Traffic and Transport Assessment

Virginia Park Development Plan

CG130498

Prepared for
The Gillon Group of Companies Pty Ltd

16 June 2014

Cardno
Shaping the Future

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1 Introduction

Cardno has been retained by The Gillon Group of Companies Pty Ltd to undertake a traffic and transport assessment of the proposed development concepts for the Virginia Park Business Centre subject to the requirements of the proposed variation to the Development Plan Overlay – Schedule 2 (DPO2) under the Glen Eira Planning Scheme.

This report has been prepared to satisfy the requirement under this Schedule to the Development Plan Overlay to prepare a Traffic, Parking and Access Report which includes the following items:

> *Include a broad assessment of the likely traffic impacts of the proposed development;*

> *Outline the general traffic management works which may be necessary to accommodate the predicted traffic generated by the development;*

> *Provide an assessment of the proposed car parking provision including suitability of scale, location and capacity to service the likely car parking generation; and*

> *Include a circulation, parking and access plan.*

This report is based on the current Development Plan which has been prepared by The Gillon Group for the development of the site in two Stages, which would provide for up to 12,000 square metres of retail and up to 1250 dwellings, serviced by signalised intersections at each of the site's accesses to East Boundary Road at South Drive and North Drive.

2 Background and Existing Conditions

2.1 Location and Land Use

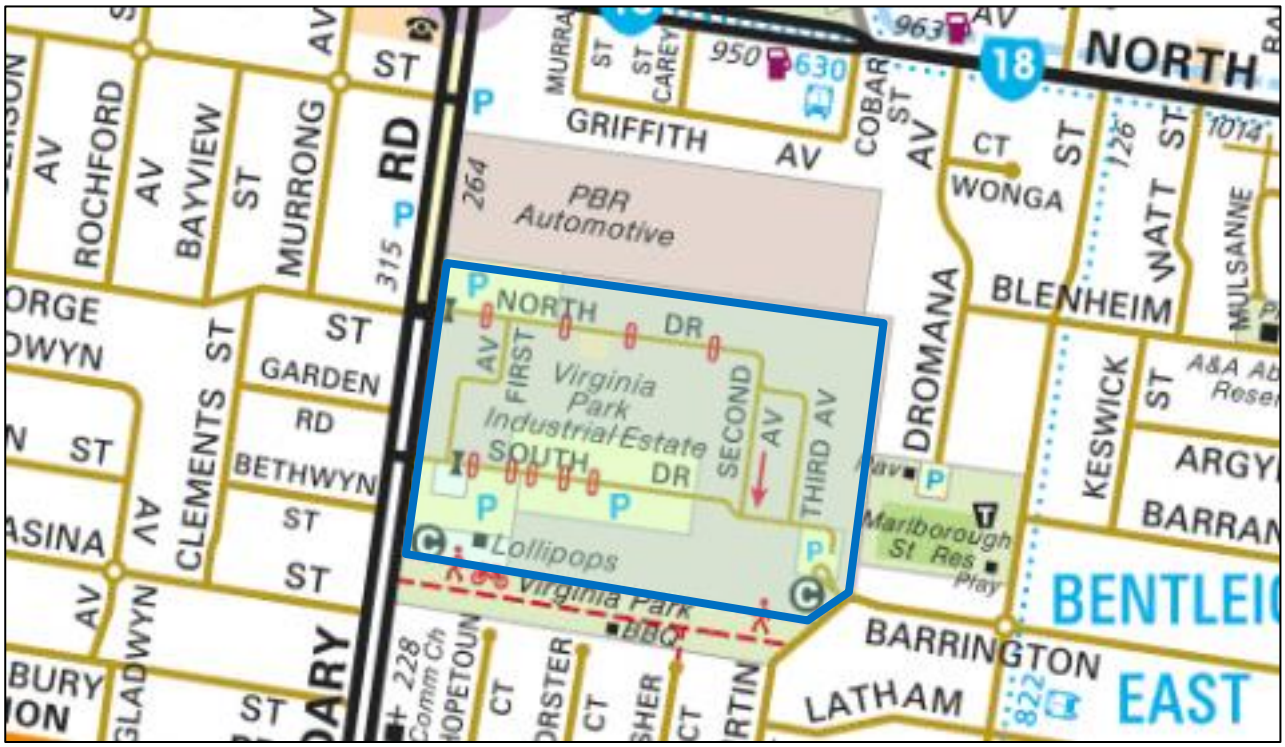
The subject site is known as the Virginia Park Business Centre and is located at 236 – 262 East Boundary Road, East Bentleigh.

Virginia Park is located on the eastern side of East Boundary Road, East Bentleigh. The park has long been a major industrial and business estate, and is known in the Glen Eira Planning Scheme as the Virginia Park Industrial Estate.

Virginia Park has an overall area of approximately 12.35 hectares and comprises of a number of buildings that have been consistently improved and updated over recent years. The complex is made up of 11 buildings, which comprise of warehousing and office facilities. In addition facilities such as a swimming pool, gymnasium and child care centre are available on site for tenant and community usage.

Access to the site is currently provided via two unsignalised intersections at North Drive and South Drive. An internal access road provides links between the two access points as shown in Figure 2-1.

Figure 2-1 Site Location



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Land use surrounding the site is a mixture of uses, with predominantly residential uses located on the western side of East Boundary Road and industrial uses to the north of the site, south of Griffith Avenue. A new residential development is proposed with access via Dromana Avenue, at the east of the site, and the south and south-eastern boundaries of the site abut reserves.

2.2 Existing Site Use, Parking and Access

The existing site provides in the order of 57,757 square metres of office, warehouse and miscellaneous uses. The majority of uses on the site are predominantly office and warehouse, split evenly between the two uses. This also includes approximately 8,468 square metres of vacant floor space.

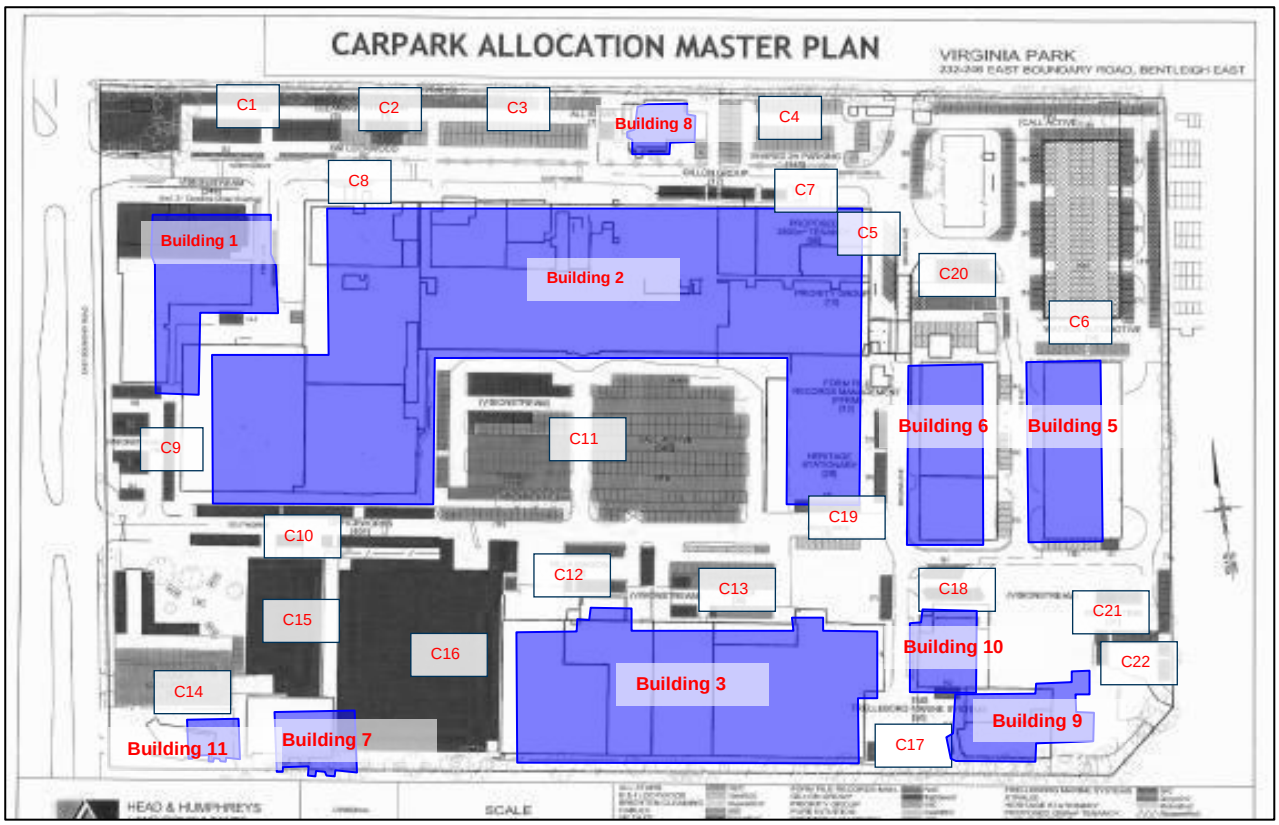
The existing parking supply servicing the site is approximately 1,800 spaces, equating to an existing supply average rate of 3.11 spaces per 100 square metres of floor area.

A breakdown of the floor areas occupied within each building on the site is provided in Table 2-1. Figure 2-2 indicates the layout of the site, existing buildings and car parks.

Table 2-1 Existing Tenancies – Virginia Park

Building	Floor Area (sqm)
Building 1	3,593 m^2
Building 2	31,645 m^2
Building 3	9,851 m^2
Building 4	- m^2
Building 5	2,338 m^2
Building 6	2,015 m^2
Building 7	870 m^2
Building 8	- m^2
Building 9	3,880 m^2
Building 10	1,160 m^2
Other	2,405 m^2
Total	**57,757 m^2**

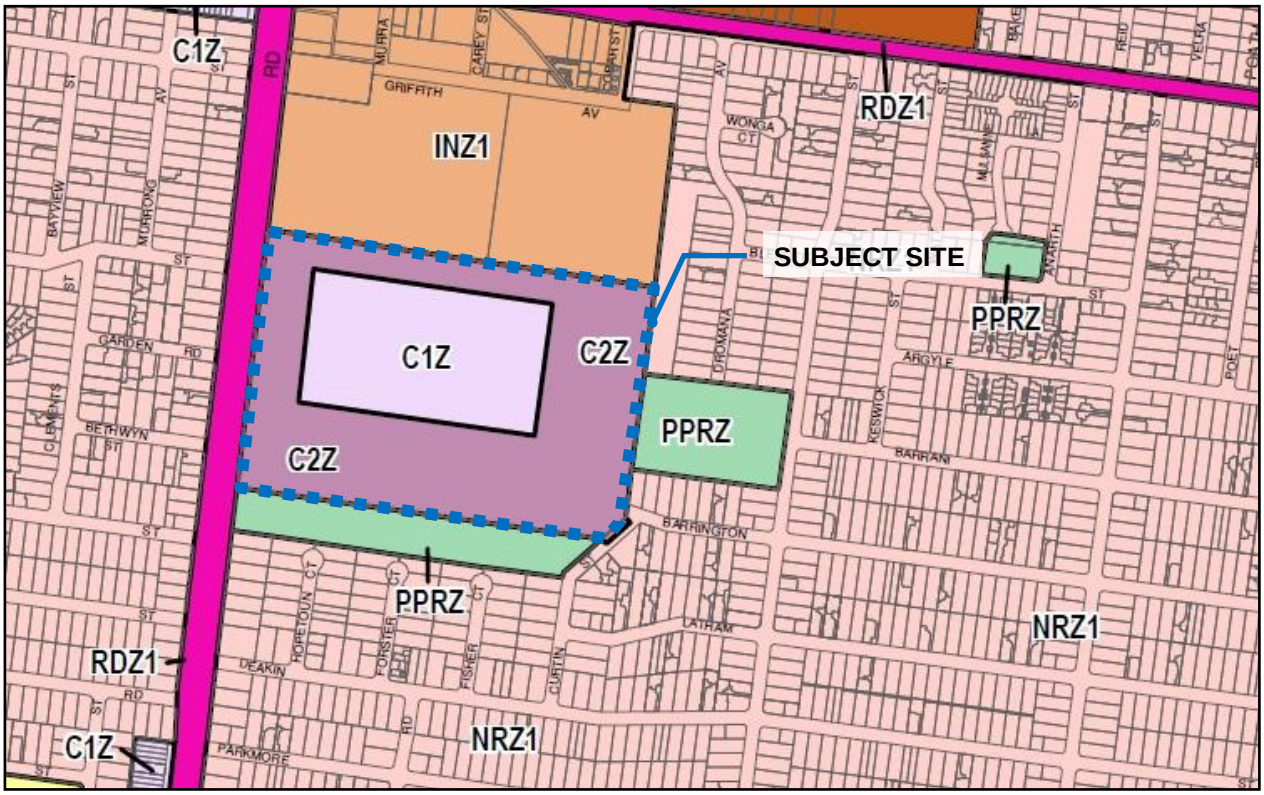
Figure 2-2 Site Layout, Building and Car Parking Numbers



2.3 Planning Zones

Figure 2-3 shows the location of the site and the current Glen Eira Planning Scheme Zones. The central precinct is currently zoned as a Commercial 1 Zone (C1Z) and the remainder of the site zoned as Commercial 2 Zone (C2Z).

Figure 2-3 Planning Scheme Zones



As noted previously, the subject site is controlled by the Development Plan Overlay – Schedule 2 (DPO2) and is listed as Virginia Park Business Centre.

Further, the current and proposed DPO2 carries a general requirement in that a Traffic, Parking and Access Report should be prepared and include the following items:

> *Include a broad assessment of the likely traffic impacts of the proposed development;*

> *Outline the general traffic management works which may be necessary to accommodate the predicted traffic generated by the development;*

> *Provide an assessment of the proposed car parking provision including suitability of scale, location and capacity to service the likely car parking generation; and*

> *Include a circulation, parking and access plan.*

2.4 Road Network

East Boundary Road is a primary arterial road, oriented north-south between North Road and South Road.

