BELMORE LINX PTY LTD

TRAFFIC AND PARKING IMPACT ASSESSMENT

FOR

CONCEPT PLAN DEVELOPMENT APPLICATION

AT 677-681, 687 CANTERBURY ROAD,

AND

48 DRUMMOND STREET,

BELMORE

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Job No.: **1187-19**
Report No.: **3A/19** **FEBRUARY 2019**

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1.0 INTRODUCTION

1.1 Background

A Concept Plan Development application is to be made by Belmore Linx Pty Ltd for a development site at **677-681, 687** Canterbury Road and **48** Drummond Street Belmore.

The land is zoned B6 Enterprise Corridor in Canterbury LEP2012. Prohibited uses include residential accommodation and retail premises. However, under *Division 5* of *SEPP (Affordable Rental Housing) 2009 Clause 36(2)(a),* the site compatibility certificate certified by the Director-General in Schedule 1 permits mixed use development comprising 3 buildings with ground floor commercial space along Canterbury Road and residential development pursuant to the provisions of *SEPP (Affordable Rental Housing) 2009*.

The site is within 800 metres radial distance from Belmore Railway Station.

The site is shown in **Figure 1 Locality Plan**. The Lot numbers, D.P.'s and residential addresses are shown in **Figure 2.** The site area is **7070.13** square metres which includes all of the amalgamated lots.

1.2 Scope of Report

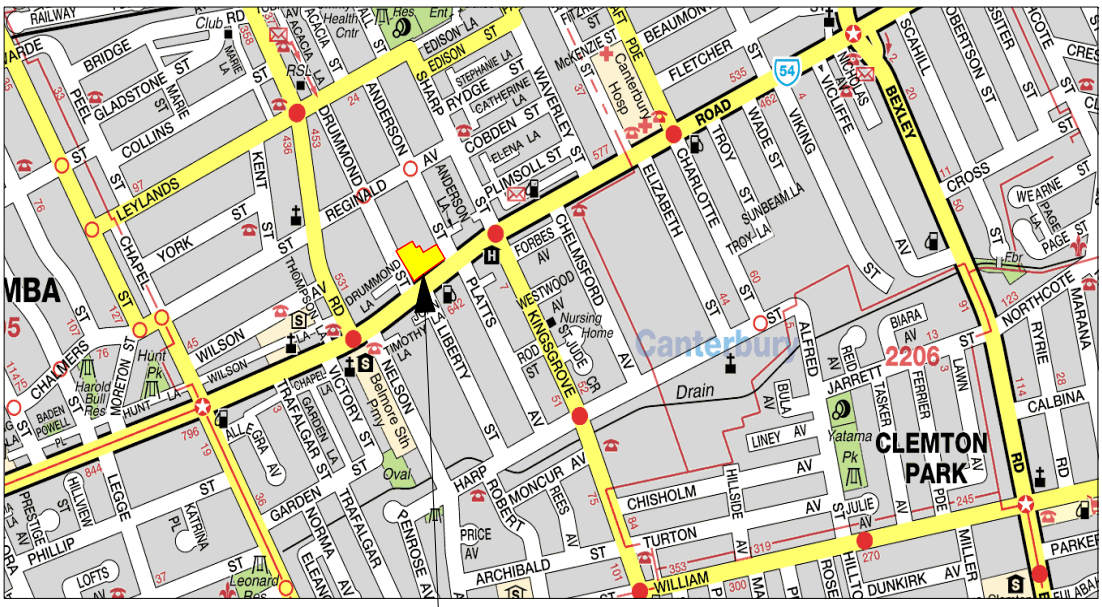
This report addresses the *traffic* and *parking issues* for the proposed Concept Plan Development.

We have also read the following Strategic documents:-

- Canterbury Council's LEP 2012.
- Canterbury Council's DCP 2012.

The tasks are estimated to be as follows:-

1. Check street inventory, road widths, turning ban restrictions on-street parking and traffic controls including surrounding road intersections.
2. Review parking provision and car parking requirements in accordance with Canterbury Council DCP. Assess bicycle parking requirements in accordance with Canterbury Council DCP.
3. Review access for MRV rigid vehicles for delivery and service vehicles.
4. Review internal circulation, swept paths at 90-degree angle bends, ramp design and parking layout.
5. SIDRA analysis of surrounding road intersections using Sidra 8.0 intersection program.
6. Assign generated traffic to the road network.
7. Prepare draft report for review.
8. Prepare final report in electronic format.



PROPOSED SITE -
677-681, 687, CANTERBURY ROAD
& 48 DRUMMOND STREET
BELMORE

SCALE 1:20000

FIGURE 1
LOCALITY MAP

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FIGURE 2: SITE PLAN- CADASTRAL PLAN

2.0 EXISTING TRAFFIC CONDITIONS

2.1 Existing Road Network

The site has a frontage of approximately **98** metres to Canterbury Road and a frontage to Drummond Street of **92.96** metres and a site frontage to Anderson Street **44.27** metres. The site is located in the Belmore Centre and has good access to bus services. The site is approximately **800** metres from the centre of the site to Belmore Railway Station.

Canterbury Road runs east/west linking Lewisham to Bankstown. It has a **60km/hr** speed limit. It is a classified Main Road **A34.** The nearest permanent *Counting Station No 24014* is located in Canterbury Road at Wiley Park east of Canarys Road. The 2012 **ADT** data was **18,000** vehicles eastbound and **19,300** westbound. The 2005 **AADT** published by the **RMS** was **37,009**.

Drummond Street is a Local road that runs north/south and has low volumes of traffic. It has 'Giveway' sign control at Canterbury Road and a 'roundabout' control at Reginald Avenue. Anderson Street also runs north/south and connects Leylands Parade and Canterbury Road. The nearest cross street is Reginald Avenue which has a 'roundabout' control and there is a Giveway sign control at Canterbury Road.

Burwood Road, is a Regional Road No 7047 and is unclassified. It is located west of the subject site and there is a signalized intersection with Canterbury Road. Burwood Road can be accessed via Reginald Avenue to the north of the site.

Kingsgrove Road is a Regional road No **7309** and runs parallel to Platts Avenue just east of Anderson Street. Kingsgrove Road has Signal control at Canterbury Road to the north and connects to the **M5** Motorway south of the subject site.

The road inventory and number of traffic lanes are illustrated in **Figure 3A**.

2.2 Road Inventory and Parking

The sign posted parking restrictions are *Clearway* restrictions on the northern and southern sides of Canterbury Road signposted **6:00-10:00am** and **3:00-7:00pm** Monday-Friday. There is a ***1****-hour parking restriction* in Anderson Street on the western side for **3** spaces directly outside the site frontage and in Drummond Street on the eastern side directly outside the site frontage there are 5 spaces.

2.3 Existing Peak Hour Traffic Volumes

Traffic Counts were made at the following intersections in *15 minute intervals* on **Tuesday 4th August 2015** from **7:30am** to **8:30am** and **5:30pm** to **6:00pm** correspond with the commuter peak hours:-

- **Drummond Street/. Canterbury Road**
- **Anderson Street / Canterbury Road**

The traffic counts are provided in **Appendix D**.

Extensive counts were undertaken at numerous intersections around the site environs on Thursday 11/12/14 as located in **Figure 3A**. The SIDRA analysis shown in Table 2.3 from Report No 1/15 is included in **Appendix C**.

The **am** peak hour was **7:15am – 8:15am** at all intersections. The **pm** peak hour was **5:00 – 6:00pm**. The *existing peak hour* count summary is shown in **Figures 3B** and **3C.**

Illegal 'right-hand turns' were recorded at the intersection of Drummond Street and Canterbury Road.

2.4 Intersection Performance

The intersections have been analysed using **SIDRA** Version 6, 2015. The traffic volumes in Drummond Street and Anderson Street near the vicinity of the site are less than 100 vehicles per AM and PM peak hour and are very low. Intersections are operating at **Level Of Service A.**

The network performance is determined by the Level of Service (**LoS**) Average Vehicle Delay (**AVD**), Degree of Saturation (**DoS**) and maximum delay on the critical movement at the intersections during peak hours. The Level of Service criteria for intersections are explained in **Table 4.2** taken from the *RTA Guide to Traffic Engineering Developments*.

Table 4.2
***(RTA Guide To Traffic Generating Developments*) Level of Service criteria for intersections.**

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	< 14	Good operation	Good operation
B	15 TO 28	Good with acceptable delays spare capacity	Acceptable delays & spare capacity
C	29 TO 42	Satisfactory	Satisfactory, but accident study required
D	43 TO 56	Operating near capacity	Near capacity & accident study required
E	57 TO 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode

The results of the analysis are set out in **Table 2.4**

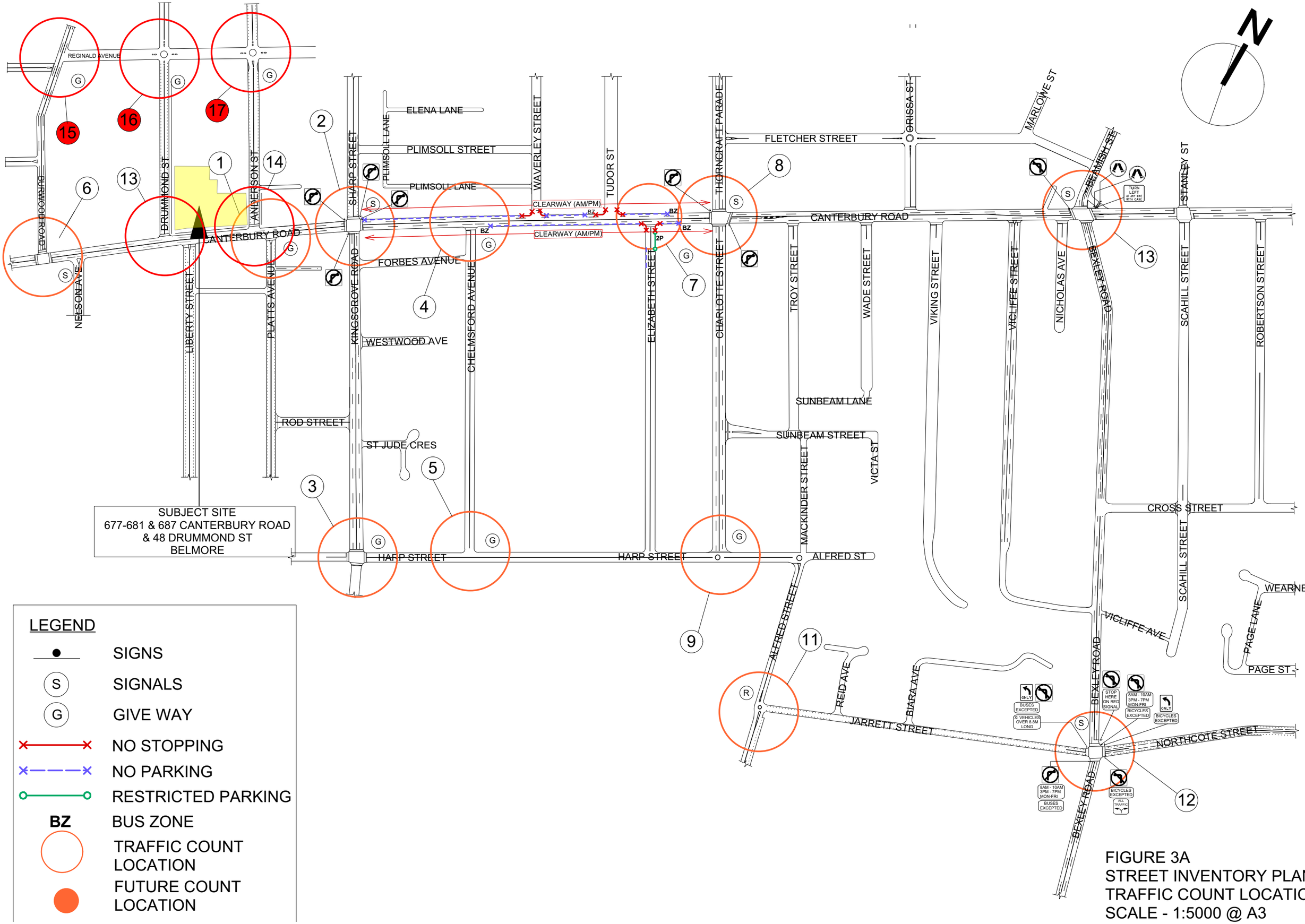
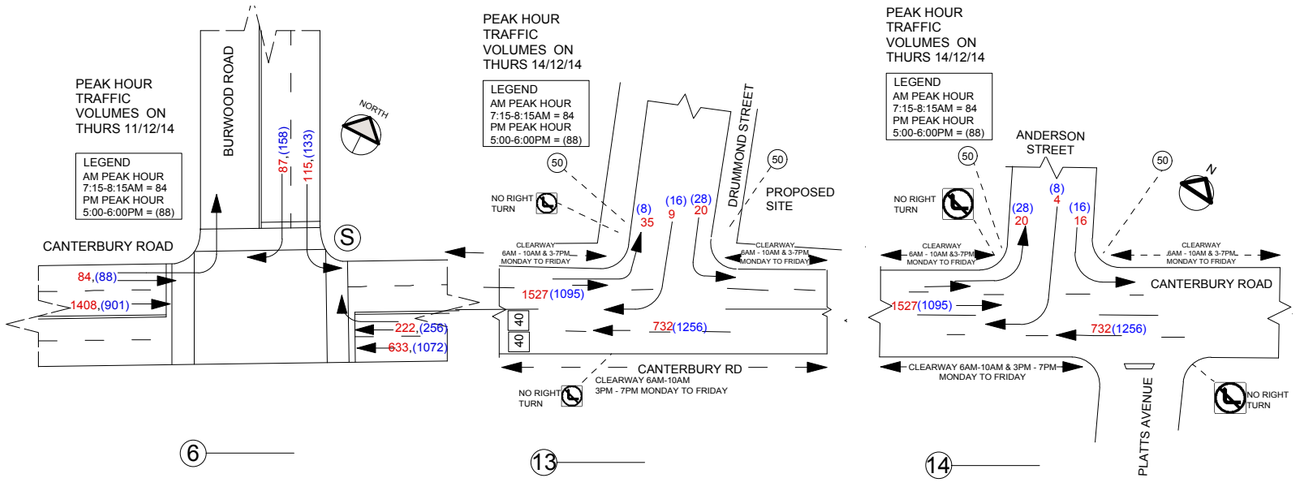


