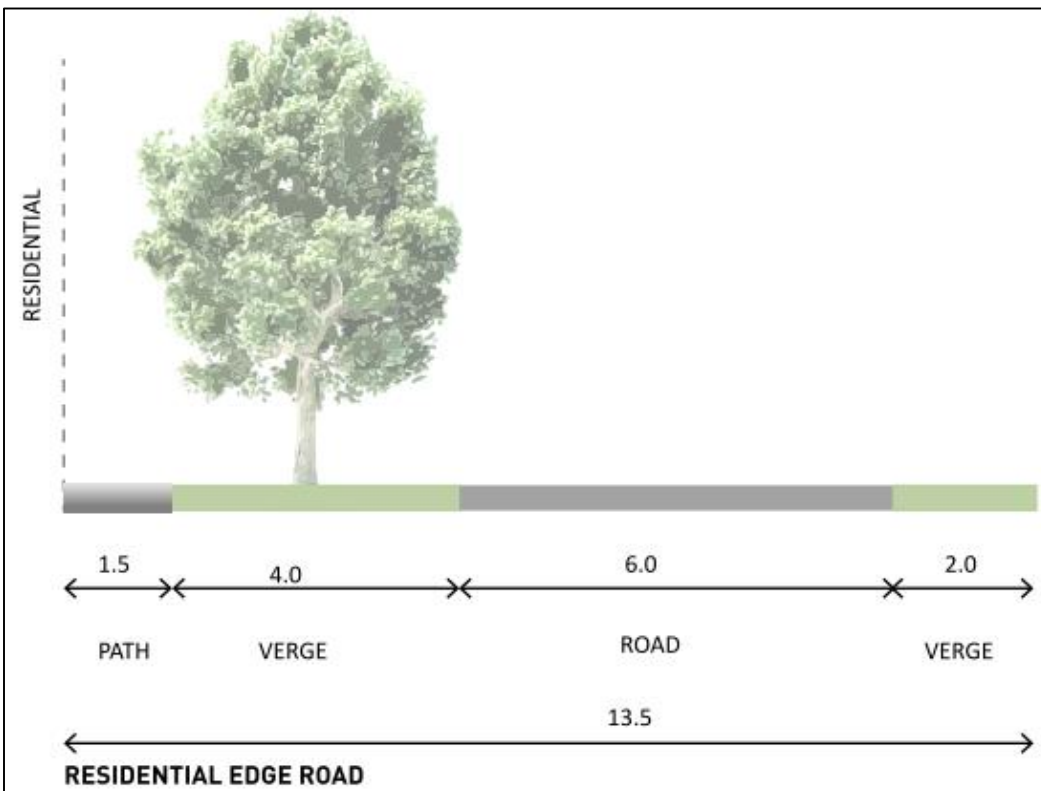


Figure 5-4 Typical 13.5m - 14m Road Reserve Cross Section



6 Planning Scheme Assessment

1.1 Clause 56

Clause 56 of the City of Greater Geelong Planning Scheme relates to 'Residential Subdivision' and specifies 'Objectives' and 'Standards' to meet specified design element criteria.

With regard to traffic and car parking issues, the most relevant is *Clause 56.06; Access and Mobility Management*, consisting of the following key objectives:

- 56.06-1: Integrated Mobility Objectives
- 56.06-2: Walking and Cycling Network Objectives
- 56.06-3: Public Transport Network Objectives
- 56.06-4: Neighbourhood Street Network Objectives
- 56.06-5: Walking and Cycling Network Detail Objectives
- 56.06-6: Public Transport Network Detail Objectives
- 56.06-7: Neighbourhood Street Network Detail Objectives
- 56.06-8: Lot Access Objective

The assessment of the effectiveness of the road network in meeting the above objectives will be determined by its ability to provide;

- > A safe and accessible road network;
- > No incentive for through traffic intrusion;
- > Suitable access for emergency and service vehicle access;
- > A low speed traffic environment;
- > A safe and convenient pedestrian and bicycle network;
- > An attractive streetscape with a high level of residential amenity;
- > Safe intersection design, with a preference for T-intersections; and
- > Sufficient room for drainage systems, public utility services and street lighting.

An assessment of each of the relevant objectives is presented below:

Objective Clause 56.06-1: Integrated Mobility

The intent is to achieve an urban design that is permeable and compact that encourages walking, cycling and public transport modes, with accessibility to larger activity centres.

The proposed subdivisional road network has been designed for substantial integrated mobility networks to be created with linkages to the north and east.

Objective Clause 56.06-2 & 56.06-5: Walking and Cycling

The intent is to create subdivisions that encourage walking and cycling within the residential development, and between surrounding neighbourhoods.

The road network within the proposed subdivision is suitably designed to cater for and encourage both pedestrian and cyclist trips within and through the area. The internal road network has footpaths on both sides of most streets.

Objective Clause 56.06-3 & 56.06-6: Public Transport Network

The intent is to encourage the use of existing public transport infrastructure, and to create new services that provide links to surrounding activity nodes.