East Boundary Road operates with two traffic lanes, kerbside parallel parking and a bicycle lane in each direction. In the vicinity of the subject site, East Boundary Road accommodates a portion of car parking within a central road, separated by the north and south bound carriageways.

East Boundary Road provides access to the subject site via two fully direction crossovers, known as North Drive and South Drive, represented within Figure 2-4 and Figure 2-5 respectively.

North Drive and South Drive extend within the site as private roads servicing the existing on-site car parking.

At the frontage of the subject site, a speed limit of 70km/h applies.

Figure 2-4 East Boundary Road, looking south-east towards the North Drive crossover

Figure 2-5 East Boundary Road, looking south-east towards the South Drive crossover

2.5 SmartRoads Network Operating Plans

SmartRoads Network Operating Plans have been developed through extensive consultation with local councils, government agencies and relevant stakeholders, and illustrate which transport modes have priority on the road at different times of the day.

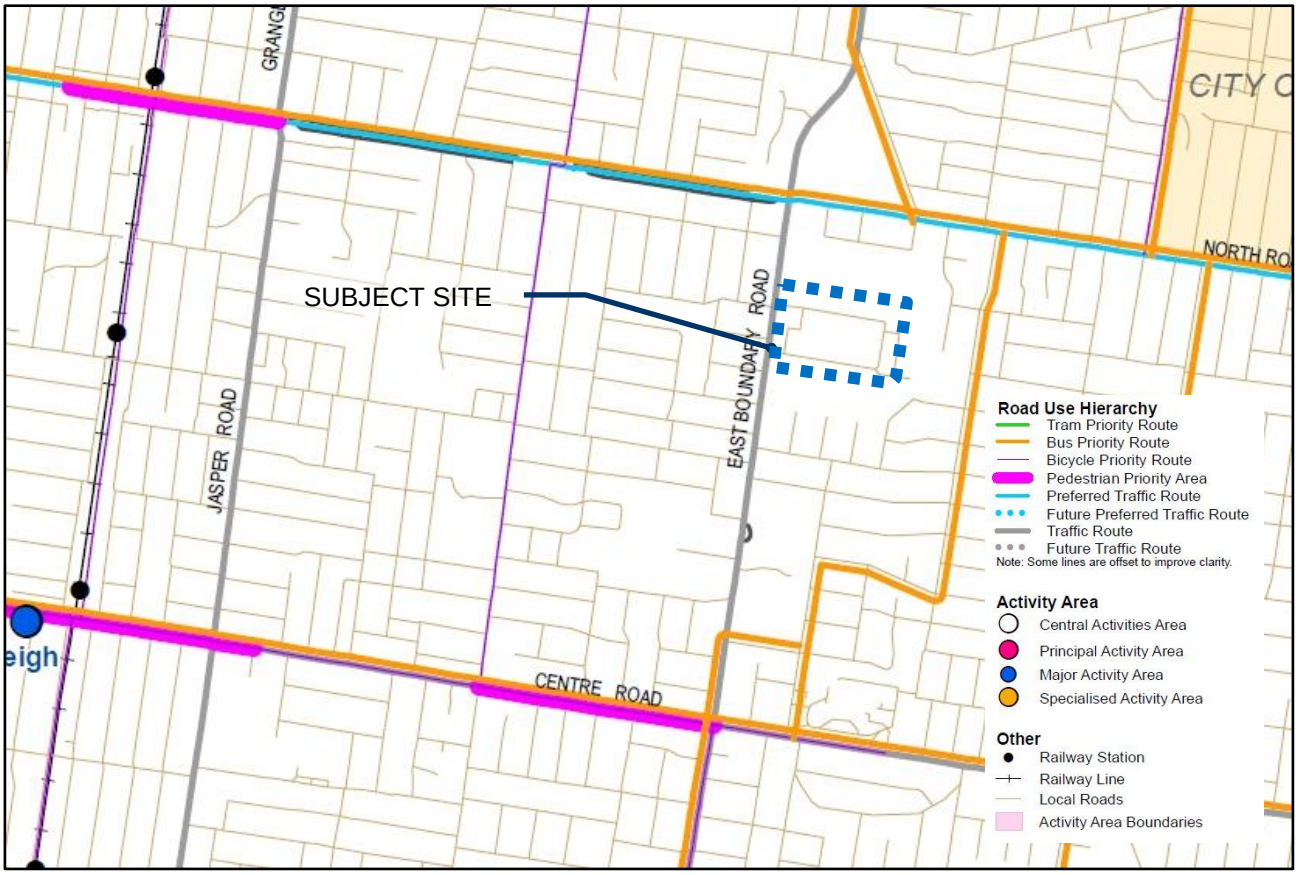
Figure 2-6 identifies the Network Operating Plan in the vicinity of the site.

East Boundary Road, along the site's frontage is nominated as a Traffic Route.

North Road and Centre Road to the north and south of the site respectively are nominated as Bus Priority Routes.

North Road also operates as a "Preferred Traffic Route" whilst Centre Road is nominated with Pedestrian and Bicycle Priority in the vicinity of the site.

Figure 2-6 SmartRoads Network Operating Plan



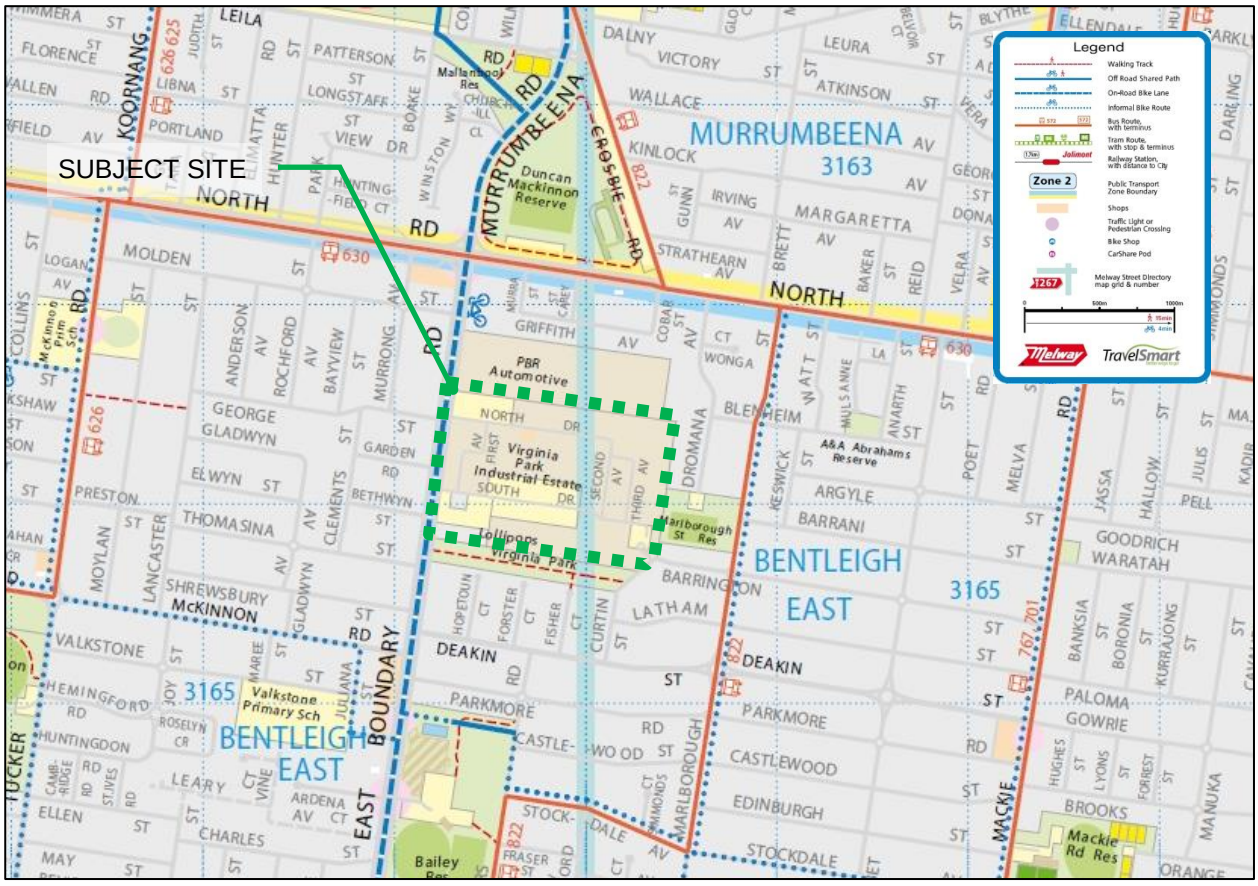
2.6 Sustainable Transport

2.6.1 TravelSmart Map

The TravelSmart map for the City of Glen Eira in the vicinity of the site is shown in Figure 2-7.

The TravelSmart map shows a number of sustainable options that are available in the vicinity of the site.

Figure 2-7 TravelSmart Map



2.6.2 Public Transport

The site has reasonable public transport accessibility, with the following services located within close proximity, as outlined in Table 2-2.

Table 2-2 Public Transport Provision

Service	Route No's	Route Description	Nearest Stop
Bus	630	Elwood - Monash University via Gardenvale, Ormond & Huntingdale	North Road (~250m NW)
	822	Chadstone - Sandringham via Murrumbeena & Southland	Marlborough Street (~400m NE)

2.6.3 Bicycle Network

Currently, East Boundary Road and Murrumbeena Road provide on-road bike routes and connections to the Melbourne CAD and Principle Bicycle Network.

Additionally, a number of informal bike paths operate in the vicinity of the site on Marlborough Street and McKinnon Road as shown on the TravelSmart map in Figure 2-7.

3 The Development Plan

3.1 Overview

The Development Plan proposes that a portion of the existing site will be redeveloped for the purposes of retail and residential uses in two stages, with a portion of the existing office/warehouses tenancies to be retained on-site.

The current staging is proposed as follows:

3.2 Stage 1

Stage 1 is proposed to remove 21,956 m^2 of existing office/warehouse floor area (Buildings 3, 4, 5, 6, 7, 10, 11 and part of Building 9) and car parking within Car Parks 5, 6, 10, 12 – 22.

A total of 35,801 square metres of existing office/warehouse floor area (Buildings 1, 2, 8 and part of Building 9) will be retained along with existing car parking in Car Parks 1, 2, 3, 4, 7, 8, 9 and 11.

The removed buildings and car parks will make space for the development of that portion of the site for the purposes of 12,000 square metres of retail, 118 residential townhouses and 214 residential apartments.

The total 12,000 square metres of retail is proposed to include:

> A 6,000 square metre large format supermarket;

> A smaller format 1,500 square metre supermarket; and

> 4,500 m^2 specialty retail

Parking will be provided on-site associated with the above uses, and also to support the retained office and warehouse uses.

3.3 Stage 2

Stage 2 proposes to provide a further 918 residential apartments (to provide a total of 1,250 dwellings) on the site.

A summary of the future floor areas and dwelling numbers is provided in Table 3-1.

Table 3-1 Existing, Stage 1 and Stage 2 Floor Areas/Development Numbers

Use		Existing	Stage 1		Stage 2	
			Net Change	Total at Stage1	Net Change	Total at Stage 2
Existing Office/Warehouse		57,757 m^2	- 21,956 m^2	35,801 m^2	No Change	35,801 m^2
Retail	Supermarket 1	-	+ 6,000 m^2	6,000 m^2	No Change	6,000 m^2
	Supermarket 2	-	+ 1,500 m^2	1,500 m^2	No Change	1,500 m^2
	Specialty	-	+ 4,500 m^2	4,500 m^2	No Change	4,500 m^2
	Total Retail			**12,000 m^2**		**12,000 m^2**
Residential	Townhouses	-	+ 118 units	118 units	No Change	118 townhouses
	Apartments	-	+ 214 units	214 units	+ 918 units	1,132 apartments
	Total Residential			**332 dwellings**		**1250 dwellings**

3.4 Vehicle and Pedestrian Access

The site currently takes access to and from East Boundary Road via two unsignalised access points at North Drive and South Drive.

VicRoads has recently approved the signalisation of the East Boundary Road/South Drive access intersection as per the attached Cardno Functional Layout Plan at Appendix A

It is proposed that Stage 1 will utilise this signalised access and the retained existing unsignalised intersection at North Drive.

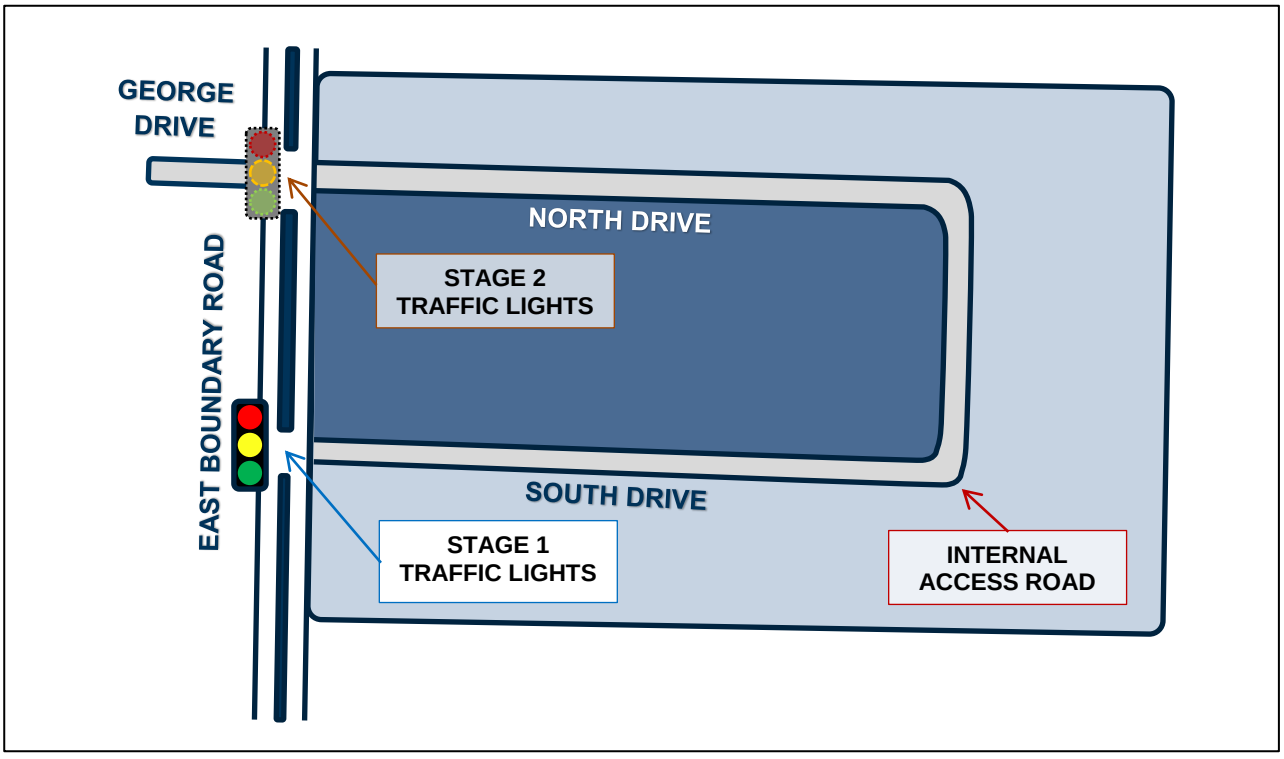
It is proposed that Stage 2 will include the signalisation of the East Boundary Road/North Drive access to accommodate additional traffic generated to and from the site by the future development.