FIGURE 3A
STREET INVENTORY PLAN
TRAFFIC COUNT LOCATION
SCALE - 1:5000 @ A3



NOTE: -
REFER TO FIGURE 3C FOR CONTINUATION

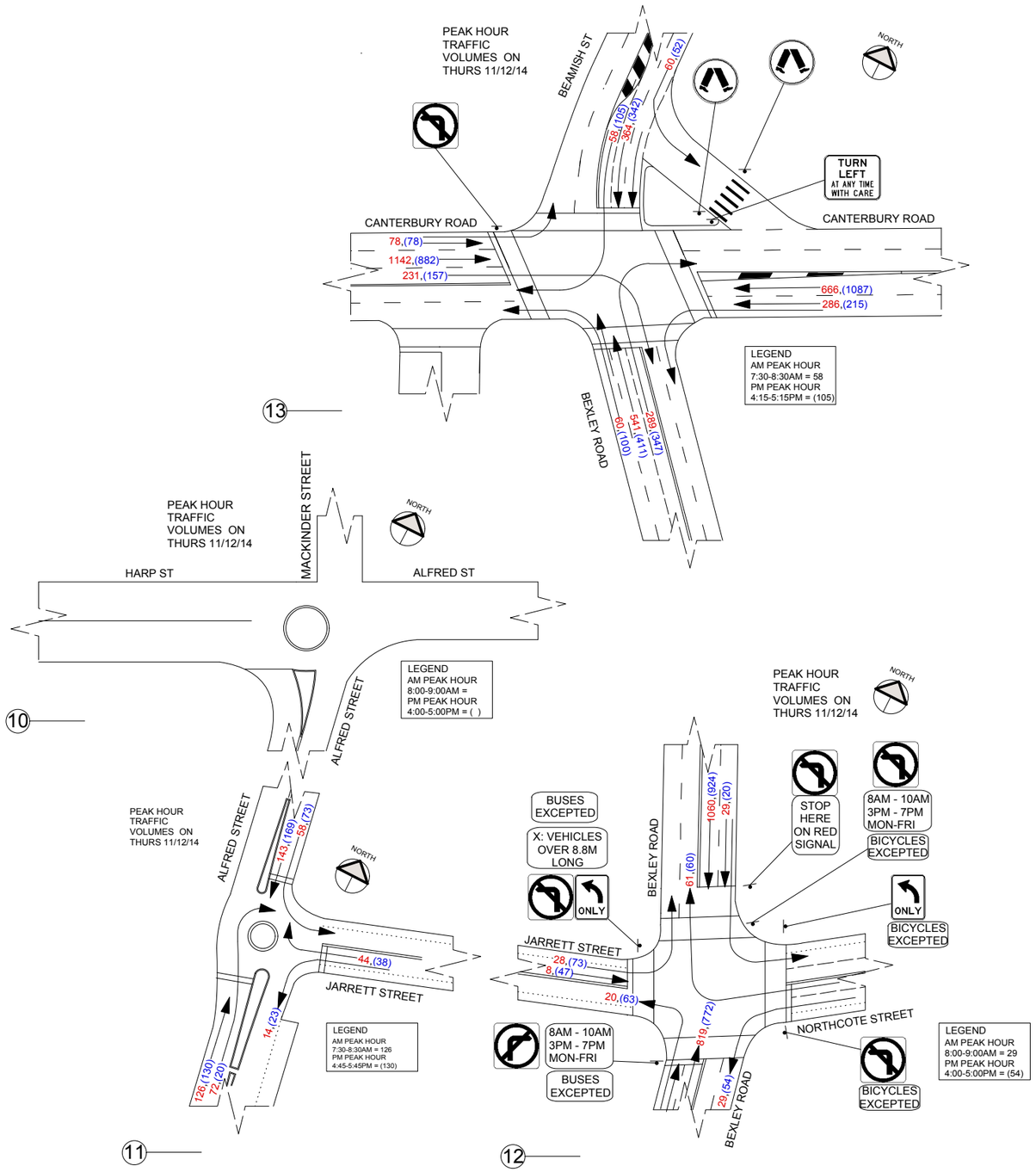
LEGEND

AM PEAK HOUR
8:00-9:00AM = 122
PM PEAK HOUR
4:00-5:00PM = (98)

(G) GIVEWAY
(S) SIGNAL

0m 10m 20m 30m 40m

FIGURE 3B
EXISTING PEAK HOUR TRAFFIC VOLUME COUNTS
SCALE - 1:1000 @ A3



NOTE: -
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FOR CONTINUATION

LEGEND

AM PEAK HOUR
8:00-9:00AM = 122
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Ⓖ GIVEWAY
Ⓢ SIGNAL

0m 10m 20m 30m 40m

FIGURE 3C
EXISTING PEAK HOUR
TRAFFIC VOLUME
COUNTS
SCALE - 1:1000 @ A3

2.4 (Continued)

Table 2.4 Intersection Performance

	Intersection	Peak Hour	Level of Service LoS	Degree of Saturation DOS	Average Delay per Veh.	Critical Movement Delay per Veh.
G	Canterbury Road/ Drummond Street	7:15am-8:15am	A (WORST B)	0.401	0.4Secs.	RHT from Drummond St into Canterbury Rd 59.7secs
		5:00pm-6:00pm	A (WORST E)	0.322	0.6Secs.	RHT from Drummond St into Canterbury Rd 68secs
G	Canterbury Road/ Anderson Street	7:15am-8:15am	A (WORST E)	0.397	0.2secs	RHT from Anderson St into Canterbury Rd 61 secs
		5:00pm-6:00pm	A (WORST E)	0.322	0.3secs	RHT from Anderson St into Canterbury Rd 59.5 secs

(1) Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.

(2) Average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.

Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.

Note: S Signals

G Give Way

2.5 Current Uses of Existing Site

The current uses are as follows:-

No. 671-677 Canterbury Rd	Vacant Sandler Shoe Shop Outlet
No. 687 Canterbury	Vacant Sandler Shoe Shop Outlet
No. 48 Drummond Street	Residential Dwelling House.

The buildings and driveways along the Canterbury Road frontage and of the subject site are shown in **Photographs P1** to **P4**

2.6 Vehicle Driveway Access to Site

There is a single driveway to No. 48 Drummond Street along the proposed northern boundary of the site. There is an existing vehicular driveway along the site boundary to No 671-677 Canterbury Road in Drummond Street and another vehicular driveway in Anderson Street **38.27 metres** from the intersection with Canterbury Road.

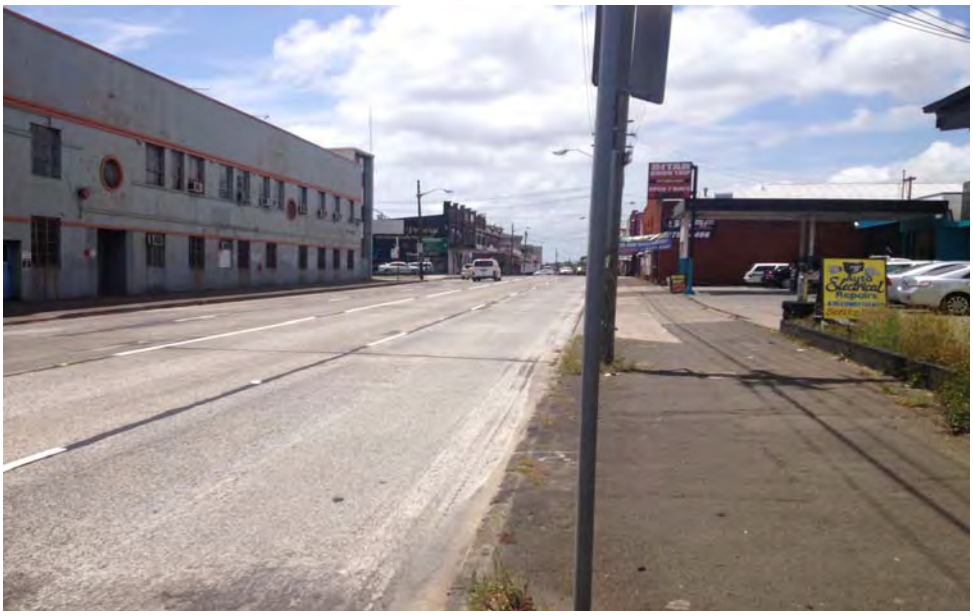


PHOTO P1 **View East along Canterbury Road towards subject site on the left Nos 677-681 Canterbury Road Belmore. Vacant Sandler Shoe Factory.**

PHOTO P2 **View West along Canterbury Road opposite subject site 677-681.**

PHOTO P3 View East along Canterbury Road outside No 687 Canterbury Road.

PHOTO P4 View South along Anderson Street towards Canterbury Road.

2.7 Public Transport

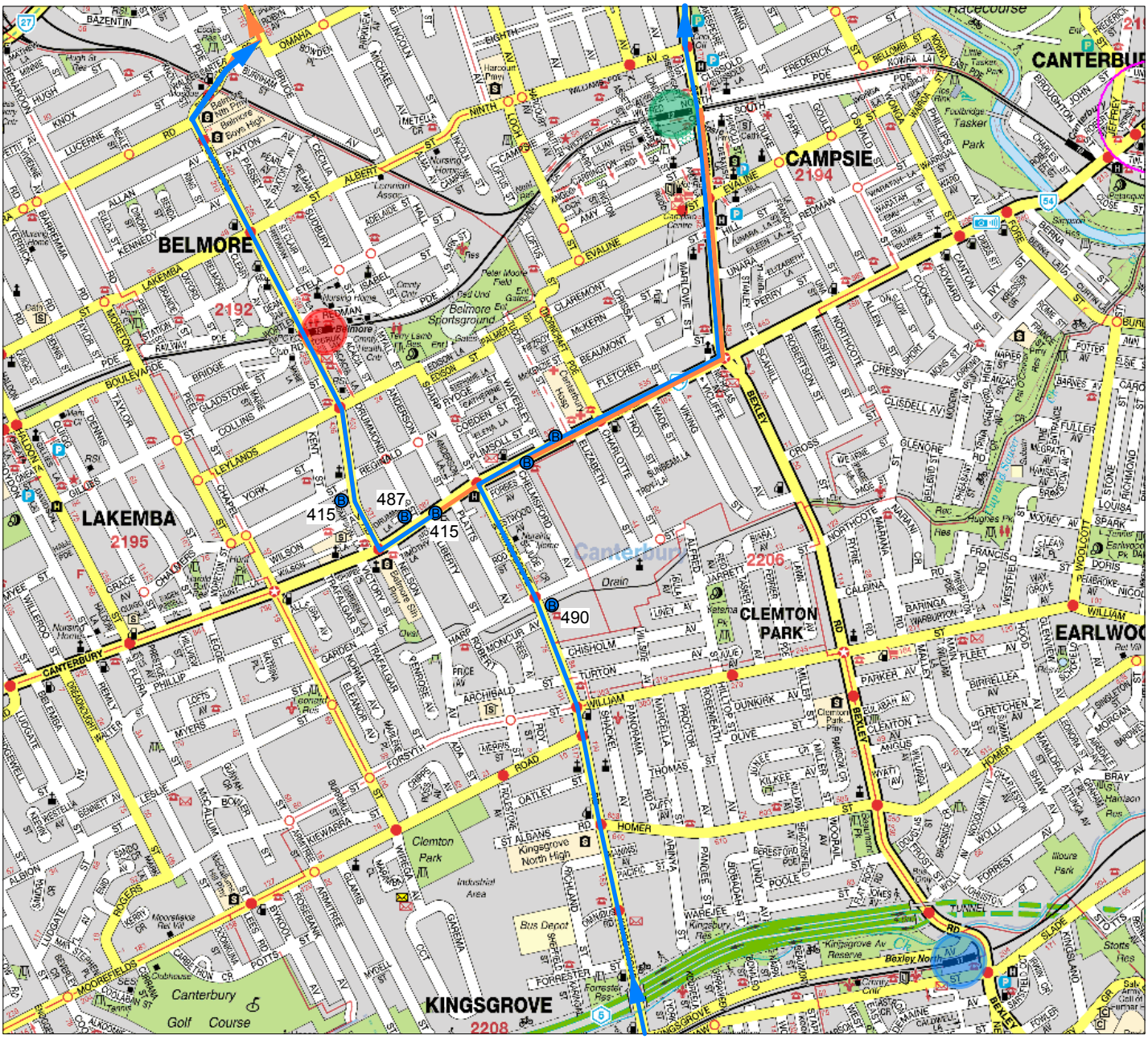
The site is well served by public transport services. Belmore Railway Station is a *14-minute walk* from the 677-681 Canterbury Road.