It is expected that over time, bus linkages and stops will be provided along Barrabool Road.

Objective Clause 56.06-4 & 56.06-7: Neighbourhood Street Network

The intent is for direct, safe and easy movement through and between neighbourhoods for pedestrians, cyclists, public transport and other motor vehicles.

The proposed internal subdivision roads consist of individual roads, which fall under the classification of “Access Street” within Clause 56. It is considered that the layout proposed and the cross section of those roads is appropriate to promote safe and easy movement through the subdivision for all road users.

Furthermore, the proposed road network will provide adequate clearances to cater for the access requirements of service and emergency vehicles (e.g. typically up to an 8.8m truck).

The forecast daily traffic volumes for the internal subdivision roads are well within the recommended volume limits specified in Table C1 of Clause 56.06 for an Access Place.

Objective Clause 56.06-8: Lot Access

The intent is to provide for safe vehicle access between roads and subdivision lots.

All internal single dwelling lots will have direct access onto the proposed internal road network via conventional crossovers.

7 Traffic Management

1.2 Road Design Speeds

All internal local roads within the subdivision will have a posted speed limit of 50 kilometres per hour.

1.3 Signage and Line marking

Signage and line marking throughout the subdivision should be in accordance Vic Roads Traffic Engineering Manual Volume 2, with signage to be in accordance with the Australian Standard Manual of Uniform Traffic Control Devices, AS1742.

1.4 LATM Treatments

In general, LATM treatments should only be considered as part of the road network functional/detailed design in locations where there is an identified risk of higher than target vehicle speeds and it is not possible or practical to manage this through the planning of the subdivision street network.

Post development LATM treatments may be also be required to manage isolated identified traffic issues. LATM treatments should only be contemplated on bus routes and other high order access routes as a last resort.

When necessary, LATM's should be incorporated into intersection treatments using raised intersection or modified 'T' treatments. Examples of modified 'T' treatments are shown in Figure 7-1 and Figure 7-2. Where midblock treatments are necessary single lane 'pinch point' treatments are preferred. Midblock and raised intersection treatments may also be combined with pedestrian/bicycle crossing points where practical.

Figure 7-1 Modified 'T' Treatment Type 1

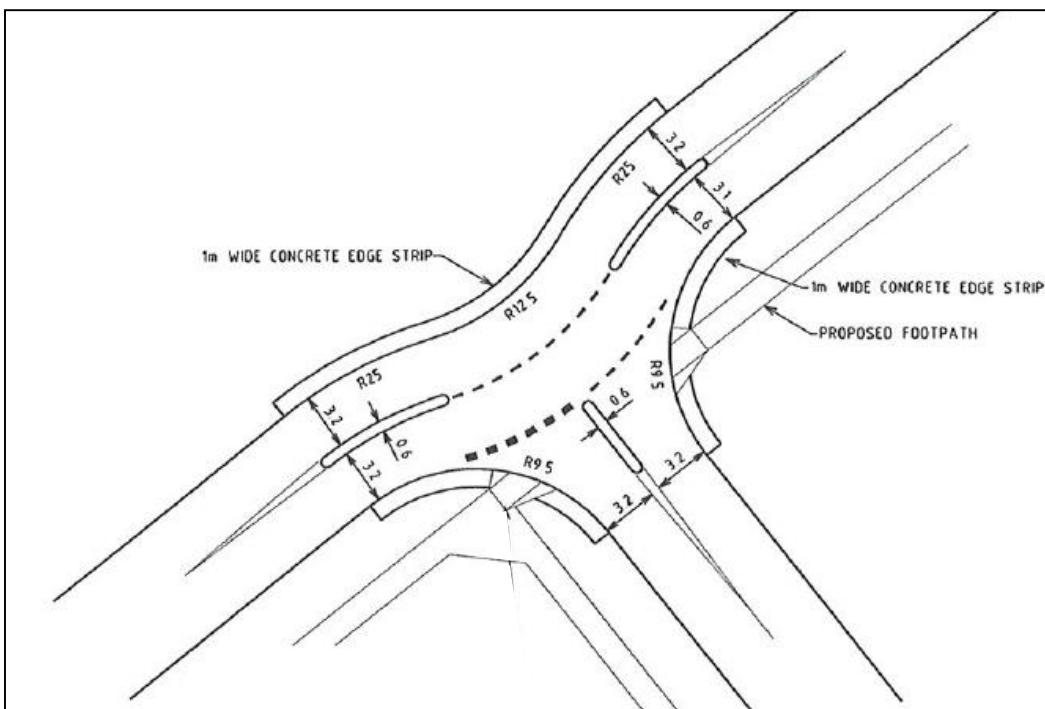
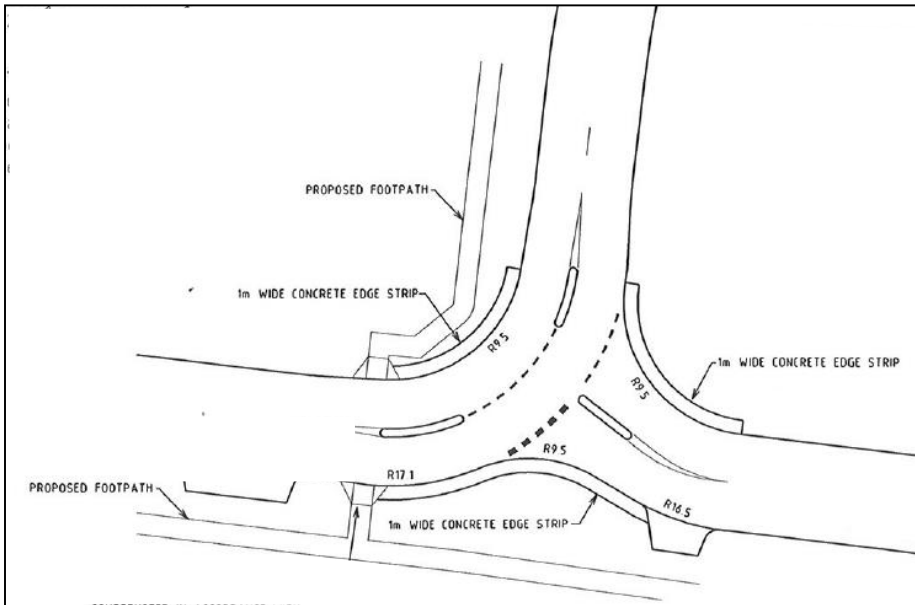