An internal access road will continue to be provided within the site, linking the two access points and providing access to the different land uses and parking areas and providing footpaths and pedestrian linkages around the site.

The new signalised intersections will provide signalised pedestrian crossing facilities across East Boundary Road, linking existing land uses in the surrounding area with the new proposal.

The proposed access arrangements are shown in Figure 3-1.

Figure 3-1 Subdivision Layout and Road Hierarchy



4 Design Considerations

4.1 Car Parking and Access

The car park and access design are to be provided in accordance with the requirements of the Glen Eira Planning Scheme and the Australian Standard for off-street car parking (AS/NZS 2890.1).

> Car parking is to be designed to meet the minimum specifications at Table 2 of Clause 52.06-8 within the Glen Eira Planning Scheme;

> Alternatively, car spaces and aisle width dimensions are to be in accordance with the minimum requirements for the required user class under AS/NZS2890.1:2004;

> Where provided, small car spaces should be designed in accordance with the design requirements of AS/NZS 2890.1:2004 or adjusted to the Planning Scheme to suit;

> Parking for disabled is to be provided generally in accordance with the specifications of AS/NZS2890.6:2009;

> Spaces located next to a wall are to be provided with additional width to allow for door opening;

> Columns are to be located in accordance with the design envelope for car parking to allow for door opening and access (as required by the Planning Scheme and/or AS/NZS2890.1:2004);

> Aisle extensions are to be provided in accordance with AS/NZS2890.1:2004 to allow for manoeuvring into/out of end spaces;

> Height clearances are to be provided in accordance with the Australian Standard, being 2.2m clear within the car park and on access ramps, and 2.5m clear above disabled parking bays and the adjacent shared areas;

> Access widths and controls are to be designed in accordance with the Australian Standard, providing sufficient queuing area on-site and appropriate design at access intersections;

> Pedestrian sight triangles are to be provided at the access points in accordance with Figure 3.3 of AS/NZS2890.1:2004; and

> The access ramp, including transitions, maximum grades, crossfall and head clearance, are to be design generally in accordance with the requirements as outlined in AS/NZS2890.1:2004.

4.2 Bicycle Parking and Access

The bicycle parking and access design are to be provided in generally accordance with the requirements of the Glen Eira Planning Scheme and the Australian Standard for bicycle parking facilities (AS/NZS 2890.3):

> Bicycle parking facilities are to provide sufficient dimensions to accommodate a bicycle with dimensions of 0.7m width at the handlebars, 1.2m in height and 1.7m in length;

> A minimum access aisle of 1.5m is to be provided to bicycle parking spaces, and, where possible, on access paths to bicycle parking facilities;

> Bicycle parking can be provided as a combination of vertical, wall mounted and at-grade racks for use by visitors, staff and residents; and

> Provision should be made for appropriate access into bicycle parking areas, including the transport of bicycles on ramps, stairs and within lifts.

5 Loading Considerations

Clause 52.07 of the Glen Eira Planning Scheme outlines the requirements for the loading and unloading of vehicles. It specifies that no building or works may be constructed for the manufacture, servicing, storage or sale of goods or materials unless space is provided on the land for loading and unloading vehicles as specified in Table 5-1;

- The driveway to the loading bay is at least 3.6 metres wide;
- The driveway that provides access to the loading bay is at least 3.6 metres wide.
- A permit may be granted to reduce or waive these requirements if either
- The land area is insufficient; or
- Adequate provision is made for loading and unloading vehicles to the satisfaction of the responsible authority.

Table 5-1 Planning Scheme Loading Requirements – Clause 52.07

Floor Area of Building	Minimum Loading Bay Dimensions	
2,600 m^2 or less in single operation	Area	27.4 m^2
	Length	7.6 m
	Width	3.6 m
	Height clearance	4.0 m
For every additional 1,800 m^2 or part	Additional 18 m^2	

The proposed retail and office/warehouse components of the proposed development will generate a statutory requirement to provide a loading area, which will be provided in accordance with the above specifications.

6 Bicycle Parking Considerations

Clause 52.34 of the Glen Eira Planning Scheme specifies the following bicycle parking provision requirements with regard to the different components of the proposed development.

A summary of the Planning Scheme requirements for the proposed development is presented in Table 6-1.

Table 6-1 Planning Scheme Bicycle Parking Requirements – Clause 52.34

Component	Area/No	Requirement	
		Rate	Total
Dwelling	1250 dwellings	1 space per 5 dwellings for residents 1 space per 10 dwellings for visitors	250 125
Shop	12,000 m^2	1 space per 600m^2 for employees 1 space per 500m^2 for visitors	20 24
Total - Residents			**250**
- Employees			**20**
- Visitors			**149**

Under the above rates, the current level of development at Stage 2 of the Development Plan would generate a requirement to provide some 419 bicycle parking spaces on the site.

Parking for residents and staff should be provided at the above rates.

It is considered that the provision of shared bicycle facilities for the retail and residential uses within an appropriate location would be sufficient, and assist in reducing the overall requirements for visitors.

Additionally, Clause 52.34 requires the provision of employee showers in accordance with the following requirements.

Table 6-2 Shower Requirements – Clause 52.34

Component	Employee Bike Parking Spaces	Requirement	
		Rate	Total
Showers	20	1 shower for the first 5 employee spaces; plus 1 shower for each additional 10 employee spaces.	3

Furthermore, all showers should be provided with access to a change room, or should incorporate a combined change room with the shower.

7 Car Parking Considerations

7.1 Statutory Car Parking Requirements – Clause 52.06

Clause 52.06 of the Glen Eira Planning Scheme specifies two different rates for parking requirements for new developments – one for sites located within a general Parking Overlay, and another for all other sites.

It is noted that the site is not currently located within a Parking Overlay, however the following parking provision requirements with regard to the different components of the proposed development are listed for comparison, and indicated in Table 7-1.

Table 7-1 Planning Scheme Car Parking Requirements – Clause 52.06-5

Use	Rate (All Zones)	Rate (Parking Overlay)	Car Parking Measure
Dwelling	1	1	to each one or two bedroom dwelling, plus
	2	2	to each three or more bedroom dwelling (with studies or studios that are separate rooms counted as bedrooms), plus
	1	0	for visitors to every 5 dwellings for developments of 5 or more dwellings
Office other than listed in this table	3.5	3	to each 100 sq m of net floor area
Shop other than listed in this table	4	3.5	to each 100 sq m of leasable floor area
Supermarket	5	5	to each 100 sq m of leasable floor area
Warehouse other than listed in this table	2	2	to each premises, plus
	1.5	1	to each 100 sq m of net floor area

The requirements of the Development Plan Overlay – Schedule 2 (DPO2) for Virginia Park Business Centre indicate that an assessment is required of the "*proposed car parking provision including suitability of scale, location and capacity to service the likely car parking generation"*

Furthermore, Clause 52.06-6 of the Glen Eira Planning Scheme states that any application to reduce or waive the requirement for car spaces must be accompanied by a Car Parking Demand Assessment, which includes an assessment of the following:

> The likelihood of multi-purpose trips within the locality which are likely to be combined with a trip to the land in connection with the proposed use.

> The variation of car parking demand likely to be generated by the proposed use over time.

> The short-stay and long-stay car parking demand likely to be generated by the proposed use.

> The availability of public transport in the locality of the land.

> The convenience of pedestrian and cyclist access to the land.

> The provision of bicycle parking and end of trip facilities for cyclists in the locality of the land.

> The anticipated car ownership rates of likely or proposed visitors to or occupants (residents or employees) of the land.

> Any empirical assessment or case study.

7.2 Car Parking Case Studies

7.2.1 Overview

It is considered that given the nature of the proposed development, it is likely that a large proportion of trips to the site would be shared. That is, that customers/patrons would park on the site and attend a number of the proposed uses in one trip.

Furthermore, the variety of uses proposed on the site will allow for shared use of the on-site parking, particularly as different uses would experience peak demands at differing times.

The following sections provide an assessment of both the likely demands which are expected to be generated by the proposal, and suitable parking provision rates based on case study data.

In assessing the likely empirical demands for component uses on the site to inform the Car Parking Demand Assessment, case studies of parking demands of uses similar to the component uses within the proposal have been researched. In selecting appropriate case study data, the following has been taken into consideration.

> Similar land use type and size;

> Similar location within areas of Melbourne and particularly with regard to surrounding development; and

> Similar accessibility to public transport and sustainable forms of transport.

7.2.2 Existing Office and Warehouse Uses

The existing site provides in the order of 57,757 square metres of office, warehouse and miscellaneous uses. The majority of uses on the site are predominantly office and warehouse, split evenly between the two uses. This also includes approximately 8,468 square metres of vacant floor space.

The existing parking supply servicing the site is approximately 1,800 spaces, equating to an existing supply average rate of 3.11 spaces per 100 square metres of floor area.

Having regard to the site's operation, potential for a variety of uses or tenants to be located within the site, and the Parking Overlay rates which apply to Office and Warehouse uses, it is considered that an average rate of 3.0 spaces per 100 square metres should apply to the existing floor area which is to be retained, unless otherwise justified by prospective or existing tenant.

7.2.3 Residential Dwellings

Data from the Australian Bureau of Statistics 2011 Census includes details of the number of cars that were garaged at each dwelling (or nearby), by dwelling type.

Car ownership data for the City of Glen Eira from the 2011 census was obtained from the Australian Bureau of Statistics (ABS). Table 7-2 shows the results of the census data for both "semi-detached, row/terrace, townhouse' style dwellings and for 'flats, units or apartments of three storeys or less', adopted in order to filter out Department of Housing flats which may otherwise skew the data.

Table 7-2 ABS Census Data 2011– Car Ownership for City Of Glen Eira

	Apartment Type	Average Car Ownership	85th percentile Car Ownership	% with 1 or less vehicles
flats, units or apartments' of three storeys or less	1 Bedrooms	0.90	0.98	86%
	2 Bedrooms	1.14	1.49	73%
	3 Bedrooms	1.44	1.89	57%
semi-detached, row/terrace, townhouse'	2 Bedrooms	1.19	1.53	71%
	3 Bedrooms	1.59	1.88	47%

Based on the above average and 85th percentile rates and the percentages of dwellings who own one vehicle or less, it is considered that the car parking rates for residential dwellings are appropriate for the site.

7.2.4 Residential Visitor Demands

Surveys undertaken by Cardno indicate peak residential visitor parking demands for a weekday of around 0.10 spaces per unit. The average visitor parking demand recorded on a Saturday was 0.09 spaces per unit, with a peak of 0.10 spaces per unit. During the weekday business hour periods, parking demands were observed to be around 50% of the peak rate.

7.2.5 Supermarket

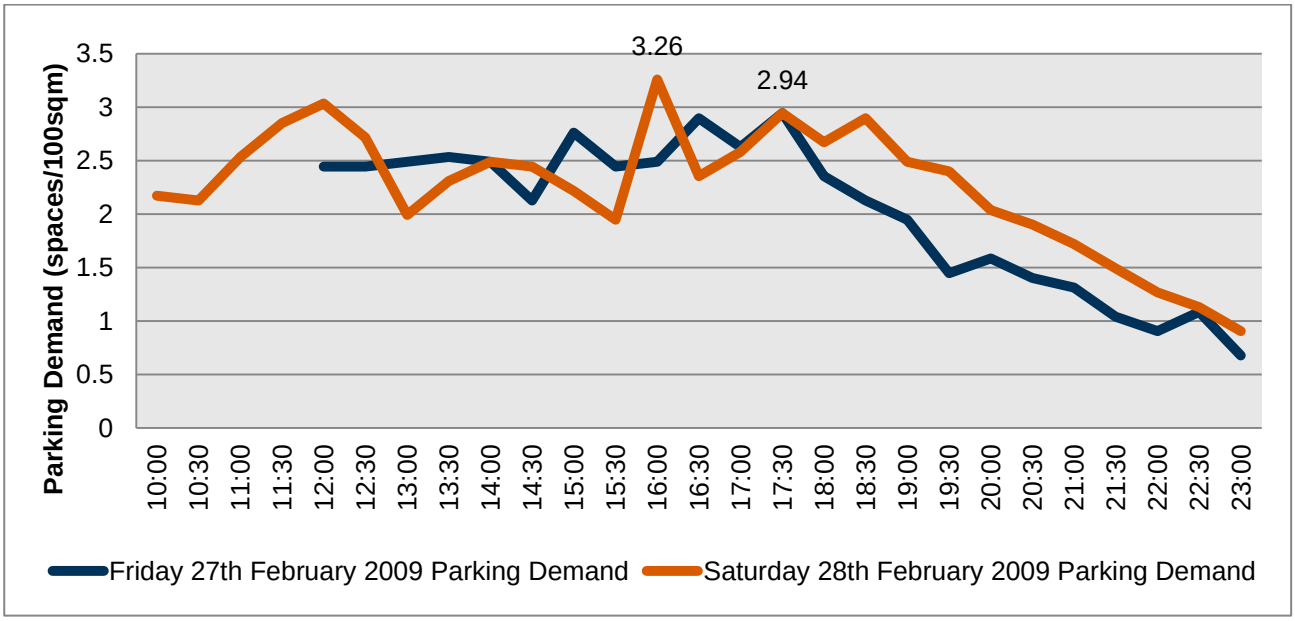
7.2.5.1 Coles Supermarket, North Balwyn

Cardno undertook a car parking occupancy survey of the existing Coles supermarket in North Balwyn on Friday 27th and Saturday 28th February 2009. This site has a floor area of approximately 2,209 m^2, and is relatively unrestrained in terms of car parking and access provisions.