Diagram A: Walking Distance From 677-681 Canterbury Rd to Belmore Station. 14-minute walk.

There are **4** routes that have regular ***7****-day services* within a *15 minute* walking distance of the site. The services and Service providers are:-

Bus Service Operator	Description	Route No.	Service	Walk Time to Site.
Sydney Buses	Stop No. 219244 Kingsgrove Road near Harp Street	Route 490	Hurstville to Drummoyne	11 min.
Sydney Buses	Stop No. 219235 Canterbury Road near Drummond Street	Route 487	Canterbury to Bankstown.	1 min.
Sydney Buses	Stop No. 219215 Canterbury Road near Liberty Street	Route 415	Campsie to Chiswick	4 mins.
Sydney Buses	Stop No. 220876 William Street	423	City to Kingsgrove	15 mins.

The Public Transport Network surrounding the site is shown in **Figure 4**.



B BUS STOP

CANTERBURY ROAD TO BUS STOP 219235 (CANTERBURY ROAD NEAR DRUMMOND ST - 1MIN WALK
BUS ROUTE 487 CANTERBURY RO BANKSTOWN SERVICE

CANTERBURY ROAD TO BUS STOP 219216 (CANTERBURY ROAD NEAR LIBERTY ST - 2 MIN WALK
BUS ROUTE 415 CAMPSIE STATION TO CHISWICK SERVICE

BUS STOP 219241 (CANTERBURY RD NEAR CHELMSFORD AVE) 7 MIN WALK
BUS ROUTES TRAVEL TO BELMORE STATION 8 MIN TRIP
490 DRUMMOYNE TO HURSTVILLE
692 BEAMISH ST, CAMPSIE TO KINGSGROVE

CAMPSIE STATION

BELMORE STATION

BEXLEY NORTH STATION

N

FIGURE 4:
TRANSPORT NETWORKS
677-681, 687 CANTERBURY ROAD AND
48 DRUMMON STREET BELMORE

3.0 TRAFFIC EFFECTS OF PROPOSED DEVELOPMENT

3.1 Floor Areas and Uses

Under Division 5 of *SEPP (Affordable Rental Housing) 2009 Clause 36(2)(a*), the site Compatibility Certificate certified by the Director-General in Schedule 1 permits mixed use development comprising 3 buildings with ground floor commercial space along Canterbury Road and residential development pursuant to the provisions of *SEPP (Affordable Rental Housing) 2009*.

The gross floor areas for the business premises have been calculated. The buildings have commercial areas on the ground floor and residential building A has 7 floors of residential units and buildings, B and C have 6 floors of residential units. These areas and the number and type of each residential unit are contained in **Table 4.1**. It is understood that 50% (102) will be affordable rental housing units and 10%(20) of the total number of units will be adaptable units.

Table 4.1 Floor Areas and Uses

USE	LEVEL	Gross Floor Area M²	Gross Leasable Floor Area M²				
BUSINESS COMPONENT					.		
Building A	**Ground**	**508**					
Building B	**Ground**	**428**					
RESIDENTIAL COMPONENT				**1BR.**	**2BR.**	**3BR**	**STUDIO**
		GFA					
	LEVELS						
Building A	1-7	**NA**		30	43	6	1
Building B	1-6	**NA**		15	35	4	0
Building C	1-6	**NA**		10	32	8	0
				55	**110**	**18**	**1**

There are a total of **184** residential units. The level 1 floor plan, and sections are located in **Appendix A** of this Report.

As stated in Canterbury **DCP Part B1.2.2,** Belmore is classified as a 'Large Centre'. Parking rates for Large Centres have been used in the calculation of parking requirements.

3.2 Estimated Residential and Workforce Population

In the Canterbury Council Development Contributions Plan 2013, the number of persons per dwelling type is listed as **1.53** persons per **1** bedroom dwelling or unit, **2.4** persons per **2** bedroom unit and **3.3** persons per **3** bedroom unit.

The number of employees and *car travel mode* has been determined from reviewing the data in the *RMS TDT04/2013 and the RTA Land Use Traffic Generation Data and Analysis Reports* for Bulky Goods Developments No 18 and for Office Blocks No 1. The average rates given are shown in **Table 3.2**.

Table 3.2 Comparison Summary: Area m^2 per Employee

Facility		GFA m^2	No Of Staff Average
RMS Bulky Goods Retail RMS TDT 04a/2013 App G1			
Average		2765.9	22.6
Area m^2 per employee		122.4	
RTA Bulky Goods Retail Data and Analysis 18			
Average		2440.15	15.3
Area m2 per employee		159.49	
RMS Offices TDT 04a/2013 App D1			
Average		14470.5	645.75
Area m^2 per employee		22.4	
RTA Office Blocks Data and Analysis 1			
Average		5256	273.8
Area m^2 per employee		19.2	

For the purposes of this report as the use is not yet determined we have assumed an average rate as *1 employee per 50m^2* of *Gross Floor Area*. The car travel mode for Belmore area of **75%** is then *multiplied* by the *number of employees* to obtain the *traffic generated* by the *business premises component*.

3.3 Car Parking Requirements and Provision

3.3.1 Residential Parking

As 50% of the residential units will be affordable rental units as permitted in the site compatibility certificate under *SEPP(ARH) 2009*, it is relevant to note that in *Clause 36(4)* Car Parking is not required to be provided in relation to development to which this Division applies.

The *Canterbury Council DCP 2012* specifies parking rates for residential units in residential flat buildings and for shops, business and retail premises in the table to *Clause B1.3.1* in *Part B of DCP 2012 General Controls.*

Objective 3J-1 in the *NSW Planning and Environment Apartment Design Guide* for sites that are within 800 metres of a railway station states *"the minimum car parking requirement for residents and visitors is set out in the Guide to Traffic Generating Developments, or the car parking requirement prescribed by the relevant council, whichever is less."* The rates in the RMS Guide to Traffic Generating Developments for high density residential are lower than Canterbury Councils DCP 2012.

For this report, the relevant parking rates in Councils DCP 2012 have been adopted.

Residential car parking has been calculated in accordance with *Canterbury Development Control Plan 2012 Transport and Parking Clause B1.3.1 General Parking Rates.*

Parking has been calculated for residential car parking, as shown in **Table 3.3.1**. The required number of spaces for the *residential component* is **291** spaces.

3.3.2 Business Premises Parking

The car parking for the business premises has been calculated in accordance with **CDCP 2012 Section B1.3.1**. The definition of 'commercial premises' as described in the Canterbury LEP 2012 definitions is listed below.

3.3.2 (continued)

business premises means a building or place at/ or / on which:-

(a) an occupation, profession or trade (other than an industry) is carried on for the provision of services directly to members of the public on a regular basis, or

(b) a service is provided directly to members of the public on a regular basis, and includes a funeral home and, without limitation, premises such as banks, post offices, hairdressers, dry cleaners, travel agencies, internet access facilities, betting agencies and the like, but does not include an entertainment facility, home business, home occupation, home occupation (sex services), medical centre, restricted premises, sex services premises or veterinary hospital.

Note: Business Premises are a type of Commercial premises.

commercial premises means any of the following:

(a) business premises,
(b) office premises,
*(c) retail premises.**

Table 3.3.1 Car Parking Requirements for Mixed Use Development

Unit type/Use	Parking Rate	Unit No	No of Required Spaces
1 Bed/ STUDIO	1 space/unit	56	56
2 Bed	1.2 space/unit	110	132
3 Bed	2 space/unit	18	36
Visitor	1 space/ 5 units	184	36.8 (37)
TOTAL FOR RESIDENTIAL			**261**
		Area GFA	
Business Premises & Retail Premises	1 space/ 33m^2	936	28.36
Total for Retail			**28.36(29)**
TOTAL PARKING FOR DEVELOPMENT			**290**

As the business *premises use* has not yet been determined for the site the required number of parking spaces has been calculated using the higher car parking rate of 1 space per 33m^2 GFA, large local centres. The calculated number of spaces for the retail/ business premises component is **29** spaces.

As there are 19 adaptable units proposed, the number of parking spaces will include a shared area between each two disabled parking spaces as shown in *Figure 2.3* in *AS/NZS2890.6*. There will also be 4 disabled spaces required for visitors and 3 disabled spaces for retail which include shared areas.

3.4 Bicycle Storage Facilities

In order to encourage the use of bicycles by residents and workforce, it is proposed to provide *'bicycle storage racks/rails'* within the basement car park to encourage commuter and recreational cycling.

The storage facilities required in *Clause B1.3.1 in Canterbury Council DCP 2012 Part B Transport and Parking* are as follows:

		Bicycle rail/racks	Total
Residential	**Residents**	1 per 5 units	36.8 (37)
	Visitors	1 per 10 units	18.4 (19)
Shops, Business & Retail Staff		1 per 300m^2 GFA	3.1 (4)

3.5 Access, Internal Parking Layout and Circulation

Vehicular access is provided from Drummond Street to the Basement 01 car park under Buildings A and C and to the Basement 01 car park under Building B from Anderson Street. The driveway ramps are straight.

These ramps are 6.5 metres wide between kerbs, have 300mm wide kerbs and provide access for cars and MRV trucks. The ramp gradients comply with *Table 3.1 in AS2890.2*.

The internal ramps under Buildings A and C provide car access from Basement 01 to Basement 02. The internal ramp under Building B provides two-way access for cars from Basement 01 to Basements 02 and 03.

The number of parking spaces on Basement 01 and 02 under Buildings A and C is 176 plus a loading bay. The number of parking spaces on Basements 01, 02 and 03 under Building B is 114 plus a loading bay on B1. The class of parking is predominantly residential 1A and Drummond Street and Anderson Street are local roads. Hence a combined two-way driveway complies with Access category 2 in *Table 3.1 in AS/NZS 2890.1*.

The access driveway gradients have been checked for compliance with rates of change of grade in *Table 3.2 in AS2890.2* for an MRV design vehicle.

The residential parking bay dimensions are 2.4 metres wide by 5.4 metres long and comply with *AS/NZS2890.1*. The minimum aisle width is 5.8 metres.

The parking bay dimensions for the retail/ business parking are 2.7 metres wide by 5.4 metres long. The parking layout is conceptual and all dimensions need to be confirmed in the detail design.

3.6 Estimated Traffic Generation

The proposed building is a *high density residential flat building* in the town centre of Belmore. Based upon the traffic generation rates for the Rockdale Regional LGA Area in the ***RMS TDT 2013/04, A Guide to Traffic Generating Developments Updated Traffic Surveys*.** the residential units are expected to generate **0.32 vehicle trips** in the **AM** peak hour and **0.23 trips,** per unit in the **PM** peak hour. Based upon surveys conducted by this firm, the *directional distribution* for the residential traffic is **75% out** and **25% in** in the **am** peak hour and **67% in** and **33% out** in the **pm** peak hour.

For the business premises, the **RMS** traffic generation rates **TDT 04a/2013** for Bulky Goods Retail premises in the peak hour period is **2.46** vehicles per **100m^2 GFA**.

In the **AM** peak hour, the traffic generation by the business premises - retail will be mainly due to *staff arriving* for work. The number of retail employees is estimated to be **17,** as shown in **Table 3.6.** The **GFA** for the retail shops is **936m^2**, as shown in **Table 3.1.** A further allowance of **10%** of the **pm** peak generation has been allowed for *shoppers* in the **am** peak. The *directional distribution* assigned for retail shopper trips is **50% in** and **out** in the **pm** peak hour. The estimated traffic generation is shown in **Table 3.6**.

Table 3.6 Peak Hour Traffic Generation by Proposed Mixed Use Development.

Use	Peak Hour	Generation Rate/Unit	No.of Units	Traffic Generation		
				IN	OUT	TOTAL
Residential Units	8.00-9.00am 4.00-5.00pm	0.32 trips/hr 0.23trips/hr	184 "	14.7 28.3	44.2 14.0	58.9 42.3
Business Premises		2.46/100m^2*	936 GFA m^2			
	8.00-9.00am 4.00-5.00pm			2.3 11.5	2.3 11.5	4.6 23.0
Employees	17 8.00-9.00am			**14**	**0**	**14**
TOTAL AM PEAK				**31.0**	**46.5**	**77.5**
TOTAL PM PEAK				**39.8**	**25.5**	**65.3**

Notes:

AM Peak Hour For Residential is based on 0.25 in and 0.75 out and in the **PM** Peak Hour **0.66 IN** and **0.33 OUT**.

AM Peak Hour trips for the Business Premises is 10% **IN** and 10% **OUT** .**PM** peak hour assumes 50% **IN** and 50% **OUT**.

The number of employees is calculated as :

936/50m^{2}x 0.75 =**14.** (**75%** is the mode split for car driver for Belmore).