Figure 7-2 Modified 'T' Treatment Type 2



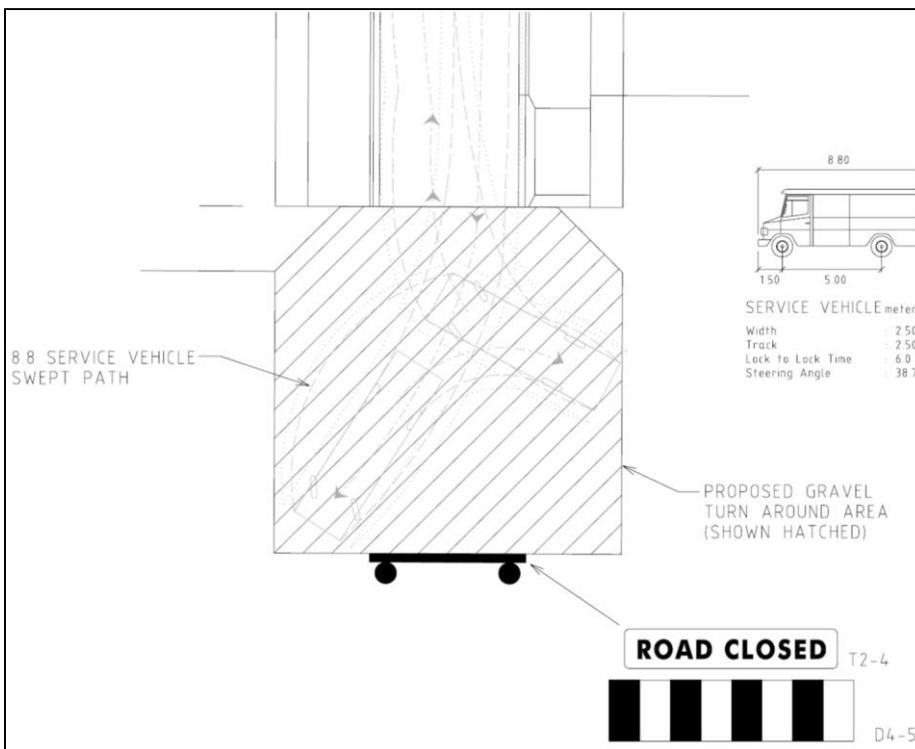
7.2 End of Stage Treatments

Where required, temporary end treatments will be installed at road discontinuations between stages. These end treatments will consist of a gravelled turn around area beyond the end of the road/street pavement with road closure signage installed at the far end of the end treatment.

End treatments will be of sufficient size to accommodate a 3 point turn manoeuvre of a medium rigid vehicle (i.e. a garbage truck / standard CFA tanker).

The proposed configuration of a typical end of stage end treatment is shown in Figure 7-3.

Figure 7-3 Temporary End of Stage Road End Treatment



8 Conclusions

Based on the preceding analysis, it is concluded that:

- > The development of the site contemplates a total of 180 residential dwellings;
- > The development is anticipated to generate approximately 1566 vehicle movements per day, with 157 vehicle movements occurring during the peak periods. Generated traffic will be distributed onto Barrabool Road via Cityview Drive;
- > The proposed intersection treatments will provide for the safe and efficient operation of the main site access points; and
- > Bicycle and pedestrian links are proposed within the site leading to Cityview Drive, which provides adequate connection onto Barrabool Road.