The surveys recorded a peak parking demand, inclusive of staff demands, of **2.94** spaces per 100 square metres at 5.30pm on the Friday, and **3.26** spaces per 100 square metres at 4pm on the Saturday as shown in 0.

Peak demands generated by the supermarket on both the Friday and Saturday evening (after 6pm) were recorded at a maximum of 66% and 80% of the absolute peak recoded during business hours on each day.

Figure 7-1 Parking Demand Profile – Coles North Balwyn



7.2.5.2 Woolworths Supermarket, Heidelberg

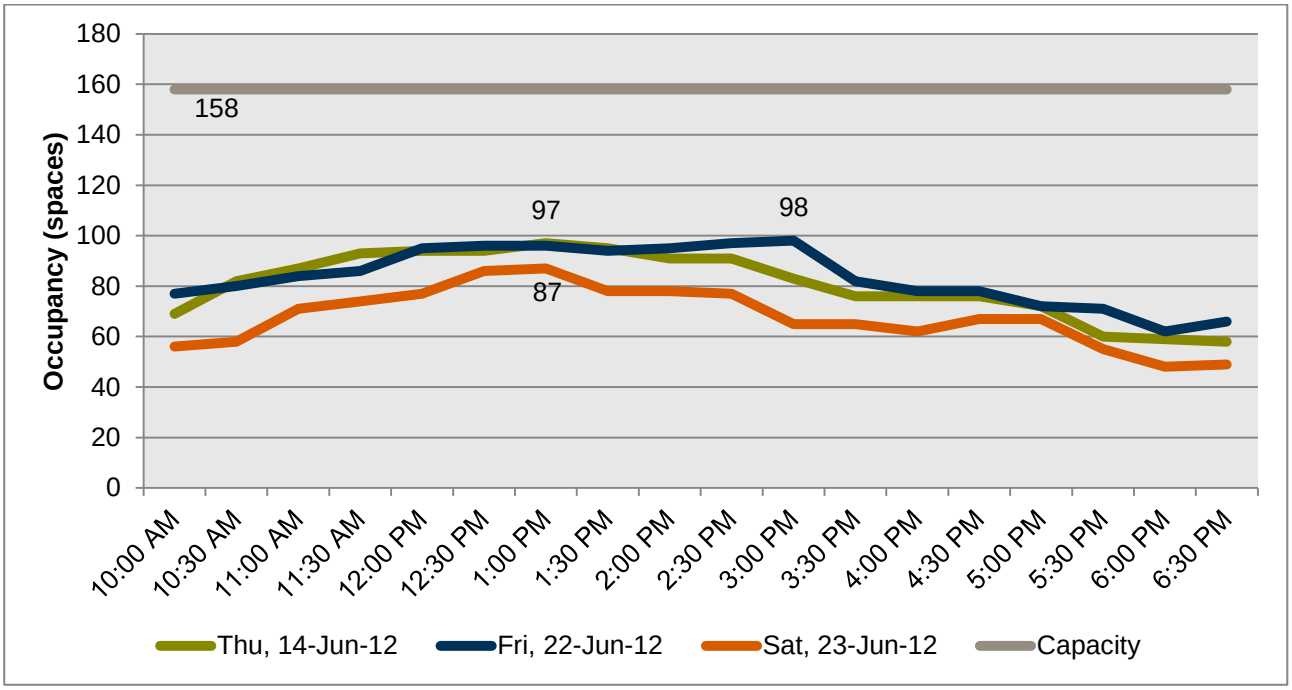
Heidelberg Woolworths is located at the north-west corner of the intersection of Banksia Street and Rosanna Road, is relatively isolated from other uses, has an existing floor area of approximately 2,500m^2 and provides parking for 158 spaces within at-grade parking.

Surveys were undertaken in June 2012 for a Thursday, Friday and Saturday, with the parking profiles shown within Figure 7-2.

The results of these surveys indicated that the peak demand occurred on the Friday at 3:30pm when a total of 98 spaces were occupied. For the existing supermarket of approximately 2500 square metres, this occupancy translates to a peak parking demand of 3.9 car spaces per 100 square metres of floor area.

As with the North Balwyn site, parking occupancy after 6pm on both Friday and Saturday evenings was measured at less than 80 % of the peak daytime rates.

Figure 7-2 Woolworths Heidelberg - Car Parking Occupancy June 2012



7.2.5.3 Various ALDI Stores

In February and March 2005, GTA Consultants undertook surveys of a number of ALDI stores around Melbourne, identifying an average peak parking generation rates ranging from 3.2 to 5.0 spaces per 100 square metres. These five sites have an average generation rate of 4.0 spaces per 100 square metres during the peak periods as shown in Table 7-3.

A brief description of each of the stores is as follows:

> Sunbury ALDI is located on Gap Road and is provided with an at-grade car park, with a number of small retail and commercial tenancies located immediately east. The nearest full line supermarkets (Morgans Supa IGA and Coles Sunbury) are located at Sunbury Central Shopping Centre approximately 1.4km to the east

> Ferntree Gully ALDI is located on Burwood Highway within the Hill View Neighbourhood Centre which provides a number of retail and commercial tenancies. A number of supermarket uses are in close proximity to the site, including a Coles approximately 1.2km to the west, Woolworths approximately 500m to the east, Maxi Foods approximately 1.7km to the east and Boronia Shopping Centre 2.7km to the north.

> Hampton Park ALDI is located on Pound Road and is adjacent a Chemist Warehouse and another smaller commercial tenant. Woolworths and Coles Hampton Park are located approximately 2 km to the west of the site and Fountain Gate Shopping Centre, which contains a Coles, ALDI and a Woolworths is approximately 3km to the north-east.

> Carrum Downs ALDI is located on Frankston Dandenong Road, adjacent Peninsula Link. A Ritchies Supa IGA is located approximately 600m to the south-west and Woolworths and Maxi Foods supermarkets are located on Hall Road approximately 2.5km to the north-east.

> Rosebud ALDI is located within the south-western retail centre of Rosebud Activity Centre on Point Nepean Road. Coles Rosebud is located within the same centre (approximately 300m to the south-west) and a Woolworths supermarket is located approximately 1.5km to the north-east.

Table 7-3 ALDI Parking Generation Rates During Peak Periods

Site	Net Floor Area (m^2)	Parking Supply (Spaces)	Peak Demand (Spaces)	Peak Demand Rate (per $100m^2$)
Sunbury	1,274 m^2	110	43	3.4
Ferntree Gully	1,274 m^2	117	63	5.0
Hampton Park	1,291 m^2	132	41	3.2
Carrum Downs	1,284 m^2	85	59	4.6
Rosebud	1,454 m^2	114	53	3.7
Average	**1,315 m^2**	**112**	**52**	**4.0**

7.2.5.4 Summary of Supermarket Case Studies

A summary of the rates for each of the case study sites is provided in Table 7-4 below indicating a range of parking generation between 3.3 spaces per 100 square metres and 4.0 spaces per 100 square metres.

Table 7-4 Parking Generation Rates During Peak Periods

Site	Peak Demand Rate (per $100m^2$)
Coles North Balwyn	3.3
Heidelberg Woolworths	3.9
Average of ALDI Stores	4.0

Based on the preceding, and having regard to the proposal, its proximity to public transport and the potential for sharing of parking on the site between the retail uses, it is considered that an appropriate rate for the supermarket use is 4 spaces to each 100 square metres.

7.2.6 Specialty Retail Uses

Case study data held by Cardno for a number of specialty retail uses indicates that the Parking Overlay rate of 3.5 spaces to each 100 square metres is generally representative of the peak parking demands for these types of uses.

7.3 Proposed Parking Rates

Based on the preceding, the following parking rates are recommended to be applicable to the site.

In order to simplify future applications on the site and allow for more streamlined applications for individual developments on the site, it is recommended that these rates be incorporated as part of a Schedule to Clause 45.09 (Parking Overlay) specific to the site.

Table 7-5 Proposed Car Parking Rates

Use	Rate	Car Parking Measure
Existing Uses (Office/Warehouse)	3	to each 100 sq m of net floor area
Supermarket	4	to each 100 sq m of leasable floor area
Shop/Specialty Retail	3.5	to each 100 sq m of leasable floor area
Dwellings	1	to each one or two bedroom dwelling, plus
	2	to each three or more bedroom dwelling
	0.1	for visitors to every 5 dwellings for developments of 5 or more dwellings

8 Traffic Considerations

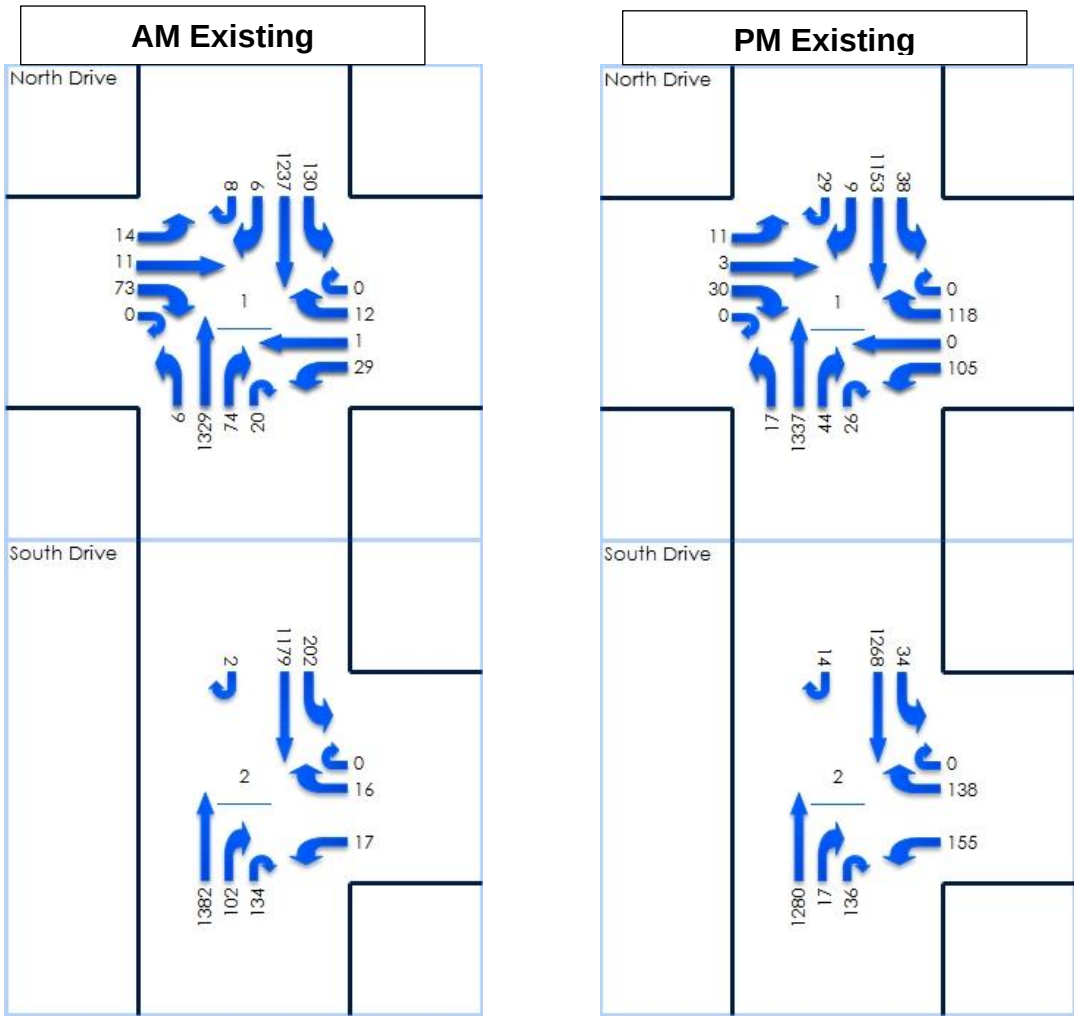
8.1 Existing Conditions

8.1.1 Traffic Survey

Cardno undertook traffic surveys at the intersections of East Boundary Road/North Drive and East Boundary Road/South Drive.

The surveys were undertaken between 7am-10am and 3:30pm-6:30pm on Friday 9th May 2014.Turning movement counts were undertaken by Trans Traffic Surveys at the intersections of East Boundary Road/North Drive and East Boundary Road/South Drive. The surveys were undertaken between 7am-10am and 3:30pm-6:30pm on Friday 9th May 2014. The AM and PM peak hour volumes are shown in Figure 8-1.

Figure 8-1 Existing Traffic Volumes – AM/PM Peak Hours



8.1.2 Existing Site Traffic Generation

In order to determine the existing traffic generation of the site, the turning movement counts were reviewed for vehicles entering and exiting the site via North and South Drives.

Reference to the surveys indicates that the existing car parking on the site generates some 594 vehicle movements during the AM peak hour and 632 vehicle movements during the PM peak hour.

Traffic generation for this site, and similar warehouse and office uses is generally a function of the parking supply. Relating the existing peak hour traffic generation to the number of parking spaces on the site

indicates that the site currently generates traffic at a rate of 0.33 movements per space in the AM peak hour and 0.35 movements per space in the PM peak hour.

A summary of the results is provided in Table 8-1.

Table 8-1 Existing Site Peak Hour Traffic Generation

	In AM	Out AM	Total AM	In PM	Out PM	Total PM
Existing Ins/Outs	519	75	594	138	494	632
Existing Traffic Rate (per space)	0.29	0.04	0.33	0.08	0.27	0.35

8.1.3 Existing Site Access and Operation

Access to the site is currently provided via two unsignalised intersections to East Boundary Road at North Drive and South Drive.