***** Generation rates for Bulky Goods Stores from TDT 04a/2013 App G2 weekdays.

3.7 Intersection Performance

In order to assign the 'trip distribution', to the road network, the Journey to Work data for residents and those employees commuting to Belmore have to be *reviewed* from the *JTW Explorer figures* from the *2011 Journey To Work Data*.

Table 3.7a Journey To Work in Belmore by Car Driver Employee

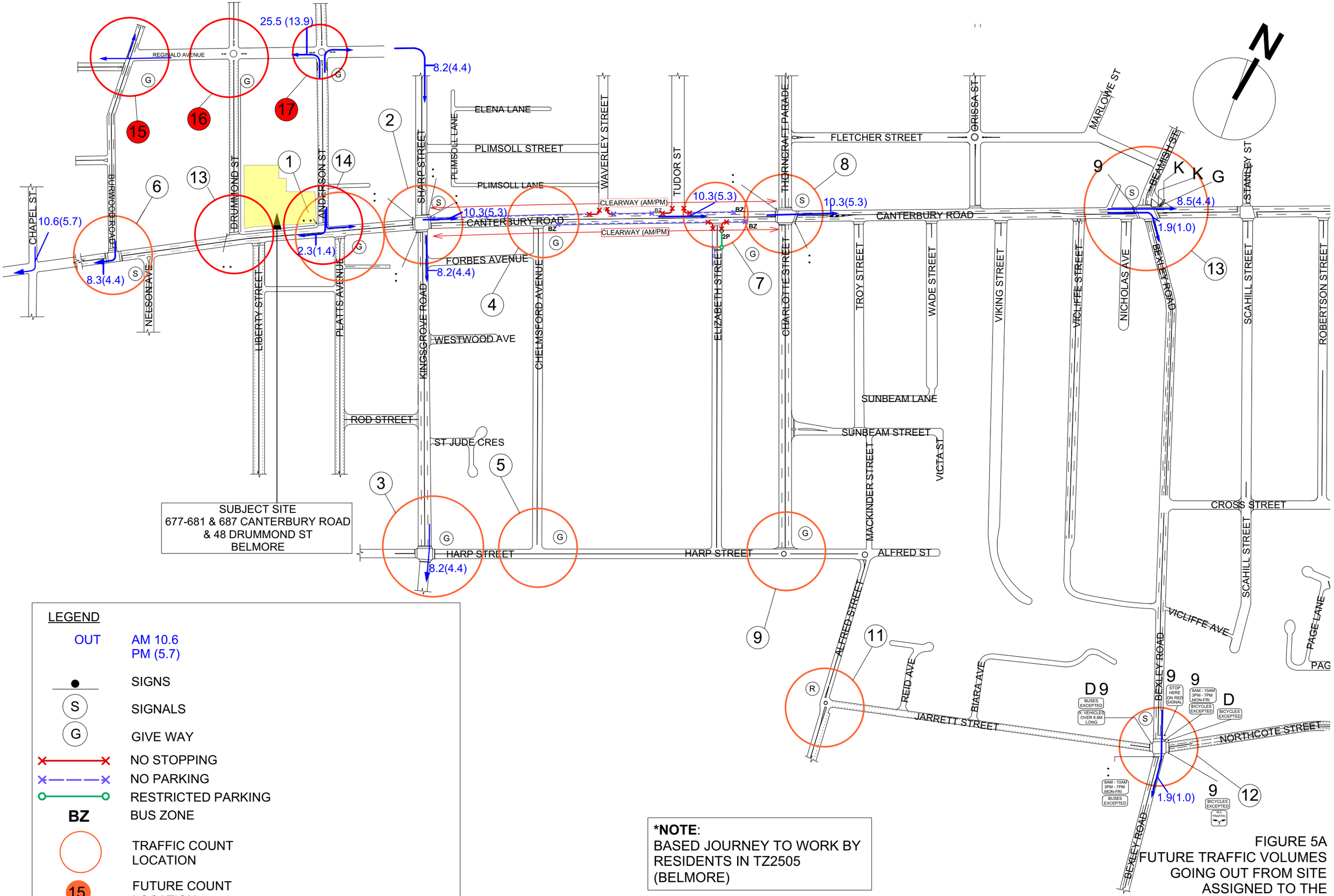
Origin SA3	Origin SA3 ID	Vehicle No	Driver %
Wyong	10202	4	1.39
Newcastle	11103	3	1.04
Baulkham Hills	11501	4	1.39
Marrickville - Sydenham - Petersham	11702	3	1.04
Sydney Inner City	11703	6	2.08
Eastern Suburbs - South	11802	3	1.04
Bankstown	11901	46	15.97
Canterbury	11902	83	28.82
Hurstville	11903	6	2.08
Kogarah - Rockdale	11904	13	4.51
Canada Bay	12001	7	2.43
Strathfield - Burwood - Ashfield	12003	29	10.07
Hornsby	12102	3	1.04
Camden	12301	3	1.04
Wollondilly	12303	3	1.04
Blue Mountains	12401	4	1.39
St Marys	12405	3	1.04
Auburn	12501	3	1.04
Parramatta	12504	9	3.12
Ryde - Hunters Hill	12602	3	1.04
Bringelly - Green Valley	12701	10	3.47
Fairfield	12702	14	4.86
Liverpool	12703	8	2.78
Cronulla - Miranda - Caringbah	12801	3	1.04
Sutherland - Menai - Heathcote	12802	9	3.12
Hervey Bay	31904	3	1.04
Tuggeranong	80107	3	1.04
Total		288	100

3.7 (continued)

Table 3.7b No of employed residents living in Belmore travelling out- Car Driver

Destination SA3	Destination SA3 Id	Vehicle No	Driver %
Baulkham Hills	11501	3	0.58
Blacktown	11601	10	1.94
Mount Druitt	11603	4	0.78
Botany	11701	26	5.05
Marrickville - Sydenham - Petersham	11702	33	6.41
Sydney Inner City	11703	45	8.74
Eastern Suburbs - North	11801	4	0.78
Eastern Suburbs - South	11802	13	2.52
Bankstown	11901	46	8.93
Canterbury	11902	103	20
Hurstville	11903	18	3.5
Kogarah - Rockdale	11904	21	4.08
Canada Bay	12001	17	3.3
Leichhardt	12002	11	2.14
Strathfield - Burwood - Ashfield	12003	47	9.13
Chatswood - Lane Cove	12101	3	0.58
North Sydney - Mosman	12104	7	1.36
Warringah	12203	6	1.17
Campbelltown (NSW)	12302	3	0.58
Auburn	12501	11	2.14
Carlingford	12502	3	0.58
Merrylands - Guildford	12503	9	1.75
Parramatta	12504	12	2.33
Ryde - Hunters Hill	12602	24	4.66
Bringelly - Green Valley	12701	3	0.58
Fairfield	12702	3	0.58
Liverpool	12703	18	3.5
Cronulla - Miranda - Caringbah	12801	6	1.17
Sutherland - Menai - Heathcote	12802	6	1.17
Total		515	100

The additional traffic volumes in the **am** and **pm** *peak hours* have been distributed to the *road network in the study area* based upon the 'turning volumes' at the intersections, shown in **Figures 5A** and **5B**.



LEGEND

OUT	AM 10.6 PM (5.7)
●	SIGNS
S	SIGNALS
G	GIVE WAY
×——×	NO STOPPING
×– – –×	NO PARKING
o——o	RESTRICTED PARKING
BZ	BUS ZONE
○	TRAFFIC COUNT LOCATION
15	FUTURE COUNT LOCATION

***NOTE**:
BASED JOURNEY TO WORK BY RESIDENTS IN TZ2505 (BELMORE)

FIGURE 5A
FUTURE TRAFFIC VOLUMES GOING OUT FROM SITE ASSIGNED TO THE ROAD NETWORK
SCALE - 1:5000 @ A3

AMENDED 14/02/19

SUBJECT SITE
677-681 & 687 CANTERBURY ROAD
& 48 DRUMMOND ST
BELMORE

LEGEND

IN	AM 18.1 PM (23.3)
●	SIGNS
S	SIGNALS
G	GIVE WAY
×——×	NO STOPPING
×– – –×	NO PARKING
o——o	RESTRICTED PARKING
BZ	BUS ZONE
○	TRAFFIC COUNT LOCATION
15	FUTURE COUNT LOCATION

***NOTE**:
DATA EMPLOYEES TRAVELLING TO TZ2505 (BELMORE)

FIGURE 5B
FUTURE TRAFFIC VOLUMES GOING TO SITE ASSIGNED TO THE ROAD NETWORK
SCALE - 1:5000 @ A3

AMENDED 14/02/19

3.7 (Continued)

Table 3.7 Intersection Performance

.

The future volumes at the intersections of Drummond Street and Anderson Street are very low and will have little effect on the intersection performance of these intersections and so they have not been modelled in SIDRA 8.0 for this report.

Future traffic impact assessment studies at Development Application Stage may include additional intersections that may be on routes used by residents. These may include the intersections of Anderson Street and Reginald Avenue and Drummond Street and Reginald Avenue as well as Reginald Avenue and Burwood Road.

All intersections within the road network can be remodeled using SIDRA 8.0 at development application stage together with known development site volumes.

3.8 Delivery / Service Vehicles

The proposed development has a gross retail floor area of **936m^2** and **184** residential units.

Based upon *Table 5.1 in the RTA Guide to Traffic Generating Developments* the number of unloading bays for business premises/ bulky goods is not specified but under other uses it is given as 1 space per 2000m^2 of GFA. The requirement for the residential units is **1 space** for every **50** units under **200** units, therefore **3.7** bays are required.

Based upon a paper prepared by J B Watters for a M Eng Sc., thesis in 1972, the *arrival rates* in Sydney suburbs from surveys were:-

Mixed small shops – 3.5 arrivals per 929m^2 GLFA (λ)

The average service rate where the driver unloads the truck only was **8.5** to **10.5** ***vehicles per hour*** **(μ).**

The estimated *arrival rate* for the retail shops of **936m^2** is **3.53 arrivals**

The total arrival rate *3.53 divided by the service rate of **10** vehicles per hour (μ) is **0.35.*** If we provide **3 spaces** in total for retail and residential. The probability of a truck having to queue is less than 1%. The majority of retail deliveries are made in the mornings before **12** noon. A Management Plan may be required so that the *residential unloading / loading requirements are carried out after the busy retail deliveries period and on weekends*.

The design has provided for **2 loading spaces for MRV vehicles.**

3.9 Alternative Green Travel Plan

It is recommended that a "Green Travel Plan" be adopted for this development to *reduce car-based travel* to encourage employees in the retail tenancies to make *greater use* of public transport, cycling, walking and car sharing for the journey to work.

The following initiatives are recommended:-

1. Bicycle storage, showers and changing facilities be provided to encourage cycling by employees and bicycle storage for residents.

2. Provide train and bus timetables to staff and residents.

3. Provide a walking map that shows walking distances to bus stops, schools, parks and local shops.

4.0 SUMMARY

- The traffic report has been prepared in support of a concept plan development application for mixed-use development comprising residential units and business premises on the ground floor. The site is zoned B6 Enterprise Corridor. There is a site compatibility certificate certified by the Director-General which permits mixed use development pursuant to the provisions of SEPP (Affordable Rental Housing) 2009.
- The site is known as Lots 1 & 2 DP 53319, Lot 91 DP 3862 Nos 677-681 Canterbury Road and Lot B DP 952115 No 687 Canterbury Road, Lot A DP 952115 No 48 Drummond Street, Belmore.
- The site has a frontage to Canterbury Road of **98** metres, a site frontage to Drummond Street of **92.96** metres and a frontage to Anderson Street of **44.27** metres. The site area is **7070.13m^2**.
- The site has vehicular access to the Basement 01 under Buildings A and C from Drummond Street and to the Basement 01 car park under Building B from Anderson Street. These ramps permit access by a MRV truck and are 6.5 metres wide between kerbs.
- The proposed development proposes **936m^2 GFA.** of 'business use' and **184 residential units.**
- The architectural drawings for the proposed development prepared by Aleksandar Design Group proposes **184** residential units with **1** studio unit, **55** one-bedroom units, **110** two-bedroom units and **18** three-bedroom units.
- 50% of the units are to be affordable rental units and 10% of the **184** units are to be adaptable.
- The car parking requirement for this site has been calculated to be **290 spaces** in accordance with **Canterbury DCP 2012**. The basement car park will have **3** levels.
- Loading docks have been provided for two Medium Rigid Truck loading spaces. The loading docks are located on Basement 01 under Buildings A and B and have a minimum head height clearance of **2.9** metres.
- The proposed traffic generation for the development is **77.5** vehicles in the AM peak hour and **65.3** vehicles in the PM peak hour.
- The **SIDRA** analysis of the existing scenario at the intersections of Canterbury Road and Drummond Street and Anderson Street and Canterbury Road shows that they were operating at Level of Service A.
- We support this rezoning application on traffic and parking grounds.

APPENDICES

APPENDIX A

677 - 687 CANTERBURY ROAD + 48 DRUMMOND STREET, BELMORE

LOT 91 DP 3862 + LOTS 1 & 2 DP 533919 + LOTS A & B DP 952115

site area	7,070	m²				
Controls			Proposed			
zone	B5					
height limit	18	m	**18 m**			
allowable fsr	n/a		**:1**		**m2**	
communal open space (ADG, min. 3m wide)	25%	1,768 m2	**1786 m2**	**25%**		
communal open space with solar access	50% of COS	884	**1117 m2**	**63%**	**of COS**	
deep soil	7%	495 m2	**1100 m2**	**16%**		
	6m min dim					

Yield: Apartments

	no. of storeys	STUDIO	1 bed	2 bed	3 bed	#	2HRS SOLAR	>15MINS	NO SOLAR	CROSS VENT	COMMERCIAL/ RETAIL GFA (m2)
BUILDING A			50m2	70-75m2	95m2						
building A L1 / ground	1	1	6	1		8	4	4	0	3	508
building A L2	1		6	7	1	14	9	4	1	9	
building A L3	1		6	7	1	14	10	3	1	9	
building A L4	1		6	7	1	14	10	3	1	9	
building A L5	1		2	7	1	10	7	2	1	7	
building A L6	1		2	7	1	10	7	2	1	7	
building A L7	1		2	7	1	10	10			10	
sub total	**7**	**1**	**30**	**43**	**6**	**80**	**71%**	**23%**	**6%**	**68%**	
		1%	***38%***	***54%***	***8%***						
BUILDING B											
building B L1 / ground	1		4	2		6	5	1		3	430
building B L2	1		3	9		12	9	2	1	8	
building B L3	1		3	9		12	9	2	1	8	
building B L4	1		1	7	2	10	7	2	1	6	
building B L5	1		3	5		8	6	2		6	
building B L6	1		1	3	2	6	6			6	
sub total	**6**		**15**	**35**	**4**	**54**	**78%**	**17%**	**6%**	**69%**	
			28%	***65%***	***7%***						
BUILDING C											
building C L1 / ground	1		2	10	2	14	10	2	2	10	
building C L2	1		2	2	2	6	2	2	2	2	
building C L3	1		2	8		10	8	2		8	
building C L4	1			6	2	8	6	2		6	
building C L5	1		2	2	2	6	5	1		6	
building C L6	1		2	4		6	6			6	
sub total	**6**		**10**	**32**	**8**	**50**	**74%**	**18%**	**8%**	**76%**	
			20%	***64%***	***16%***						
totals	**1**	**55**	**110**	**18**	**184**						**938**
percentages	***1%***	***30%***	***60%***	***10%***		**74%**	**19%**	**7%**	**71%**		**0%**

WASTE

GARBAGE GENERATION

	UNITS		GARBAGE GENERATION (L/UNIT/WEEK)	GENERATED GARBAGE (L/ WEEK)	COMPACTED GARBAGE (2:1) (L/WEEK)	NO. 660L BINS
BUILDING A						
	80		110	8800	4400	7
BUILDING B						
	54		110	5940	2970	5
BUILDING C						
	50		110	5500	2750	4
TOTAL	***184***				***TOTAL 660L BINS***	***15***

RECYCLING GENERATION

	UNITS		RECYCLING GENERATION (L/UNIT/WEEK)	GENERATED RECYCLING (L/ WEEK)		NO. 240L BINS
BUILDING A						
No. BINS	80		82.5	6600		28
BUILDING B						
No. BINS	54		82.5	4455		19
BUILDING C						
No. BINS	50		82.5	4125		17
TOTAL	***184***				***TOTAL 240L BINS***	***63***

PROVIDED PARKING SPACES

	B1	B2	B3	TOTAL
RESIDENTIAL SPACES	48	145	30	223
VISITOR SPACES	38			38
RETAIL SPACES	29			29
TOTAL SPACES	115	145	30	**290**
RES ADAPTABLE	11	8		19
VIS ADAPTABLE	4			4
RET ADAPTABLE	3			3
BICYCLE SPACES	40	20		60

REFER TO TRAFFIC CONSULTANTS REPORT FOR REQUIRED PARKING RATES

ARCHITECT

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+61 2 9361 5560 ALEKSANDARPROJECTS.COM.AU

KEY / NOTES

CLIENT: STATEWIDE PLANNING PTY LTD

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E	TRAFFIC COORDINATION	20/2/19
D	TRAFFIC COORDINATION	15/2/19
C	TRAFFIC COORDINATION	7/2/19
B	TRAFFIC COORDINATION	24/1/19
A	CLIENT REVIEW	13/11/18

TITLE: COVER PAGE + CALCULATIONS

SCALE @ A3: 1:500
DRAWN BY: JL
CHECKED BY: A3

PRELIMINARY

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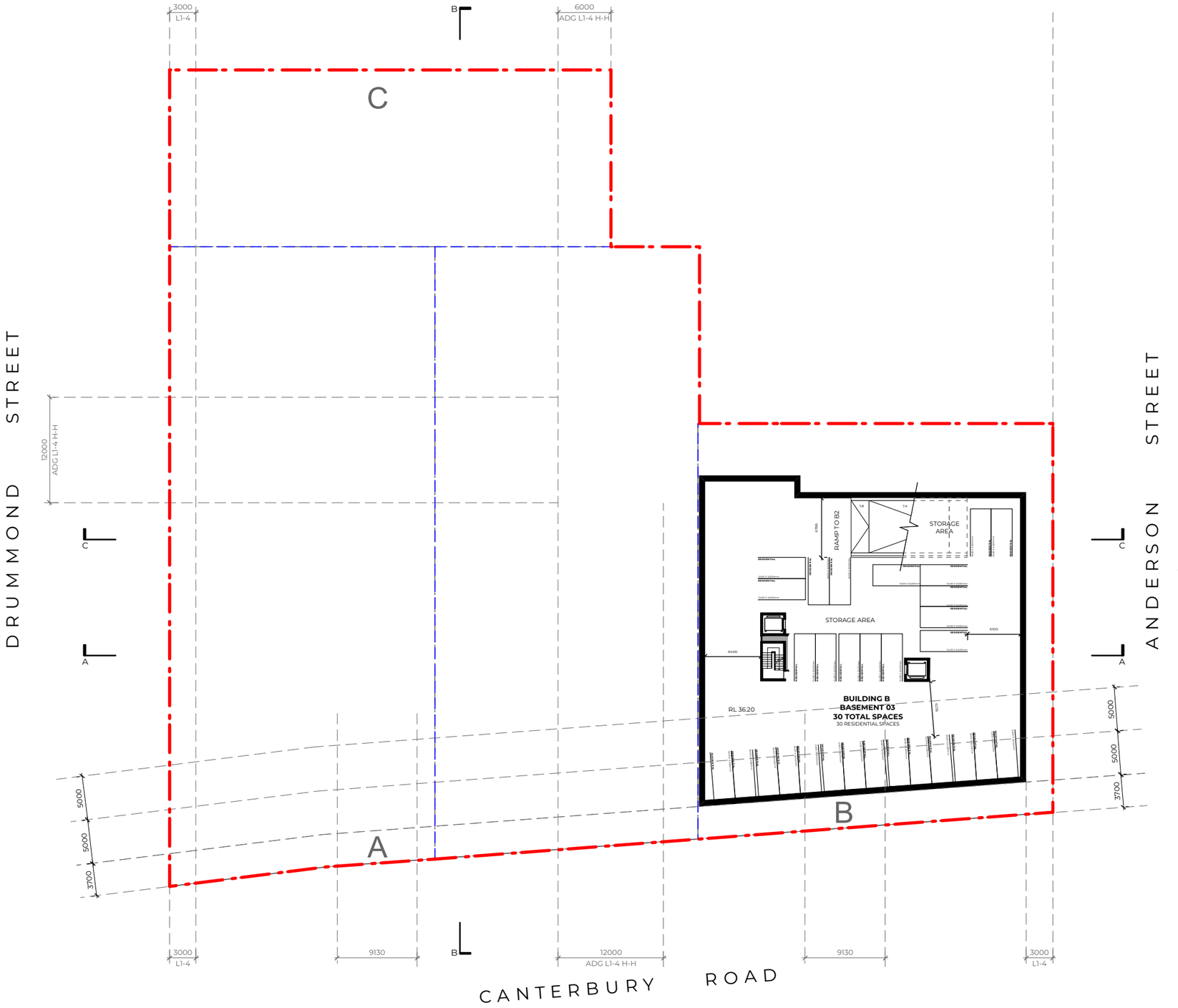
DRAWING NO. DA00

REVISION E



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A	CLIENT REVIEW	13/11/18

TITLE
BASEMENT 03

SCALE @ A3 1:500
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D	TRAFFIC COORDINATION	7/2/19
C	TRAFFIC COORDINATION	1/2/19
B	TRAFFIC COORDINATION	24/1/19

TITLE
BASEMENT 02

SCALE @ A3 1:500
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PRELIMINARY

PROJECT NO. 17011

DRAWING NO. DA04

REVISION F

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E	TRAFFIC COORDINATION	15/2/19
D	TRAFFIC COORDINATION	7/2/19
C	TRAFFIC COORDINATION	1/2/19
B	TRAFFIC COORDINATION	24/1/19

TITLE
BASEMENT 01

PRELIMINARY

PROJECT NO. 17011

DRAWING NO. DA05

REVISION F

SCALE @ A3 1:500
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C	TRAFFIC COORDINATION	1/2/19
B	TRAFFIC COORDINATION	24/1/19
A	CLIENT REVIEW	13/11/18

TITLE: LEVEL 01 FLOOR PLAN

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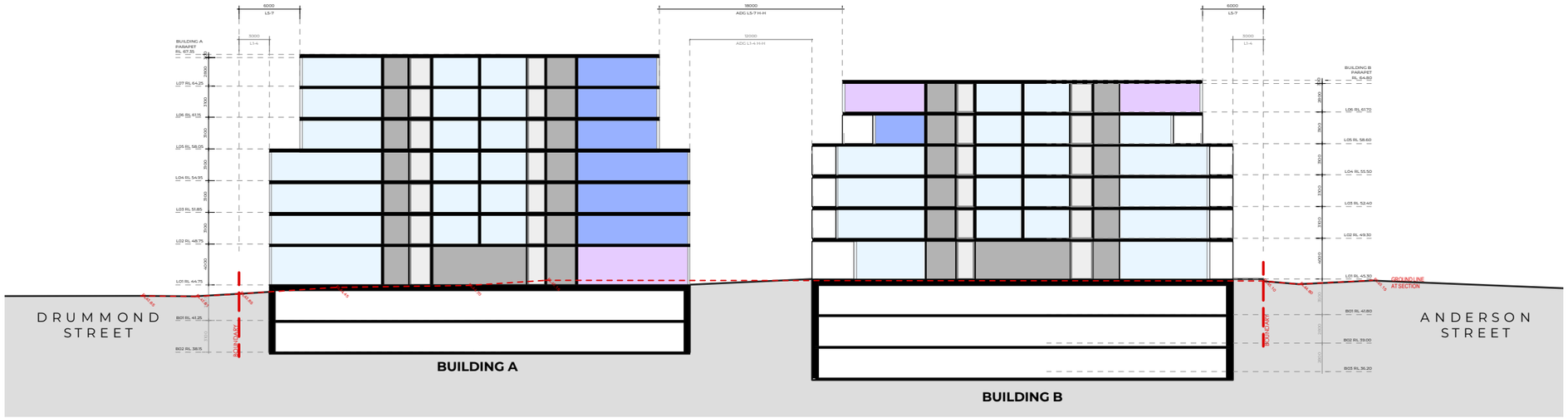
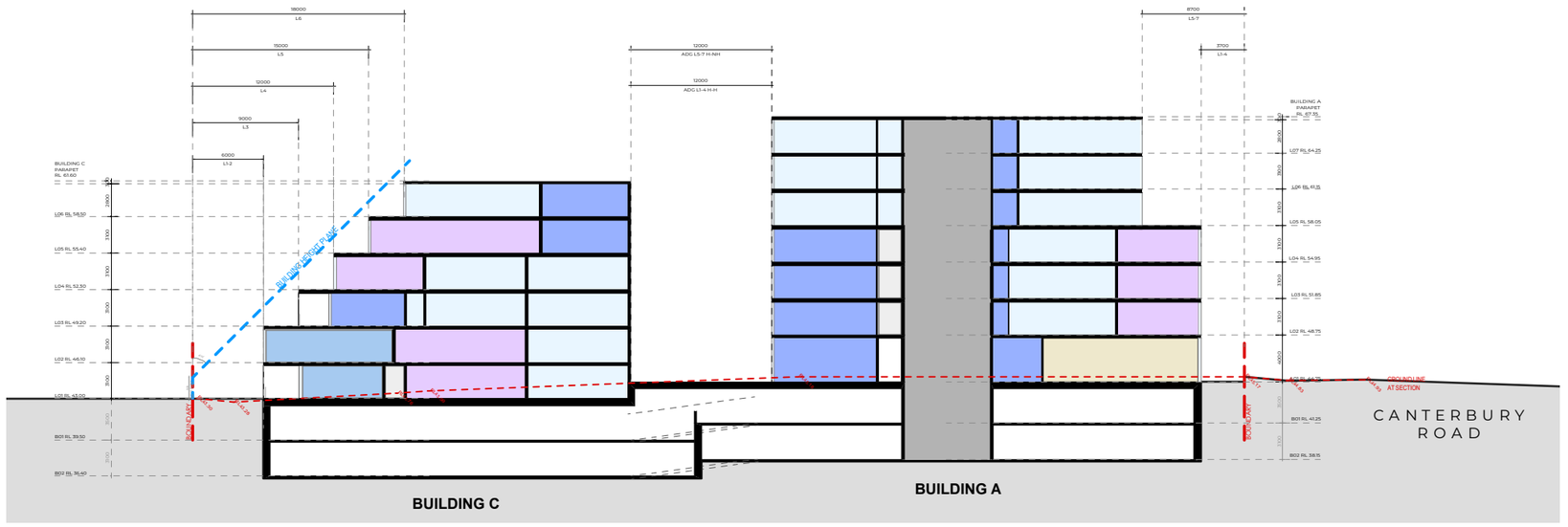