VicRoads has recently approved the signalisation of the East Boundary Road/South Drive access intersection as per the attached Cardno Functional Layout Plan at Appendix A.

Traffic intersection analysis has been undertaken using SIDRA Intersection to identify the operation of the existing road network based on:

> The existing network traffic volumes at Figure 8-1;

> The unsignalised East Boundary Road/North Drive access intersection; and

> The future signalisation of the East Boundary Road/South Drive access.

Table 8-2 provides a summary of the above SIDRA intersection analysis scenarios. It indicates that the existing unsignalised access at North Drive operates with a significant amount of spare capacity, with an existing degree of saturation of less than 0.4. The future signalisation of the South Drive access is also expected to operate with spare capacity, with a degree of saturation of less than 0.65 in both peaks.

Table 8-2 Existing Site Access Intersection Analysis Summary

Intersection	Peak Hour	Approach	Degree of Saturation	95th%ile Queue	Average Delay
East Boundary Road/North Drive (Unsignalised)	AM Peak	East Boundary Rd N	0.380	1.0 m	1.0 sec
		George St	0.244	7.1 m	17.6 sec
		East Boundary S	0.370	8.6 m	1.7 sec
		North Drive	0.125	2.9 m	19.6 sec
		Intersection	**0.380**	**8.6 m**	**2.4 sec**
	PM Peak	East Boundary Rd N	0.330	2.9 m	0.9 sec
		George St	0.121	3.1 m	17.3 sec
		East Boundary S	0.375	4.5 m	1.0 sec
		North Drive	0.345	9.8 m	17.4 sec
		Intersection	**0.375**	**9.8 m**	**2.9 sec**
East Boundary Road/South Drive (Future Signals)	AM Peak	East Boundary Rd N	0.622	183.0 m	19.6 sec
		East Boundary Rd S	0.647	200.7 m	24.2 sec
		South Dr E	0.044	3.4 m	29.9 sec
		Intersection	**0.647**	**200.7 m**	**22.1 sec**
	PM Peak	East Boundary Rd N	0.620	186.1 m	18.7 sec
		East Boundary Rd S	0.599	177.7 m	22.2 sec
		South Dr E	0.434	31.3 m	31.8 sec
		Intersection	**0.620**	**186.1 m**	**21.6 sec**

8.2 Road Network Growth – Base Case

8.2.1 Adopted Growth Rate

In order to ensure that future traffic generated by the development of Virginia Park will take into account potential growth on the external road network, Cardno has undertaken a review of existing and historical traffic volumes on East Boundary Road, as well as reviewing projected traffic volumes from the VITM model.

Table 8-3 provides a summary of two-way weekday peak hour through traffic volumes collected on East Boundary Road by Cardno in 2004, 2008, 2011 and 2014.

Table 8-3 Cardno Surveyed East Boundary Road Two-Way Peak Hour Traffic Volumes

Year of Survey	Two-way Through Volume AM Peak	Two-way Through Volume AM Peak
2004	2767 vph	2845 vph
2008	1929 vph	2351 vph
2011	2612 vph	2818 vph
2014	2561 vph	2548 vph

Of particular note, the above shows that there has been an overall reduction in two-way traffic volumes on East Boundary Road from 2004. Whilst there has been an increase in two-way peak hour traffic volumes between 2008 and 2011, there has since been a reduction in peak hour volumes between 2011 and 2014.

The above is consistent with the VicRoads AADT traffic volume data which is published on the VicRoads website which suggests that there has been limited, if any growth to volumes on East Boundary Road between North Road and South Road. A summary of the recorded volumes is provided in Table 8-4.

Table 8-4 VicRoads Published Traffic Volumes for East Boundary Road

Location	2003	2010	2011	2012	2013
East Boundary Rd N Bd Btwn South Rd & Centre Rd	11,000 (610**)	10,000* (570**)	10,000* (570**)	11,000 (600**)	11,000* (600**)
East Boundary Rd S Bd Btwn Centre Rd & South Rd	6,400 (350**)	6,200* (330**)	6,200* (330**)	6,200* (330**)	6,200* (330**)
East Boundary Rd N Bd Btwn Centre Rd & North Rd	9,000* (490**)	8,500* (460**)	8,500* (460**)	9,000 (490**)	9,000* (490**)
East Boundary Rd S Bd Btwn North Rd & Centre Rd	11,000 (630**)	11,000* (600**)	11,000* (600**)	11,000 (620**)	11,000* (610**)

** Daily Volumes*
*** Peak Hour Volumes*
(Data retrieved from http://www.vicroads.vic.gov.au/NR/rdonlyres/033097DD-D47F-48B3-A79A-BE313C29B131/0/TrafficVolumeInfoMay20142.xlsx)

In addition to the above, Cardno has accessed the VITM model (which includes modelling for the future Dingley Bypass) for the years 2011 and 2021. A comparison of these volumes indicates that between 2011 and 2021, a compounding growth rate of 0.4% is expected.

Table 8-5 Two-Way VITM Daily Volumes - East Boundary Road

Location	2011	2021	% growth
North of South Drive	36850	38510	0.4% compounding
South of South Drive	41086	42640	0.4% compounding

It is noted that VicRoads has previously requested that future analysis of intersections for this site allow for 10 years of traffic growth at a 2% rate (compounding), however having consideration of the preceding, it is considered that this is overly conservative and unnecessary.

Accordingly, a growth rate of 0.5% compounding has been adopted for the following analysis, which is in-line with the VITM model projections.

8.2.2 Base Case Volumes and Operating Conditions

The following two 'Base Case' scenarios have been modelled:

> Scenario 1 – 5 years growth at 0.5% per annum compounding; and

> Scenario 2 – 10 year's growth at 0.5% per annum compounding.

The adopted volumes for these scenarios are shown in Figure 8-2 for the Base Case Scenario 1 (5 years growth) and Figure 8-3 for the Base Case Scenario 2 (10 years growth).

SIDRA Analyses summaries for these two scenarios are provided in Table 8-6.

Reference to the results indicate that the intersections will continue to operate under 'excellent' conditions during both peaks and allowing for traffic growth to the existing through volumes on East Boundary Road.

Figure 8-2 Base Case 1 (Existing Volumes + 5 years growth)

Figure 8-3 Base Case 2 (Existing Volumes + 10 years growth)

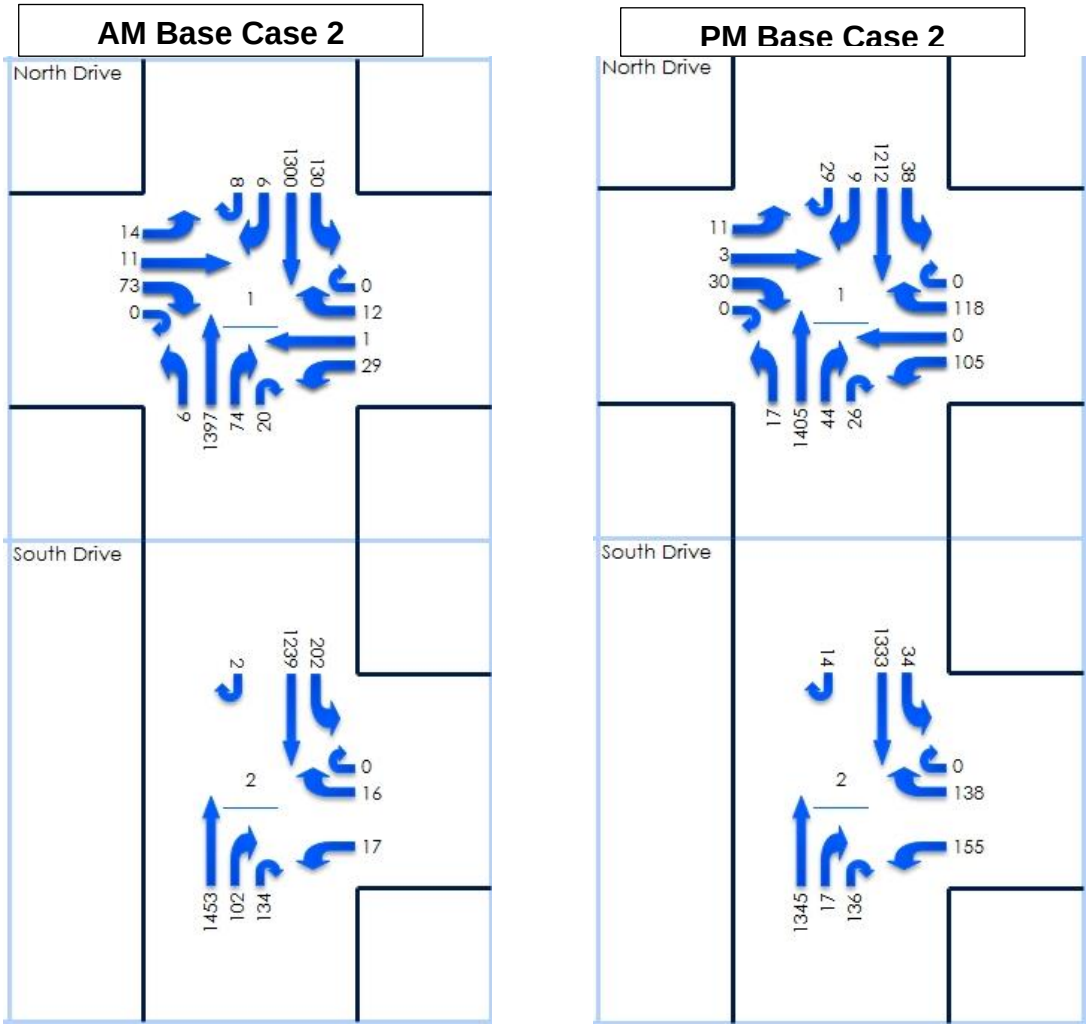


Table 8-6 Base Case Scenarios (Existing + Growth) Site Access Intersection Analysis Summary

Intersection	Peak Hour	Approach	Base Case Scenario 1			Base Case Scenario 2		
			D.o.S	95th%ile Queue	Av. Delay	D.o.S	95th%ile Queue	Av. Delay
East Boundary Road/North Drive (Unsignalised)	AM Peak	East Boundary Rd N	0.389	1.2 m	1.0 sec	0.397	1.2 m	1.0 sec
		George St	0.278	8.0 m	19.5 sec	0.291	8.4 m	20.3 sec
		East Boundary S	0.423	10.3 m	1.9 sec	0.449	11.0 m	1.9 sec
		North Drive	0.145	3.2 m	21.5 sec	0.154	3.4 m	22.4 sec
		Intersection	**0.423**	**10.3 m**	**2.6 sec**	**0.449**	**11.0 m**	**2.6 sec**
	PM Peak	East Boundary Rd N	0.338	3.4 m	1.0 sec	0.347	3.5 m	1.0 sec
		George St	0.139	3.5 m	18.8 sec	0.146	3.6 m	19.5 sec
		East Boundary S	0.385	5.2 m	1.1 sec	0.394	5.5 m	1.1 sec
		North Drive	0.387	11.0 m	19.0 sec	0.405	11.5 m	19.8 sec
		Intersection	**0.387**	**11.0 m**	**3.0 sec**	**0.405**	**11.5 m**	**3.1 sec**
East Boundary Road/South Drive (Future Signals)	AM Peak	East Boundary Rd N	0.638	190.1 m	19.8 sec	0.643	193.7 m	19.5 sec
		East Boundary Rd S	0.663	209.1 m	24.2 sec	0.680	218.1 m	24.6 sec
		South Dr E	0.044	3.4 m	30.1 sec	0.045	3.4 m	30.3 sec
		Intersection	**0.663**	**209.1 m**	**22.3 sec**	**0.680**	**218.1 m**	**22.3 sec**
	PM Peak	East Boundary Rd N	0.635	193.5 m	19.0 sec	0.635	193.5 m	19.0 sec
		East Boundary Rd S	0.614	184.7 m	22.3 sec	0.630	192.2 m	22.4 sec
		South Dr E	0.434	31.3 m	32.1 sec	0.434	31.3 m	32.1 sec
		Intersection	**0.635**	**193.5 m**	**21.8 sec**	**0.635**	**193.5 m**	**21.8 sec**

8.3 Stage 1 Traffic Considerations

8.3.1 Overview

Stage 1 includes the removal of 21,956 m^2 of existing office/warehouse floor area, and addition of 12,000 m^2 of retail, 118 townhouses and 214 apartments.

The removal of the 21,956 m^2 of existing office/warehouse floor area will result in a commensurate reduction in parking demands for the existing uses.

8.3.2 Removal of Existing Uses

As per the previous sections, it is estimated that in the order of 1,116 car parking spaces would be required on-site to service the retained office/warehouse uses. This would represent a reduction in the on-site parking supply for these uses by 684 spaces.

This parking currently generates traffic at a rate of 0.33 movements per space in the AM peak hour and 0.35 movements per space in the PM peak hour.

A reduction in existing traffic can therefore be expected proportionate to the reduction in car parking.

8.3.3 Retail Uses

It is anticipated that the retail component of the proposed development will generate relatively few traffic movements during the morning peak hour, when it is considered that the majority of traffic movements will be staff movements.

The impact of shopping centre traffic on the adjacent road network is usually most critical during the evening commuter peak period when shopping centre traffic combines with commuter traffic to produce the greatest volume on the surrounding road network.

For the purposes of comparison the "Guide to Traffic Generating Developments" produced by the NSW RTA suggests traffic generation rates for the PM peak period as shown in Table 8-7

Table 8-7 NSW RTA Traffic Generation Rates

Use	Traffic Generation Rate (Total Trips/100sq.m GLFA)
Supermarket	13.8
Specialty Shops	4.6

Surveys of a number of different shopping and retail centres have been compiled by Cardno to identify suitable peak hour traffic generation rates for the proposal. These sites, which range in size, location and proximity to other surrounding developments indicate that the average Friday peak hour traffic generation of the combined retail uses is in the order of 9.8 vehicle movements per 100 square metres.