SECTION AA



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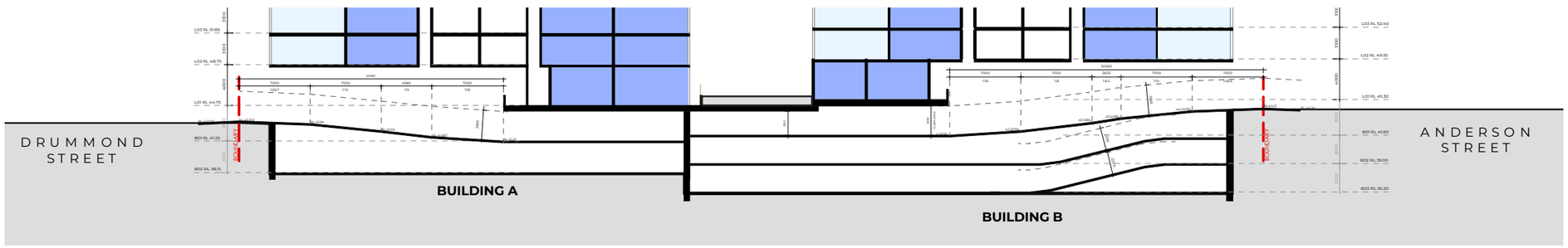

SECTION CC - ENTRY RAMP SECTION

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C	TRAFFIC COORDINATION	7/2/19
B	TRAFFIC COORDINATION	24/1/19
A	CLIENT REVIEW	13/11/18

TITLE
SECTIONS

PRELIMINARY

PROJECT NO. 17011

DRAWING NO. DA13

REVISION E

SCALE @ A3 1:500
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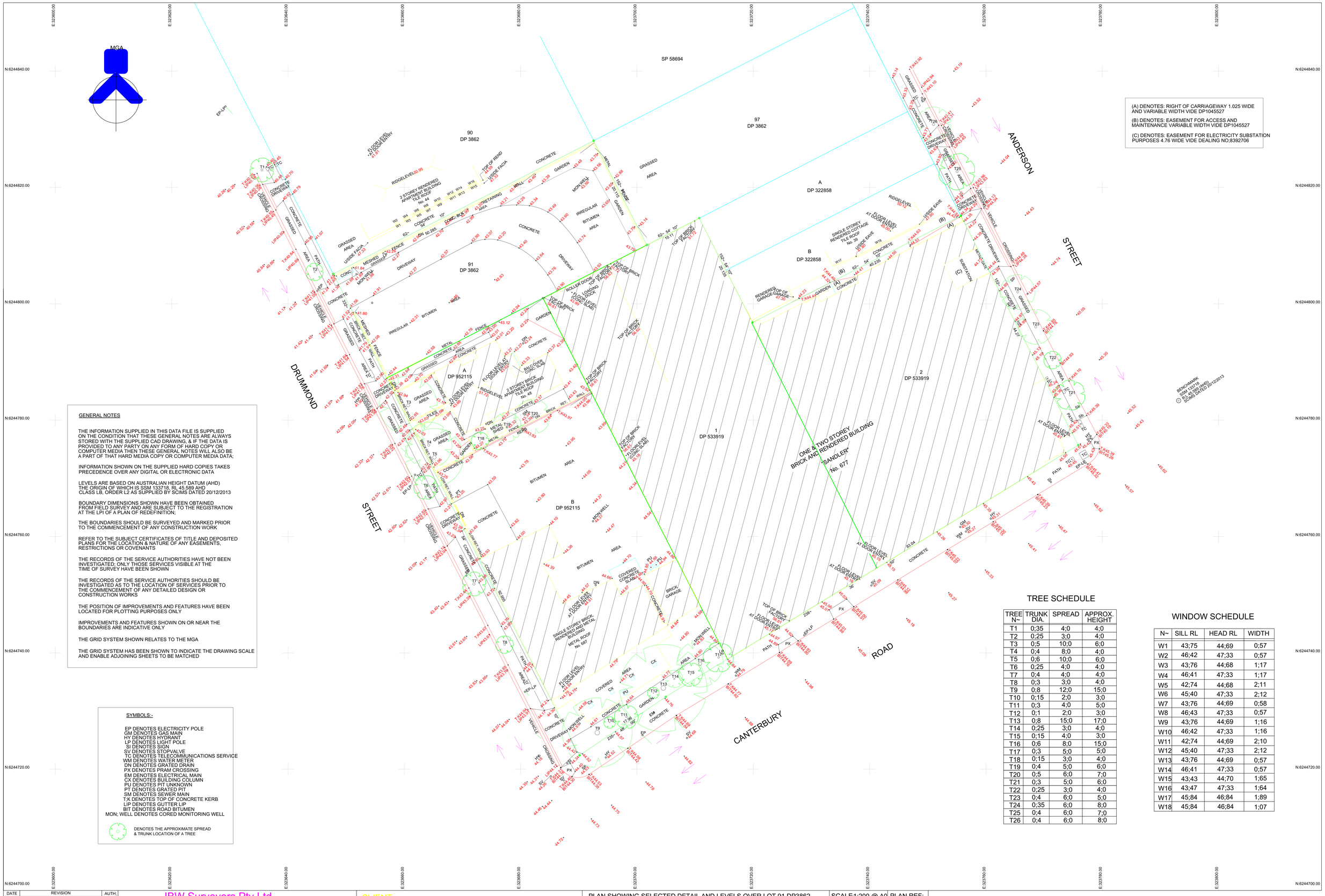
APPENDIX B



(A) DENOTES: RIGHT OF CARRIAGEWAY 1.025 WIDE AND VARIABLE WIDTH VIDE DP1045527

(B) DENOTES: EASEMENT FOR ACCESS AND MAINTENANCE VARIABLE WIDTH VIDE DP1045527

(C) DENOTES: EASEMENT FOR ELECTRICITY SUBSTATION PURPOSES 4.76 WIDE VIDE DEALING NO;8392706

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THE BOUNDARIES SHOULD BE SURVEYED AND MARKED PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION WORK

REFER TO THE SUBJECT CERTIFICATES OF TITLE AND DEPOSITED PLANS FOR THE LOCATION & NATURE OF ANY EASEMENTS, RESTRICTIONS OR COVENANTS

THE RECORDS OF THE SERVICE AUTHORITIES HAVE NOT BEEN INVESTIGATED; ONLY THOSE SERVICES VISIBLE AT THE TIME OF SURVEY HAVE BEEN SHOWN

THE RECORDS OF THE SERVICE AUTHORITIES SHOULD BE INVESTIGATED AS TO THE LOCATION OF SERVICES PRIOR TO THE COMMENCEMENT OF ANY DETAILED DESIGN OR CONSTRUCTION WORKS

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IMPROVEMENTS AND FEATURES SHOWN ON OR NEAR THE BOUNDARIES ARE INDICATIVE ONLY

THE GRID SYSTEM SHOWN RELATES TO THE MGA

THE GRID SYSTEM HAS BEEN SHOWN TO INDICATE THE DRAWING SCALE AND ENABLE ADJOINING SHEETS TO BE MATCHED

SYMBOLS:-

EP DENOTES ELECTRICITY POLE
GM DENOTES GAS MAIN
HY DENOTES HYDRANT
LP DENOTES LIGHT POLE
SI DENOTES SIGN
SV DENOTES STOPVALVE
TC DENOTES TELECOMMUNICATIONS SERVICE
WM DENOTES WATER METER
DN DENOTES GRATED DRAIN
PX DENOTES PRAM CROSSING
EM DENOTES ELECTRICAL MAIN
CX DENOTES BUILDING COLUMN
PU DENOTES PIT UNKNOWN
PT DENOTES GRATED PIT
SM DENOTES SEWER MAIN
T;K DENOTES TOP OF CONCRETE KERB
LIP DENOTES GUTTER LIP
BIT DENOTES ROAD BITUMEN
MON; WELL DENOTES CORED MONITORING WELL

DENOTES THE APPROXIMATE SPREAD & TRUNK LOCATION OF A TREE

TREE SCHEDULE

TREE N~	TRUNK DIA.	SPREAD	APPROX. HEIGHT
T1	0;35	4;0	4;0
T2	0;25	3;0	4;0
T3	0;5	10;0	6;0
T4	0;4	8;0	4;0
T5	0;6	10;0	6;0
T6	0;25	4;0	4;0
T7	0;4	4;0	4;0
T8	0;3	3;0	4;0
T9	0;8	12;0	15;0
T10	0;15	2;0	3;0
T11	0;3	4;0	5;0
T12	0;1	2;0	3;0
T13	0;8	15;0	17;0
T14	0;25	3;0	4;0
T15	0;15	4;0	3;0
T16	0;6	8;0	15;0
T17	0;3	5;0	5;0
T18	0;15	3;0	4;0
T19	0;4	5;0	6;0
T20	0;5	6;0	7;0
T21	0;3	5;0	6;0
T22	0;25	3;0	4;0
T23	0;4	6;0	5;0
T24	0;35	6;0	8;0
T25	0;4	6;0	7;0
T26	0;4	6;0	8;0

WINDOW SCHEDULE

N~	SILL RL	HEAD RL	WIDTH
W1	43;75	44;69	0;57
W2	46;42	47;33	0;57
W3	43;76	44;68	1;17
W4	46;41	47;33	1;17
W5	42;74	44;68	2;11
W6	45;40	47;33	2;12
W7	43;76	44;69	0;58
W8	46;43	47;33	0;57
W9	43;76	44;69	1;16
W10	46;42	47;33	1;16
W11	42;74	44;69	2;10
W12	45;40	47;33	2;12
W13	43;76	44;69	0;57
W14	46;41	47;33	0;57
W15	43;43	44;70	1;65
W16	43;47	47;33	1;64
W17	45;84	46;84	1;89
W18	45;84	46;84	1;07

DATE	REVISION	AUTH;

COUNCIL REF:
SUB'D; APP;:
ENGIN; APP;:

JBW Surveyors Pty Ltd.
ACN 001149373
Level 7, 376 Bay Street Brighton-Le-Sands NSW 2216
Phone: (02) 9335 9700 Fax: (02) 9556 3100
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CLIENT

CAMNIC PTY LTD

PLAN SHOWING SELECTED DETAIL AND LEVELS OVER LOT 91 DP3862, LOTS 1&2 DP533919 & LOTS A&B DP952115 KNOWN AS NO'S 677, 687 CANTERBURY ROAD & 48 DRUMMOND ST, BELMORE

LOCALITY: BELMORE

LOCAL GOVERNMENT AREA: CANTERBURY

SCALE: 1:200 @ A0

DATUM: AHD

DATE: 14/01/14

AREA: 7070m² (TOT; BY SURVEY)

PLAN REF;: 124825/D&L

DESIGNED: JSS

DRAWN: JSS

APPENDIX C

Table 2.3 Sidra intersection Summary Table

No	Location	Sign/ Control	Peak Hour	Level Of Service LoS	Degree of Saturation DoS	Average Delay Av	Critical Movement
1	Platts Ave/ Canterbury Road	G	AM	A	0.412	0.4	LHT from Platts Ave 12.6 secs
1	Platts Ave/ Canterbury Road	G	PM	A	0.342	0.7	LHT from Platts Ave 29.6 secs
2	Canterbury Road/ Kingsgrove Road	S	AM	D	0.898	55.1	South Approach from RHT from Kingsgrove Rd 91.6 secs
2	Canterbury Road/ Kingsgrove Road	S	PM	C	1.22	40.8	South Approach RHT from Kingsgrove Road 62.7 secs
3	Kingsgrove Road Harp Street	S	AM	A	0.737	13.2	Harp St – East Approach LHT 29 secs
3	Kingsgrove Road Harp Street	S	PM	B	0.883	19.5	Harp St – East Approach LHT – 25.8 secs
4	Canterbury Road/ Chelmsford Road	G	AM	A	0.932	6.1	RHT From South Approach Chelmsford 604 secs
4	Canterbury Road/ Chelmsford Road	G	PM	A	1.0	8.5	RHT from Chelmsford Ave 1081.3 secs
5	Chelmsford Road/ Harp Street	G	AM	A	0.189	1.8	RHT from North Approach in Chelmsford 17.2 secs
5	Chelmsford Road/ Harp Street	G	PM	A	0.239	1.9	RHT from North Approach in Chelmsford 21.9 secs
6	Canterbury Road/ Burwood Rd	S	AM	B	0.836	26.2	North Approach Burwood Rd RHT 54.8 secs
6	Canterbury Road/ Burwood Rd	S	PM	B	0.804	24.1	North Approach Burwood Rd RHT 45.3 secs
7	Canterbury Road/ Elizabeth Street	G	AM	A*	1.0	7.0	South Approach Elizabeth St RHT 62 secs
7	Canterbury Road/ Elizabeth Street	G	PM	A*	1.0	8.6	South Approach Elizabeth St RHT 61 secs.

NOTE
S = SIGNALS
G = GIVEWAY
R = ROUNDABOUT

NOTE *
LEVEL OF SERVICE F FOR RHT MOVEMENT IN ELIZABETH STREET. ALSO RHT TURN INTO ELIZABETH STREET FROM CANTERBURY ROAD ALSO OPERATING AT LoS D IN PM PEAK HOUR.

No L	ocation	Sign/ Control	Peak Hour	Level Of Service LoS	Degree of Saturation DoS	Average Delay Av	Critical Movement
8	Canterbury Road/ Thorncraft Parade/ Charlotte Street	S	AM	C	0.859	34.6	RHT South Approach Charlotte St 68.4 secs
8	Thorncraft Parade/ Canterbury Road/ Charlotte Street	S	PM	C	0.860	31.2	RHT South Approach Charlotte St 56.0 secs
9	Charlotte Street/ Harp Street	R	AM	A	0.308	9.9	East Approach Harp St RHT 12.3 secs
9	Charlotte Street/ Harp Street	R	PM	B	0.413	10.2	East Approach Harp St RHT 13.5 secs
11	Alfred/ Jarrett Street	R	AM	A	0.174	8.6	East Approach Jarrett St RHT 11.7 secs
11	Alfred/ Jarrett Street	R	PM	A	0.177	8.0	East Approach Jarrett St RHT 11.9 secs
12	Bexley Road/Jarrett Street/ Northcote Street	S	AM	B	0.74	19.8	RHT From East Approach Northcote St 37.5 secs
12	Bexley Road/Jarrett Street/ Northcote Street	S	PM	B	0.68	20.3	RHT From East Approach Northcote St 35.1 secs
13	Canterbury Road/ Beamish Street/ Bexley Rd	S	AM	D	0.85	97.6	West Approach RHT From Canterbury Rd 72.1 secs
13	Canterbury Road/ Beamish Street/ Bexley Rd	S	PM	E	0.971	67.4	West Approach RHT From Canterbury Rd 107.6 secs

NOTE
S = SIGNALS
G = GIVEWAY
R = ROUNDABOUT
Item 10 is omitted.

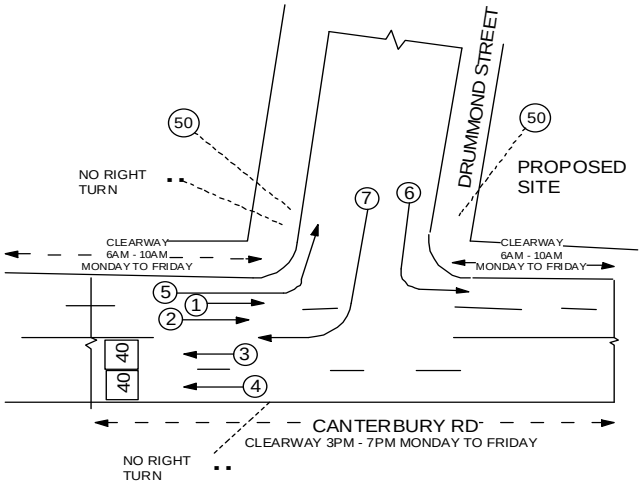
APPENDIX D

Lyle Marshall & Associates
PHONE 9953 2599

INTERSECTION:

TRAFFIC VOLUME COUNT

Canterbury Road/Drummond Street



Time	MOVEME							NRT
	1	2	3	4	5	6	7	8
7.00AM TO 7.15AM	436		136		4	5	0	
7.15AM TO 7.30AM	409		173		4	5	0	2
7.30AM TO 7.45AM	419		192		0	4	0	2
7.45AM TO 8.00AM	372		182		3	3	0	3
8.00AM TO 8.15AM	327		185		8	8	0	2
8.15AM TO 8.30AM	328		193		4	5	0	2
8.30AM TO 8.45AM	321		189		4	5	0	2
8.45AM TO 9.00AM	376		173		4	5	0	2

Notes

Counts undertaken during AMPeak Hour Period 7:30am to 8:15AM on Tues 4/8/15

Counts from Surveys undertek on 6/11/14 along Canterbury Road Platts Avenue East of Subject Site

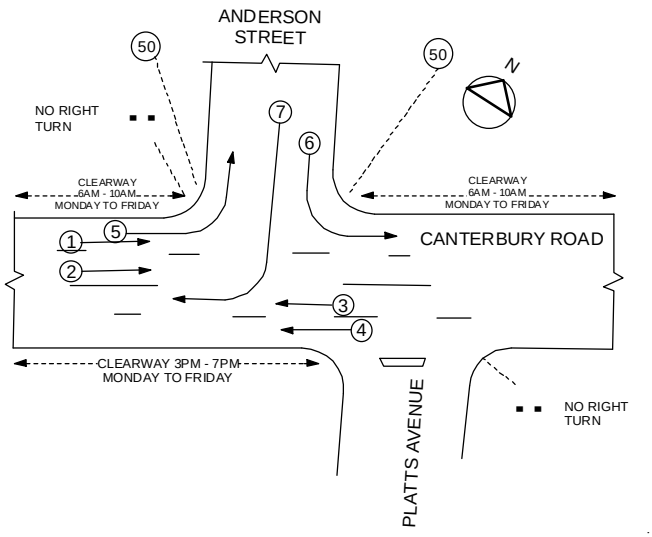
Time	1	2	3	4	5	6	7	8
7:00-8:00am	1636		683		28	17	7	7
7:15-8:15am	1527		732		35	20	9	9
7:30-8:30am	1446		752		35	20	9	9
7:45-8:45am	1348		749		40	21	9	9
8:00-9:00am	1352		740		43	23	8	8

Lyle Marshall & Associates
PHONE 9953 2599

INTERSECTION:

TRAFFIC VOLUME COUNT

Canterbury Road/Anderson Street



Time	MOVEMENT NUMBER							NRT
	1	2	3	4	5	6	7	8
7.00AM TO 7.15AM	436		136		2	3	1	0
7.15AM TO 7.30AM	409		173		2	3	1	0
7.30AM TO 7.45AM	419		192		2	3	1	0
7.45AM TO 8.00AM	372		182		2	3	1	0
8.00AM TO 8.15AM	327		185		2	3	1	0
8.15AM TO 8.30AM	328		193		3	3	0	0
8.30AM TO 8.45AM	321		189		1	2	1	0
8.45AM TO 9.00AM	376		173		1	4	1	0

Notes

Counts undertaken during AMPeak Hour Period 7:30am to 8:15AM on Tues 4/8/15

Counts from Surveys undertek on 6/11/14 along Canterbury Road Platts Avenue East of Subject Site

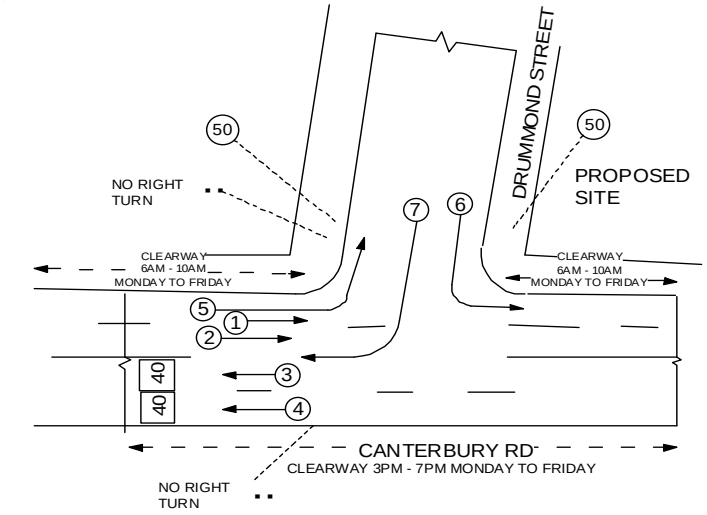
Time	1	2	3	4	5	6	7	8
7:00-8:00am	1636		683		20	16	4	0
7:15-8:15am	1527		732		20	16	4	0
7:30-8:30am	1446		752		21	15	3	0
7:45-8:45am	1348		749		19	14	3	0
8:00-9:00am	1352		740		19	15	3	0

Lyle Marshall & Associates
PHONE 9953 2599

INTERSECTION:

TRAFFIC VOLUME COUNT

Canterbury Road/Drummond Street



Time	MOVEMENT NUMBER						
	1	2	3	4	5	6	7
4.00PM TO 4.15PM	244		350		2	7	4
4.15PM TO 4.30PM	245		325		2	7	4
4.30PM TO 4.45PM	251		304		2	7	4
4.45PM TO 5.00PM	252		329		2	7	4
5.00PM TO 5.15PM	292		305		2	7	4
5.15PM TO 5.30PM	267		340		2	7	4
5.30PM TO 5.45PM	282		274		2	7	4
5.45PM TO 6.00PM	254		337		2	7	4

Counts undertaken of turning movements in Anderson Street on 4/5/15

Notes

Counts undertaken during PM Peak Hour Period 5:30PM to 5:45PM

Counts from Surveys undertek on 6/11/14 along Canterbury Road Platts Avenue East of Subject Site

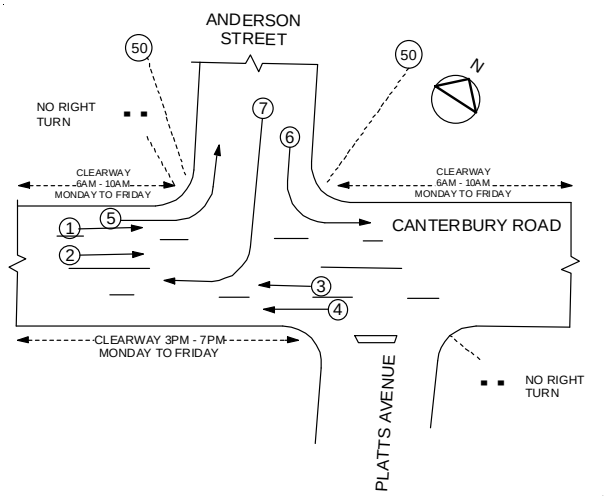
Time	1	2	3	4	5	6	7
4:00-4:15pm		992		1308	8	28	16
4:15-4:30pm		1040		1263	8	28	16
4:30-4:45pm		1062		1278	8	28	16
4:45-5:45pm		1093		1248	8	28	16
5:00-6:00pm		1095		1256	8	28	16

Lyle Marshall & Associates
PHONE 9953 2599

INTERSECTION:

TRAFFIC VOLUME COUNT

Canterbury Road/Anderson Street



Time	MOVEMENT NUMBER						
	1	2	3	4	5	6	7
4.00PM TO 4.15PM	244		350		7	4	2
4.15PM TO 4.30PM	245		325		7	4	2
4.30PM TO 4.45PM	251		304		7	4	2
4.45PM TO 5.00PM	252		329		7	4	2
5.00PM TO 5.15PM	292		305		7	4	2
5.15PM TO 5.30PM	267		340		7	4	2
5.30PM TO 5.45PM	282		274		7	4	2
5.45PM TO 6.00PM	254		337		7	4	2

Counts undertaken of turning movements in Anderson Street on 4/5/15

Notes

Counts undertaken during PM Peak Hour Period 5:30PM to 5:45PM

Counts from Surveys undertek on 6/11/14 along Canterbury Road Platts Avenue East of Subject Site

Time	1	2	3	4	5	6	7
4:00-5:00pm	992		1308		28	16	8
4:15-5:15pm	1040		1263		28	16	8
4:30-5:30pm	1062		1278		28	16	8
4:45-5:45pm	1093		1248		28	16	8
5:00-6:00pm	1095		1256		28	16	8

APPENDIX E

Site: EX-CANTERBURY ROAD-DRUMMOND STREET AM

EX-CANTERBURY ROAD-DRUMMOND STREET
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: CANTERBURY ROAD E											
2	T1	732	0.0	0.188	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		732	0.0	0.188	0.0	NA	0.0	0.0	0.00	0.00	60.0
North: DRUMMOND STREET											
4	L2	20	0.0	0.040	10.1	LOS A	0.1	1.0	0.59	0.75	46.3
6	R2	9	0.0	0.143	59.7	LOS E	0.4	2.8	0.95	0.98	28.3
Approach		29	0.0	0.143	25.5	LOS B	0.4	2.8	0.70	0.82	38.7
West: CANTERBURY ROAD W											
7	L2	35	0.0	0.401	5.5	LOS A	0.0	0.0	0.00	0.03	58.0
8	T1	1527	0.0	0.401	0.0	LOS A	0.0	0.0	0.00	0.01	59.8
Approach		1562	0.0	0.401	0.2	NA	0.0	0.0	0.00	0.01	59.7
All Vehicles		2323	0.0	0.401	0.4	NA	0.4	2.8	0.01	0.02	59.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: EX-CANTERBURY ROAD-DRUMMOND STREET PM