Table 8-8 Shopping Centre Traffic Generation Rates

Site	Average Weekday PM Peak Hour Traffic Generation Rate
Chadstone Shopping Centre	10.8 vehicle movements per 100 square metres
Taylors Hill Shopping Centre	7.7 vehicle movements per 100 square metres
Central Square Shopping Centre	9.4 vehicle movements per 100 square metres
Roxburgh Park Shopping Centre	11.7 vehicle movements per 100 square metres
Glenmore Park Shopping Centre (NSW)	11.3 vehicle movements per 100 square metres
Stud Park Shopping Centre	8.0 vehicle movements per 100 square metres
Average	**9.8 vehicle movements per 100 square metres**

It is worth noting that at the majority of shopping centres, a component of customer traffic is 'diverted linked trips' from the surrounding road network, in particular during the Friday evening commuter period.

Diverted trips relate to vehicles already on the adjacent road network that are merely re-routed to the development, when drivers are undertaking trips associated with another primary trip such as a work or home trip. Studies show that at shopping centres, this figure can range from 20% to 30%.

For the purposes of this analysis, and based on the RTA NSW rates, the case study data and potential for diverted trips, a conservative rate of 10 vehicle movements per 100 square metres has been adopted for the proposal.

During the AM peak hour, when a rate of 2 movements per $100m^2$ (20% of the PM peak hour) has been adopted.

8.3.4 Residential Dwellings

It is generally accepted that single dwelling lots in outer urban areas generate traffic at a rate of up to 10 vehicles per day per lot.

In areas of good public transport accessibility, and for multi-unit and higher density dwelling lots, lower traffic generation rates are often observed.

Recent surveys undertaken by my firm confirm that daily traffic volumes are in the order of 6 to 7 vehicle movements per dwelling in medium density developments in middle to outer suburbs. Peak hour generation rates are in the order of 10 per cent of the daily volumes.

Accordingly, a daily traffic generation rate of 7 movements per dwelling, inclusive of 0.7 movements per dwelling during the peak hours has been adopted for the apartments. A daily rate of 8 movements per dwelling, inclusive of 0.8 movements per dwelling during the peak, has been adopted for the townhouses.

8.3.5 Adopted Traffic Generation Rates

Based on the preceding, the traffic generation rates shown in Table 8-9 have been adopted for the following assessments.

Table 8-9 Adopted Traffic Generation Rates

Use	AM Peak Hour	PM Peak Hour
Existing Uses (Office/Warehouse)	0.33 movements to each car space	0.35 movements to each car space
Supermarket/ Shop/ Specialty Retail	2 movements to each 100 sq m	10 movements to each 100 sq m
Townhouses	0.8 movements to each dwelling	0.8 movements to each dwelling
Apartments	0.7 movements to each dwelling	0.7 movements to each dwelling

8.3.6 Stage 1 Traffic Generation

Based on the preceding rates, Stage 1 is expected to generate a total of 853 vehicle movements to and from East Boundary Road during the AM peak and 1,837 vehicle movements during the PM peak hour as shown in Table 8-10.

Table 8-10 Stage 1 Development Traffic Volumes

Use		No/Area	Adopted Rate	AM Peak Movements			PM Peak Movements		
				In	Out	Total	In	Out	Total
Existing Warehouse/Office		1,800 sp.		519	75	594	138	494	632
Stage 1	Warehouse/ Office Reduced	- 662 sp.	AM - 0.33 veh/100m^2 PM - 0.35 veh/100m^2	-198	-27	-225	-55	-185	-240
	Retail	6000 m2	AM - 2 veh/ 100m^2 PM - 10 veh/ 100m^2	84	36	120	300	300	600
	Retail	1500 m2		21	9	30	75	75	150
	Retail	4500 m2		63	27	90	225	225	450
	Residential	118 dwel.	8 veh / dwelling	28	66	94	57	38	95
	Residential	214 dwel.	7 veh / dwelling	30	120	150	90	60	150
	Stage 1 Change (Sub-Total)			***+28***	***+231***	***+259***	***+692***	***+513***	***+1205***
Post Stage 1 Total Site Traffic Generation				**547**	**306**	**853**	**830**	**1007**	**1837**

8.3.7 Stage 1 Traffic Volumes

Based on the above, and considering that the South Drive access is to be signalised associated with the existing and future development of this site, an analysis of Stage 1 “Post Development” has been undertaken based on:

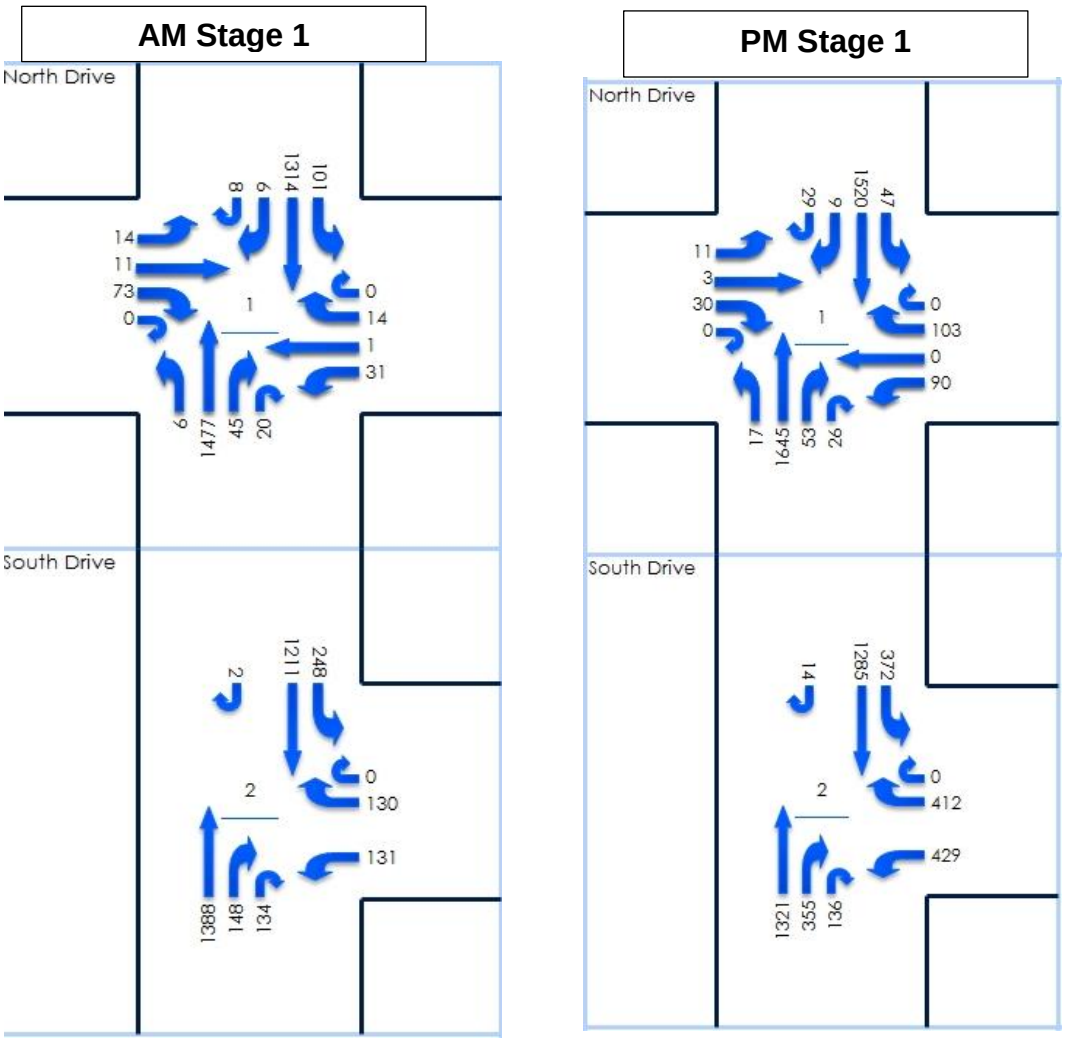
> Existing Traffic Volumes

> Plus 5 years growth at 0.5% per annum compounding; and

> The net change in traffic generation of the site as per Table 8-10.

The adopted volumes for this scenario are shown in Figure 8-4.

Figure 8-4 Stage 1 Future Volumes (Base Case 1 + Traffic Generation)



8.3.8 Stage 1 Intersection Operation

A summary of the SIDRA Analyses for the Base Case Scenario 1 (existing plus growth) and Stage 1 – Post Development scenario is provided in Table 8-11 below.

Reference to the results indicates that the intersection of North Road will continue to operate with a significant amount of spare capacity.

For the purposes of a conservative analysis, it has been assumed that the majority of traffic will utilise the new South Drive signals during Stage 1.

Therefore, whilst the new signals at South Drive will operate with a degree of saturation of 0.86 – which is considered acceptable and "fair" operating conditions – there is a sufficient level of capacity at the North Drive unsignalised intersection. In reality, it is likely that South Drive will operate at a lower degree of saturation, and the North Drive intersection will cater for more of the traffic in and out of the site.

Table 8-11 Stage 1 – Post Development SIDRA Summary

Intersection	Peak Hour	Approach	Base Case Scenario 1			Stage 1 Post Development		
			D.o.S	95th%ile Queue	Av. Delay	D.o.S	95th%ile Queue	Av. Delay
East Boundary Road/North Drive (Unsignalised)	AM Peak	East Boundary Rd N	0.389	1.2 m	1.0 sec	0.393	1.2 m	0.8 sec
		George St	0.278	8.0 m	19.5 sec	0.291	8.5 m	20.3 sec
		East Boundary S	0.423	10.3 m	1.9 sec	0.411	6.0 m	1.1 sec
		North Drive	0.145	3.2 m	21.5 sec	0.154	3.5 m	21.4 sec
		Intersection	**0.423**	**10.3 m**	**2.6 sec**	**0.411**	**8.5 m**	**2.1 sec**
	PM Peak	East Boundary Rd N	0.338	3.4 m	1.0 sec	0.434	5.6 m	1.1 sec
		George St	0.139	3.5 m	18.8 sec	0.219	5.3 m	26.9 sec
		East Boundary S	0.385	5.2 m	1.1 sec	0.497	11.6 m	1.8 sec
		North Drive	0.387	11.0 m	19.0 sec	0.558	15.6 m	29.8 sec
		Intersection	**0.387**	**11.0 m**	**3.0 sec**	**0.558**	**15.6 m**	**3.7 sec**
East Boundary Road/South Drive (Future Signals)	AM Peak	East Boundary Rd N	0.638	190.1 m	19.8 sec	0.649	194.0 m	20.2 sec
		East Boundary Rd S	0.663	209.1 m	24.2 sec	0.650	202.2 m	25.3 sec
		South Dr E	0.044	3.4 m	30.1 sec	0.337	29.4 m	32.6 sec
		Intersection	**0.663**	**209.1 m**	**22.3 sec**	**0.650**	**202.2 m**	**23.7 sec**
	PM Peak	East Boundary Rd N	0.635	193.5 m	19.0 sec	0.854	281.9 m	33.5 sec
		East Boundary Rd S	0.614	184.7 m	22.3 sec	0.847	214.0 m	34.6 sec
		South Dr E	0.434	31.3 m	32.1 sec	0.860	97.5 m	42.3 sec
		Intersection	**0.635**	**193.5 m**	**21.8 sec**	**0.860**	**281.9 m**	**35.7 sec**

8.4 Stage 2 Traffic Considerations

8.4.1 Overview

Stage 2 includes the provision of a further 918 apartments on the site, resulting in a total provision of 1,250 dwellings (including 118 townhouses). No further changes are proposed to the existing warehouse/office uses.

8.4.2 Traffic Generation

Adopting the same rates as for Stage 1, Stage 2 is expected to generate an additional 642 vehicle movements to and from East Boundary Road during the peak hours as shown in Table 8-12.

Table 8-12 Stage 2 Development Traffic Volumes

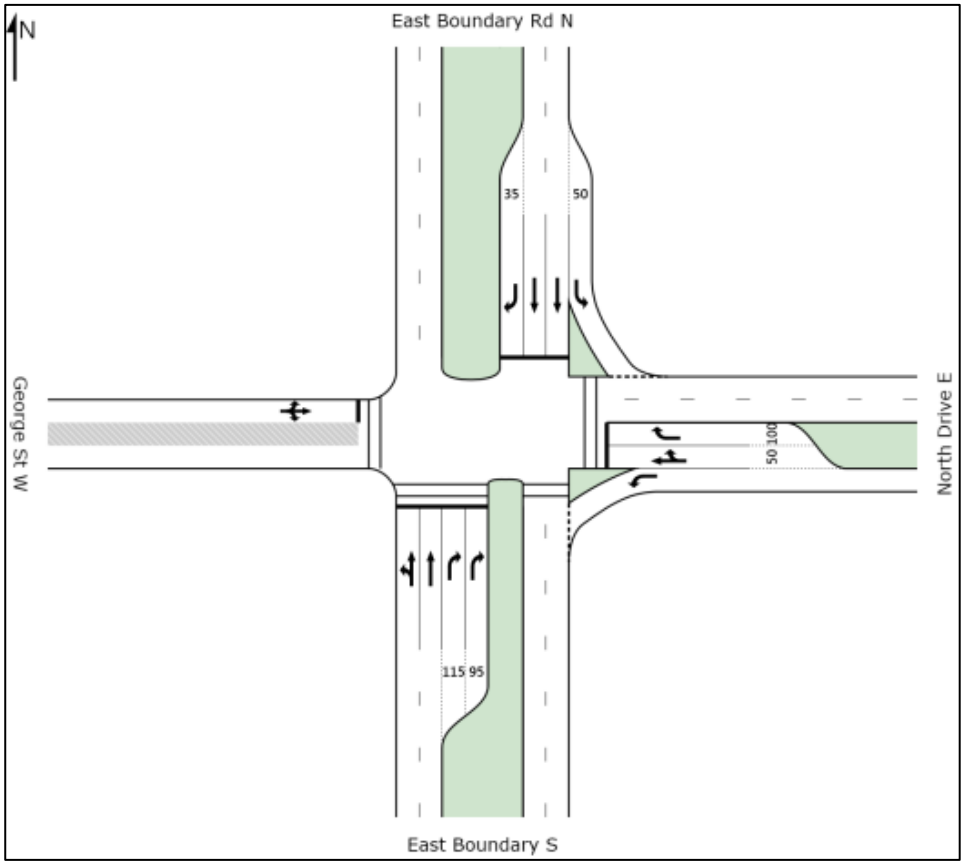
Use		No/Area	Adopted Rate	AM Peak Movements			PM Peak Movements		
				In	Out	Total	In	Out	Total
Existing Warehouse/Office				519	75	594	138	494	632
Stage 1 Total Change				+28	+231	+259	+692	+513	+1205
Stage 2	Residential	+ 918 dwel.	7 veh / dwelling	128	514	642	385	257	642
Post Stage 2 Total Site Traffic Generation				**675**	**820**	**1,495**	**1,215**	**1,264**	**2,479**

8.4.3 Future Signalisation of East Boundary Road/North Drive

Having consideration of the amount of additional traffic generated by the two Stages of development, and the level of service expected by the proposed development, it is proposed that the existing East Boundary Road/North Drive/George Street intersection be signalised as part of this stage. It is proposed to signalise the intersection, providing left-turn slip lanes into and out of the site, and a new double right turn into the site.