EX-CANTERBURY ROAD-DRUMMOND STREET
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: CANTERBURY ROAD E											
2	T1	1256	0.0	0.322	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		1256	0.0	0.322	0.0	NA	0.0	0.0	0.00	0.00	59.9
North: DRUMMOND STREET											
4	L2	28	0.0	0.042	7.9	LOS A	0.2	1.1	0.51	0.66	47.7
6	R2	16	0.0	0.258	68.0	LOS E	0.7	5.1	0.96	1.00	26.6
Approach		44	0.0	0.258	29.7	LOS C	0.7	5.1	0.67	0.79	37.0
West: CANTERBURY ROAD W											
7	L2	8	0.0	0.283	5.5	LOS A	0.0	0.0	0.00	0.01	58.2
8	T1	1095	0.0	0.283	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		1103	0.0	0.283	0.1	NA	0.0	0.0	0.00	0.00	59.9
All Vehicles		2403	0.0	0.322	0.6	NA	0.7	5.1	0.01	0.02	59.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: EX-ANDERSON STREET-CANTERBURY ROAD AM

EX-ANDERSON STREET-CANTERBURY ROAD
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: CANTERBURY ROAD E											
5	T1	732	0.0	0.188	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		732	0.0	0.188	0.0	NA	0.0	0.0	0.00	0.00	60.0
North: ANDERSON STREET											
7	L2	16	0.0	0.033	10.3	LOS A	0.1	0.8	0.61	0.76	46.2
9	R2	4	0.0	0.067	61.0	LOS E	0.2	1.3	0.95	0.98	28.1
Approach		20	0.0	0.067	20.5	LOS B	0.2	1.3	0.68	0.80	40.9
West: CANTERBURY ROAD W											
10	L2	20	0.0	0.397	5.5	LOS A	0.0	0.0	0.00	0.02	58.1
11	T1	1527	0.0	0.397	0.0	LOS A	0.0	0.0	0.00	0.01	59.8
Approach		1547	0.0	0.397	0.1	NA	0.0	0.0	0.00	0.01	59.8
All Vehicles		2299	0.0	0.397	0.2	NA	0.2	1.3	0.01	0.01	59.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: LYLE MARSHALL & ASSOCIATES PTY LTD | Processed: Thursday, 6 August 2015 11:15:23 AM
Project: Z:\LMA Jobs\SIDRA\1150-15\EX-CANTERBURY ROAD-DRUMMON STREET.sip6

MOVEMENT SUMMARY

Site: EX-ANDERSON STREET-CANTERBURY ROAD PM

EX-ANDERSON STREET-CANTERBURY ROAD
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: CANTERBURY ROAD E											
5	T1	1256	0.0	0.322	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		1256	0.0	0.322	0.0	NA	0.0	0.0	0.00	0.00	59.9
North: ANDERSON STREET											
7	L2	16	0.0	0.024	7.8	LOS A	0.1	0.6	0.50	0.65	47.7
9	R2	8	0.0	0.129	59.5	LOS E	0.4	2.5	0.95	0.98	28.4
Approach		24	0.0	0.129	25.0	LOS B	0.4	2.5	0.65	0.76	38.9
West: CANTERBURY ROAD W											
10	L2	28	0.0	0.288	5.5	LOS A	0.0	0.0	0.00	0.03	58.1
11	T1	1095	0.0	0.288	0.0	LOS A	0.0	0.0	0.00	0.01	59.8
Approach		1123	0.0	0.288	0.2	NA	0.0	0.0	0.00	0.01	59.8
All Vehicles		2403	0.0	0.322	0.3	NA	0.4	2.5	0.01	0.01	59.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: Z:\LMA Jobs\SIDRA\1150-15\EX-CANTERBURY ROAD-DRUMMON STREET.sip6

MOVEMENT SUMMARY

INTERSECTION SUMMARY

Site: EX-CANTERBURY ROAD-DRUMMOND STREET AM

EX-CANTERBURY ROAD-DRUMMOND STREET
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	Vehicles		Persons	
Travel Speed (Average)	59.4	km/h	59.4	km/h
Travel Distance (Total)	2353.8	veh-km/h	2824.6	pers-km/h
Travel Time (Total)	39.6	veh-h/h	47.6	pers-h/h
Demand Flows (Total)	2323	veh/h	2788	pers/h
Percent Heavy Vehicles (Demand)	0.0	%		
Degree of Saturation	0.401			
Practical Spare Capacity	144.4	%		
Effective Intersection Capacity	5794	veh/h		
Control Delay (Total)	0.26	veh-h/h	0.31	pers-h/h
Control Delay (Average)	0.4	sec	0.4	sec
Control Delay (Worst Lane)	59.7	sec		
Control Delay (Worst Movement)	59.7	sec	59.7	sec
Geometric Delay (Average)	0.1	sec		
Stop-Line Delay (Average)	0.3	sec		
Idling Time (Average)	0.2	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.4	veh		
95% Back of Queue - Distance (Worst Lane)	2.8	m		
Queue Storage Ratio (Worst Lane)	0.00			
Total Effective Stops	45	veh/h	54	pers/h
Effective Stop Rate	0.02	per veh	0.02	per pers
Proportion Queued	0.01		0.01	
Performance Index	40.1		40.1	
Cost (Total)	822.97	$/h	822.97	$/h
Fuel Consumption (Total)	134.9	L/h		
Carbon Dioxide (Total)	316.9	kg/h		
Hydrocarbons (Total)	0.023	kg/h		
Carbon Monoxide (Total)	0.412	kg/h		
NOx (Total)	0.062	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values				
Performance Measure	Vehicles		Persons	
Demand Flows (Total)	1,115,040	veh/y	1,338,048	pers/y
Delay	124	veh-h/y	149	pers-h/y
Effective Stops	21,433	veh/y	25,720	pers/y
Travel Distance	1,129,825	veh-km/y	1,355,790	pers-km/y
Travel Time	19,020	veh-h/y	22,824	pers-h/y
Cost	395,025	$/y	395,025	$/y
Fuel Consumption	64,729	L/y		
Carbon Dioxide	152,114	kg/y		
Hydrocarbons	11	kg/y		
Carbon Monoxide	198	kg/y		
NOx	30	kg/y		

INTERSECTION SUMMARY

Site: EX-CANTERBURY ROAD-DRUMMOND STREET PM

EX-CANTERBURY ROAD-DRUMMOND STREET
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	Vehicles		Persons	
Travel Speed (Average)	59.2	km/h	59.2	km/h
Travel Distance (Total)	2434.8	veh-km/h	2921.8	pers-km/h
Travel Time (Total)	41.1	veh-h/h	49.3	pers-h/h
Demand Flows (Total)	2403	veh/h	2884	pers/h
Percent Heavy Vehicles (Demand)	0.0	%		
Degree of Saturation	0.322			
Practical Spare Capacity	204.3	%		
Effective Intersection Capacity	7462	veh/h		
Control Delay (Total)	0.38	veh-h/h	0.45	pers-h/h
Control Delay (Average)	0.6	sec	0.6	sec
Control Delay (Worst Lane)	68.0	sec		
Control Delay (Worst Movement)	68.0	sec	68.0	sec
Geometric Delay (Average)	0.1	sec		
Stop-Line Delay (Average)	0.5	sec		
Idling Time (Average)	0.4	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.7	veh		
95% Back of Queue - Distance (Worst Lane)	5.1	m		
Queue Storage Ratio (Worst Lane)	0.00			
Total Effective Stops	39	veh/h	47	pers/h
Effective Stop Rate	0.02	per veh	0.02	per pers
Proportion Queued	0.01		0.01	
Performance Index	41.7		41.7	
Cost (Total)	853.88	$/h	853.88	$/h
Fuel Consumption (Total)	139.4	L/h		
Carbon Dioxide (Total)	327.5	kg/h		
Hydrocarbons (Total)	0.024	kg/h		
Carbon Monoxide (Total)	0.426	kg/h		
NOx (Total)	0.064	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values				
Performance Measure	Vehicles		Persons	
Demand Flows (Total)	1,153,440	veh/y	1,384,128	pers/y
Delay	180	veh-h/y	216	pers-h/y
Effective Stops	18,909	veh/y	22,691	pers/y
Travel Distance	1,168,709	veh-km/y	1,402,451	pers-km/y
Travel Time	19,730	veh-h/y	23,676	pers-h/y
Cost	409,861	$/y	409,861	$/y
Fuel Consumption	66,895	L/y		
Carbon Dioxide	157,204	kg/y		
Hydrocarbons	11	kg/y		
Carbon Monoxide	204	kg/y		
NOx	31	kg/y		

INTERSECTION SUMMARY

Site: EX-ANDERSON STREET-CANTERBURY ROAD AM

EX-ANDERSON STREET-CANTERBURY ROAD
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	Vehicles		Persons	
Travel Speed (Average)	59.6	km/h	59.6	km/h
Travel Distance (Total)	2329.4	veh-km/h	2795.3	pers-km/h
Travel Time (Total)	39.1	veh-h/h	46.9	pers-h/h
Demand Flows (Total)	2299	veh/h	2759	pers/h
Percent Heavy Vehicles (Demand)	0.0	%		
Degree of Saturation	0.397			
Practical Spare Capacity	146.9	%		
Effective Intersection Capacity	5792	veh/h		
Control Delay (Total)	0.14	veh-h/h	0.17	pers-h/h
Control Delay (Average)	0.2	sec	0.2	sec
Control Delay (Worst Lane)	61.0	sec		
Control Delay (Worst Movement)	61.0	sec	61.0	sec
Geometric Delay (Average)	0.1	sec		
Stop-Line Delay (Average)	0.1	sec		
Idling Time (Average)	0.1	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.2	veh		
95% Back of Queue - Distance (Worst Lane)	1.3	m		
Queue Storage Ratio (Worst Lane)	0.00			
Total Effective Stops	28	veh/h	34	pers/h
Effective Stop Rate	0.01	per veh	0.01	per pers
Proportion Queued	0.01		0.01	
Performance Index	39.3		39.3	
Cost (Total)	807.62	$/h	807.62	$/h
Fuel Consumption (Total)	132.8	L/h		
Carbon Dioxide (Total)	312.0	kg/h		
Hydrocarbons (Total)	0.023	kg/h		
Carbon Monoxide (Total)	0.407	kg/h		
NOx (Total)	0.061	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values				
Performance Measure	Vehicles		Persons	
Demand Flows (Total)	1,103,520	veh/y	1,324,224	pers/y
Delay	69	veh-h/y	83	pers-h/y
Effective Stops	13,431	veh/y	16,118	pers/y
Travel Distance	1,118,130	veh-km/y	1,341,756	pers-km/y
Travel Time	18,756	veh-h/y	22,508	pers-h/y
Cost	387,657	$/y	387,657	$/y
Fuel Consumption	63,735	L/y		
Carbon Dioxide	149,777	kg/y		
Hydrocarbons	11	kg/y		
Carbon Monoxide	195	kg/y		
NOx	29	kg/y		

INTERSECTION SUMMARY

Site: EX-ANDERSON STREET-CANTERBURY ROAD PM

EX-ANDERSON STREET-CANTERBURY ROAD
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	Vehicles		Persons	
Travel Speed (Average)	59.5	km/h	59.5	km/h
Travel Distance (Total)	2434.8	veh-km/h	2921.8	pers-km/h
Travel Time (Total)	40.9	veh-h/h	49.1	pers-h/h
Demand Flows (Total)	2403	veh/h	2884	pers/h
Percent Heavy Vehicles (Demand)	0.0	%		
Degree of Saturation	0.322			
Practical Spare Capacity	204.3	%		
Effective Intersection Capacity	7462	veh/h		
Control Delay (Total)	0.21	veh-h/h	0.25	pers-h/h
Control Delay (Average)	0.3	sec	0.3	sec
Control Delay (Worst Lane)	59.5	sec		
Control Delay (Worst Movement)	59.5	sec	59.5	sec
Geometric Delay (Average)	0.1	sec		
Stop-Line Delay (Average)	0.2	sec		
Idling Time (Average)	0.2	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.4	veh		
95% Back of Queue - Distance (Worst Lane)	2.5	m		
Queue Storage Ratio (Worst Lane)	0.00			
Total Effective Stops	35	veh/h	42	pers/h
Effective Stop Rate	0.01	per veh	0.01	per pers
Proportion Queued	0.01		0.01	
Performance Index	41.2		41.2	
Cost (Total)	847.25	$/h	847.25	$/h
Fuel Consumption (Total)	139.1	L/h		
Carbon Dioxide (Total)	326.9	kg/h		
Hydrocarbons (Total)	0.024	kg/h		
Carbon Monoxide (Total)	0.426	kg/h		
NOx (Total)	0.064	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values				
Performance Measure	Vehicles		Persons	
Demand Flows (Total)	1,153,440	veh/y	1,384,128	pers/y
Delay	101	veh-h/y	121	pers-h/y
Effective Stops	16,760	veh/y	20,113	pers/y
Travel Distance	1,168,718	veh-km/y	1,402,462	pers-km/y
Travel Time	19,634	veh-h/y	23,561	pers-h/y
Cost	406,680	$/y	406,680	$/y
Fuel Consumption	66,764	L/y		
Carbon Dioxide	156,895	kg/y		
Hydrocarbons	11	kg/y		
Carbon Monoxide	204	kg/y		
NOx	31	kg/y		