The proposed intersection layout is provided within Figure 8-5.

Figure 8-5 Proposed East Boundary Road/North Drive/George Street Signalisation



8.4.4 Stage 2 Traffic Volumes

Based on the above, and considering that both the South Drive and North Drive accesses will now be signalised, it is anticipated that there will be a redistribution of some traffic to and from the North Drive access. An analysis of Stage 2 "Post Development" has been undertaken based on:

> Existing Traffic Volumes

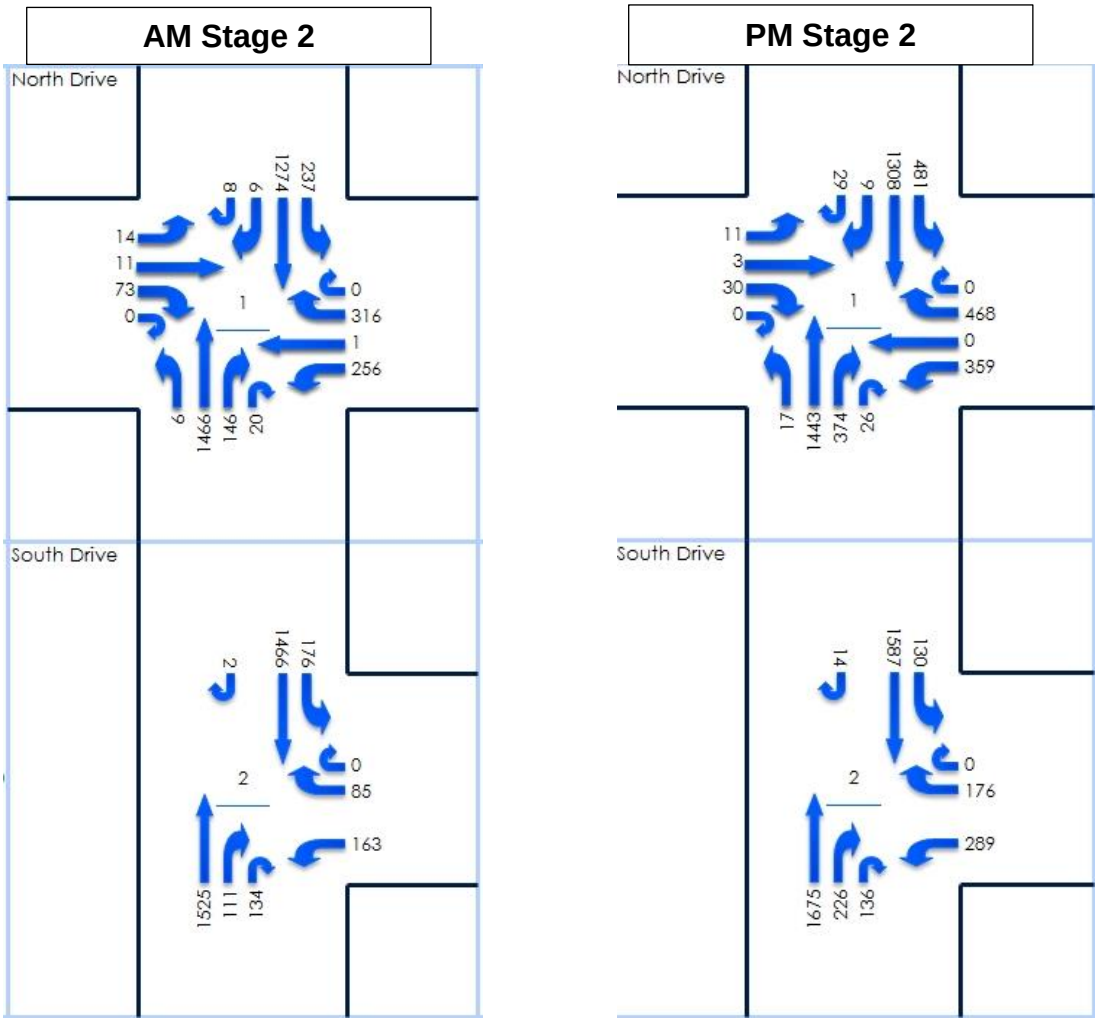
> Plus 10 years growth at 0.5% per annum compounding;

> The net change in traffic generation of the site as per Table 8-12; and

> A redistribution of traffic via the site's accesses based on the new signalised access arrangements

The adopted volumes for this scenario are shown in Figure 8-6.

Figure 8-6 Stage 2 Future Volumes (Base Case 2 + Traffic Generation)



8.4.5 Stage 2 Intersection Operation

A summary of the SIDRA Analyses for the Base Case Scenario 2 (existing plus growth for 10 years) and Stage 2 – Post Development scenario is provided in Table 8-13 below.

The summaries indicate that all intersections will continue to operate with some spare capacity during the peak periods. During the AM Peak hour, the North Drive and South Drive intersections will operate under "good" conditions, with degrees of saturation of less than 0.8.

In the PM peak hour, both intersections will operate under "fair" conditions, with degrees of saturation of less than 0.9 at both intersections.

Table 8-13 Stage 2 – Post Development SIDRA Summary

Intersection	Peak Hour	Approach	Stage 1 Post Development			Stage 2 Post Development		
			D.o.S	95th%ile Queue	Av. Delay	D.o.S	95th%ile Queue	Av. Delay
East Boundary Road/North Drive (Stage 1 – Unsignalised/ Stage 2 – Future Signals)	AM Peak	East Boundary Rd N	0.393	1.2 m	0.8 sec	0.632	191.1 m	17.9 sec
		George St	0.291	8.5 m	20.3 sec	0.218	32.5 m	41.6 sec
		East Boundary S	0.411	6.0 m	1.1 sec	0.699	227.6 m	23.9 sec
		North Drive	0.154	3.5 m	21.4 sec	0.645	77.8 m	38.4 sec
		Intersection	**0.411**	**8.5 m**	**2.1 sec**	**0.699**	**227.6 m**	**24.1 sec**
	PM Peak	East Boundary Rd N	0.434	5.6 m	1.1 sec	0.805	255.3 m	26.8 sec
		George St	0.219	5.3 m	26.9 sec	0.079	12.6 m	34.5 sec
		East Boundary S	0.497	11.6 m	1.8 sec	0.789	256.8 m	32.7 sec
		North Drive	0.558	15.6 m	29.8 sec	0.792	132.2 m	42.2 sec
		Intersection	**0.558**	**15.6 m**	**3.7 sec**	**0.805**	**256.8 m**	**32.1 sec**
East Boundary Road/South Drive (Future Signals)	AM Peak	East Boundary Rd N	0.649	194.0 m	20.2 sec	0.738	244.5 m	20.4 sec
		East Boundary Rd S	0.650	202.2 m	25.3 sec	0.768	261.5 m	29.2 sec
		South Dr E	0.337	29.4 m	32.6 sec	0.444	39.8 m	30.3 sec
		Intersection	**0.650**	**202.2 m**	**23.7 sec**	**0.768**	**261.5 m**	**25.3 sec**
	PM Peak	East Boundary Rd N	0.854	281.9 m	33.5 sec	0.837	309.0 m	26.8 sec
		East Boundary Rd S	0.847	214.0 m	34.6 sec	0.892	369.1 m	42.4 sec
		South Dr E	0.860	97.5 m	42.3 sec	0.755	89.2 m	40.2 sec
		Intersection	**0.860**	**281.9 m**	**35.7 sec**	**0.892**	**369.1 m**	**35.8 sec**

8.5 Overall Traffic Impact

Having regard to the preceding, with the signalisation of the North Drive intersection at Stage 2, it is considered that sufficient capacity will be created to provide appropriate access to and from Virginia Park, without significant impact on the operation of East Boundary Road.

It is noted that the preceding analyses allow for growth to existing traffic volumes on East Boundary Road at a rate in excess of that which has historically occurred and is expected within the VITM model.

Furthermore, East Boundary Road, along the length of the site, provides kerbside parking in each direction and which would allow for future capacity to be created by banning parking in the peaks to accommodate a new traffic lane on the East Boundary Road approaches.

9 Conclusions

Based on the foregoing analysis it is concluded that;

> The current proposal is to be provided in two stages as follows:
  - Stage 1 will remove 21,956 m^2 of existing office and warehouse floor space and provide 12,000m^2 of retail and a total of 332 dwellings on the site;
  - Stage 2 will provide a further 918 dwellings on the site, totalling 1,250 dwellings;

> The provision of car parking for the site should be in accordance with the recommended rates, and allow for some sharing of parking for visitors;

> The provision of bicycle parking and change facilities for the site should be in accordance with the Planning Scheme rates. It is considered suitable to share appropriately located visitor bicycle parking between residential and retail uses where possible;

> Loading provisions are to be adequate to service the individual uses which are proposed on the site and should be generally in accordance with the requirements of Clause 52.06 of the Glen Eira Planning Scheme;

> VicRoads has recently provided approval to the signalisation of the South Drive access. The provision of these signals at South Drive and existing capacity at the North Drive access will adequately accommodate the additional traffic generated by Stage 1;

> In order to cater for Stage 2 of the proposal, the applicant proposes to signalise the intersection of East Boundary Road/North Drive/George Street; and

> There will continue to be some spare capacity at these intersections in the future to allow for additional growth past the modelled 10 years, albeit the VITM model does not expect significant growth to existing traffic volumes in the area.

APPENDIX A

APPROVED EAST BOUNDARY ROAD/SOUTH DRIVE INTERSECTION LAYOUTS

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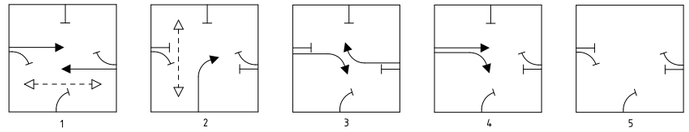
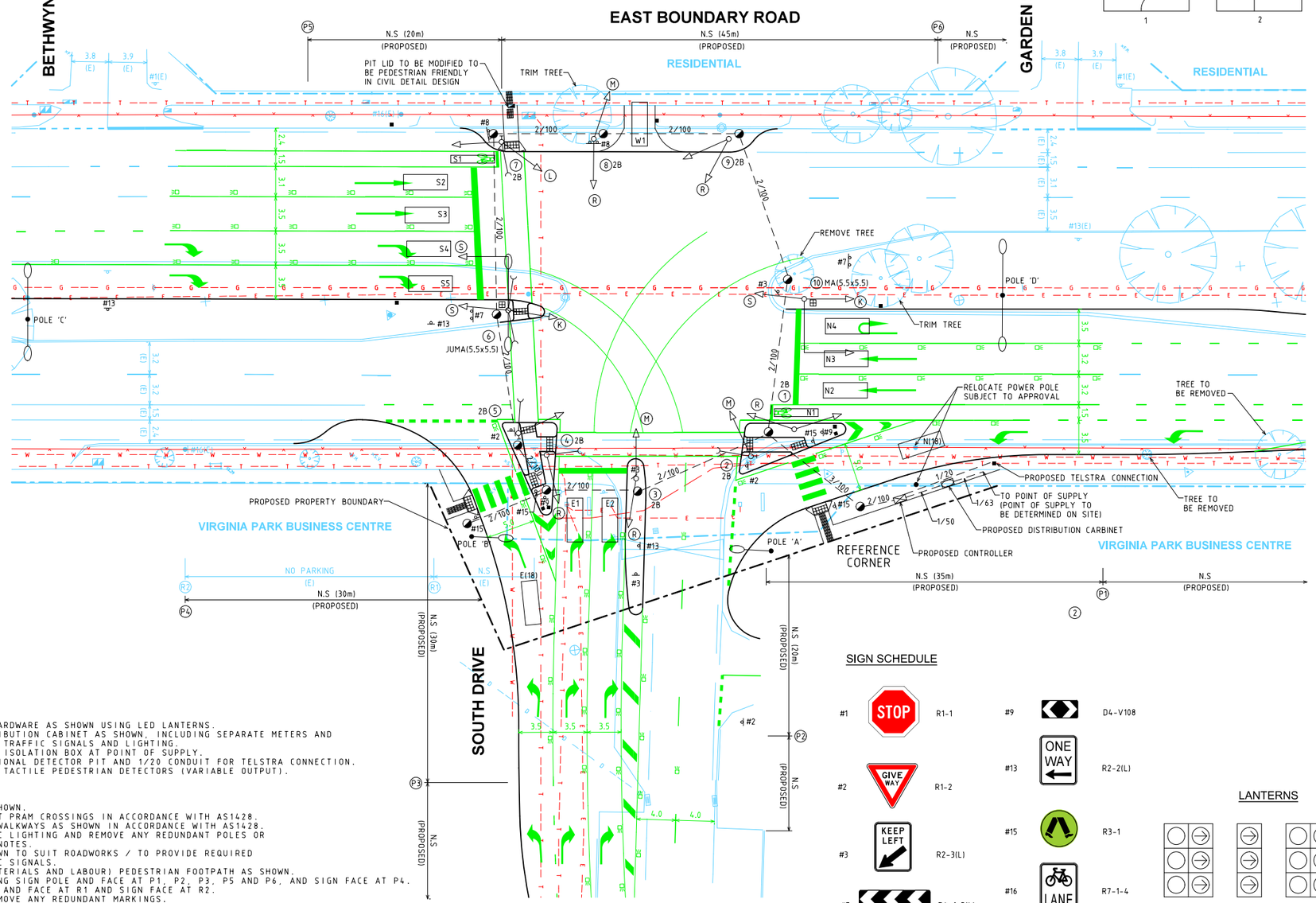
ISSUE	APP'D	DATE	AMENDMENT

PHASING





INSTALLATION NOTES

A SIGNAL CONTRACTOR

1. SUPPLY AND INSTALL NEW HARDWARE AS SHOWN USING LED LANTERNS.
2. SUPPLY AND INSTALL DISTRIBUTION CABINET AS SHOWN, INCLUDING SEPARATE METERS AND CIRCUIT BREAKERS FOR THE TRAFFIC SIGNALS AND LIGHTING.
3. SUPPLY AND INSTALL MAINS ISOLATION BOX AT POINT OF SUPPLY.
4. SUPPLY AND INSTALL ADDITIONAL DETECTOR PIT AND 1/20 CONDUIT FOR TELSTRA CONNECTION.
5. SUPPLY AND INSTALL AUDIO TACTILE PEDESTRIAN DETECTORS (VARIABLE OUTPUT).

B CIVIL CONTRACTOR

1. CONSTRUCT ROADWORKS AS SHOWN.
2. CONSTRUCT 3 DDA COMPLIANT PRAM CROSSINGS IN ACCORDANCE WITH AS1428.
3. CONSTRUCT 3 CUT-THROUGH WALKWAYS AS SHOWN IN ACCORDANCE WITH AS1428.
4. SUPPLY AND INSTALL PUBLIC LIGHTING AND REMOVE ANY REDUNDANT POLES OR EQUIPMENT. SEE GENERAL NOTES.
5. TRIM/REMOVE TREES AS SHOWN TO SUIT ROADWORKS / TO PROVIDE REQUIRED SIGHT DISTANCE TO TRAFFIC SIGNALS.
6. CONSTRUCT (SUPPLY ALL MATERIALS AND LABOUR) PEDESTRIAN FOOTPATH AS SHOWN.
7. SUPPLY AND INSTALL PARKING SIGN POLE AND FACE AT P1, P2, P3, P5 AND P6, AND SIGN FACE AT P4.
8. REMOVE PARKING SIGN POLE AND FACE AT R1 AND SIGN FACE AT R2.
9. LINEMARK AS SHOWN AND REMOVE ANY REDUNDANT MARKINGS.
10. SUPPLY AND INSTALL RRPM'S AS SHOWN AND REMOVE ANY REDUNDANT MARKERS.
11. SUPPLY AND INSTALL ROAD SIGNS WHERE SHOWN AND REMOVE ANY REDUNDANT SIGNS.
12. ALL VESI PITS AND ASSOCIATED CONDUITS TO BE INSTALLED BY POWER COMPANY APPROVED PRE-QUALIFIED ELECTRICAL CONTRACTORS.

C. VICROADS

(i) METROPOLITAN SOUTH EAST REGION
1. SUPPLY AND INSTALL NEW LED COMPATIBLE CONTROLLER (DIMMING ENABLED)
2. CONNECT CONTROLLER TO SCATS.

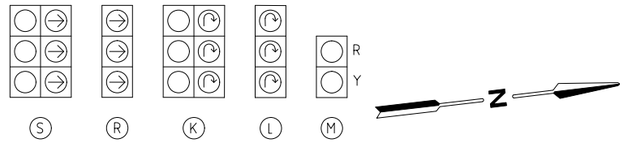
(ii) ROAD OPERATIONS - EAST

1. PROGRAM NEW CONTROLLER

SIGN SCHEDULE

#1	STOP	R1-1	#9		D4-V108
#2	GIVE WAY	R1-2	#13	ONE WAY	R2-2(L)
#3	KEEP LEFT	R2-3(L)	#15		R3-1
#7		D4-1-3(L)	#16	LANE	R7-1-4
#8		D4-1-3(R)			

LANTERNS



MELWAY REF MAP 68 K10

GENERAL NOTES

1. BASE INFORMATION SUPPLIED BY HEAD & HUMPHREYS LAND CONSULTANTS, REF No. 5009-00-ROAD-0102.DWG
2. ALL DIMENSIONS ARE TO FACE OF KERB AND CHANNEL UNLESS OTHERWISE NOTED.
3. DECLARED ROAD - EAST BOUNDARY ROAD (SPEED ZONE 70KM/H) LOCAL ROAD - SOUTH DRIVE (SPEED ZONE 15KM/H)
4. PUBLIC LIGHTING
- PEDESTAL 6 TO BE 11m JUP, 12.5m MOUNTING HEIGHT, 3.0/4.5m OUTREACH, 2X250W HPS LUMINAIRES
- POLE 'A' AND POLE 'B' TO BE 11m FRANGIBLE POLE, 12.5m MOUNTING HEIGHT, 3.0m OUTREACH, 250W HPS LUMINAIRE
- POLE 'C' TO BE FRANGIBLE POLE, 12.5m MOUNTING HEIGHT, 3.0/4.5m OUTREACH, 2X250W HPS LUMINAIRE
- POLE 'D' TO BE FRANGIBLE POLE, 12.5m MOUNTING HEIGHT, 4.5m OUTREACH, 2X250W HPS LUMINAIRE

LEGEND

- PEDESTAL - EXISTING, NEW, JOINT USE
- 3 ASPECT LANTERN - 200mm, 300mm
- MAST ARM (OUTREACH AS INDICATED)
- PEDESTRIAN PUSH BUTTON & LANTERN
- VEHICLE GROUP - ACTIVE, PROHIBITED
- PERMITTED PEDESTRIAN MOVEMENT
- STREET LIGHT LANTERN - 250W, 150W
- EXISTING STREET LIGHT LANTERN
- DETECTOR LOOP - PROPOSED, EXISTING
- TRAFFIC SIGNAL CONTROLLER
- 1/100 CONDUIT WITH NUMBER/DUCT DIAMETER
- PIT - CONDUIT, DETECTOR
- POLE - TRAMWAY, ELECTRICITY
- F.O. INTERNALLY ILLUMINATED SIGN - FIBRE OPTIC
- N.R.T. NO RIGHT TURN
- G.W.T.P. GIVE WAY TO PEDESTRIANS
- N.S. NO STOPPING
- PAVEMENT MARKER - RAISED, RAISED REFLECTIVE
- SEWERAGE PIT
- F.H. FIRE - PLUG, HYDRANT
- S.V. STOP VALVE
- GAS VALVE
- ELECTRICITY SUPPLY PIT
- UTILITY UNCLASSIFIED
- (E) EXISTING FEATURE
- OVERHEAD SERVICE
- FENCE
- S UNDERGROUND SEWER MAIN
- E UNDERGROUND ELECTRICITY
- G UNDERGROUND GAS
- W UNDERGROUND WATER
- T UNDERGROUND TELECOMMUNICATIONS
- TELECOMMUNICATIONS - PIT, PILLAR
- DRAINAGE PIT - SIDE ENTRY, GRATED
- TGSI - WARNING, DIRECTIONAL

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Date	CGR Drawn	CGR Checked
23.07.13	KS	TCW

CGR DRAWING NO. CG109287/T/05
CGR Revision P4

NOTE
PROPOSED SIGNAL HARDWARE LOCATIONS ARE INDICATIVE ONLY
The actual locations of proposed pedestals, conduit pits, conduits, etc. shall be determined on site at pre-installation meeting (Hold Point).

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

DESIGNED KS (CARDNO)
APPROVED

vicroads

CAT: METRO SOUTH EAST
PROJ: TRAFFIC
FILE: VICROADS DRAWING No.dgn

SCALE OF METRES HOR 0 5 10

EAST BOUNDARY ROAD/ SOUTH DRIVE

GLEN EIRA CITY
TRAFFIC SIGNAL PLAN

FILE NO.	SITE NO.	SHEET NO.	DRAWING NO.	ISSUE
TM/010/GLI/XX				

5/12/2013 11:03:10 AM
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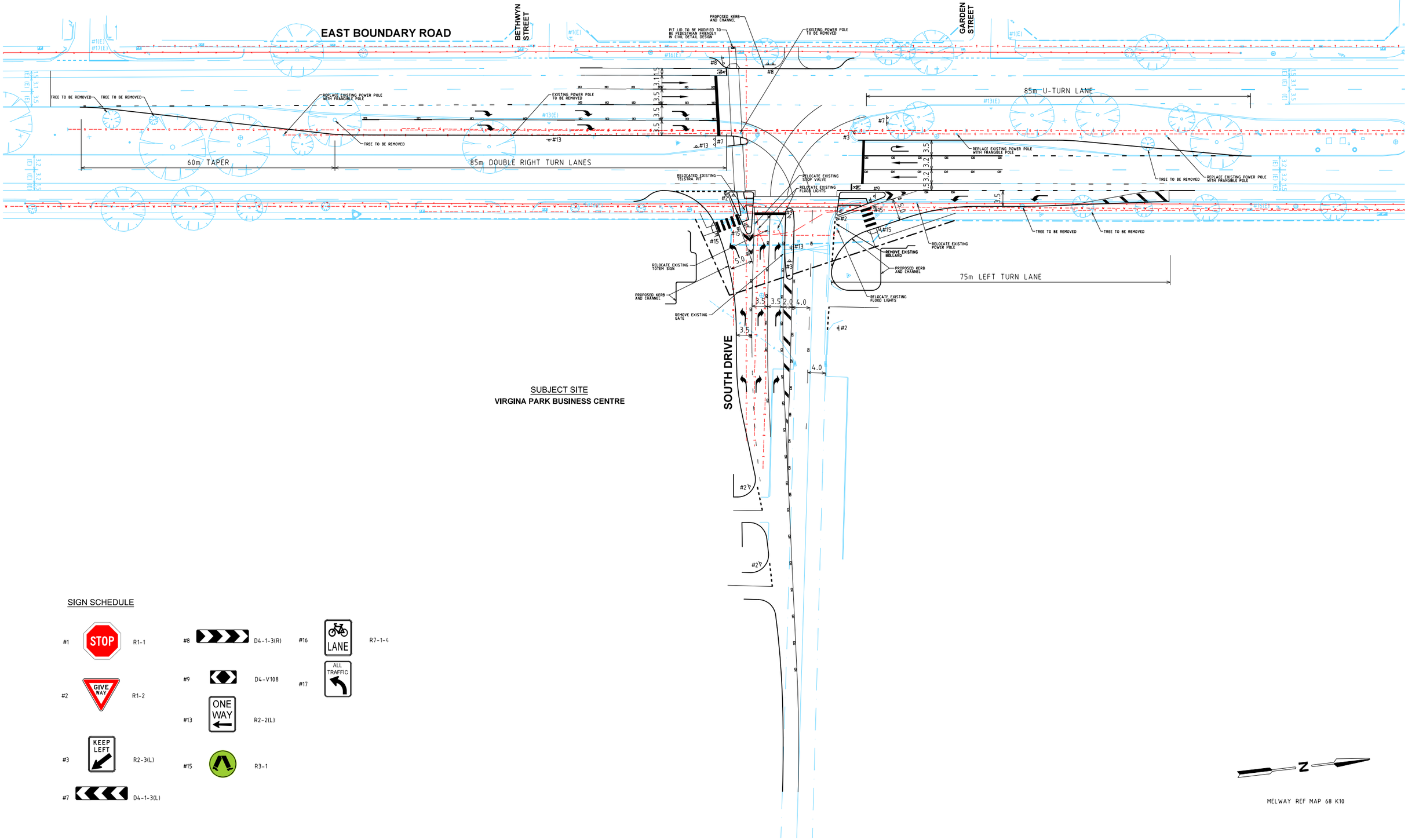

SIGN SCHEDULE

#1	STOP	R1-1	#8	D4-1-3(R)	#16 LANE R7-1-4
#2	GIVE WAY	R1-2	#9	D4-V108	#17 ALL TRAFFIC
#3	KEEP LEFT	R2-3(L)	#13	ONE WAY R2-2(L)	
#7		D4-1-3(L)	#15	R3-1	

MELWAY REF MAP 68 K10

Rev	Date	Description	Drawn	Appr.
P5	05.12.13	ADDED EXISTING TRAFFIC LANE DIMENSIONS FOR EAST BOUNDARY ROAD	TCW	JS
P4	23.08.13	RSA COMMENTS	KS	JS
P3	30.07.13	GENERAL AMENDMENTS	KS	JS
P2	25.07.13	GENERAL AMENDMENTS	KS	TCW
P1	22.07.13	ISSUED FOR INFORMATION	KS	TCW

0 4,0 8,0 16,0
1:800 @ A3

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES SHOWN ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE.

1. BASE INFORMATION SUPPLIED BY HEAD & HUMPHREYS LAND CONSULTANTS, REF No. 5009-00-ROAD-0102.DWG
2. ALL DIMENSIONS TO FACE OF KERB AND CHANNEL U.N.O
3. DECLARED ROAD - EAST BOUNDARY ROAD (SPEED ZONE 70KM/H) LOCAL ROAD - SOUTH DRIVE (SPEED ZONE 15KM/H)
4. INSTALL ALL SIGNS IN ACCORDANCE WITH VICROADS TEM VOLUME 2 AND REMOVE ALL REDUNDANT SIGNS.
5. LINE MARK IN ACCORDANCE WITH VICROADS TEM VOLUME 2 AND REMOVE ALL REDUNDANT LINEMARKING.
6. INSTALL RRPM'S AND REMOVE ANY REDUNDANT MARKERS.
7. PUBLIC LIGHTING AND TRAFFIC SIGNAL DESIGN SUBJECT TO DETAIL DESIGN STAGE

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Drawn: KS
Designed: TCW
Checked: TCW
Authorised:

Client: VIRGINIA PARK BUSINESS CENTRE
Project: VIRGINIA PARK ACCESS INTERSECTION
EAST BOUNDARY ROAD/SOUTH DRIVE, EAST BENTLEIGH
GLEN EIRA CITY COUNCIL
Title: FUNCTIONAL LAYOUT PLAN
SIGNAGE AND LINEMARKING PLAN

Status: **PRELIMINARY**
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Date	Scale	Size
22.07.13	1:800	A3

Project Number	Sheet Number	Revision
CG109287	T 04	P5