166-176 St Andrews Road, Varroville
Macarthur Memorial Park
Transport Impact Assessment

Client //	Catholic Metropolitan Cemeteries Trust (CMCT)
Office //	NSW
Reference //	16S1032000
Date //	07/10/15

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Issue: A 07/10/15

Client: Catholic Metropolitan Cemeteries Trust (CMCT)
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GTA Consultants Office: NSW

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
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GTAconsultants
Melbourne | Sydney | Brisbane
Canberra | Adelaide | Perth
Gold Coast | Townsville

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1. Introduction

1.1 Background

It is understood that a planning proposal is being prepared at the site located at 166-176 St Andrews Road, Varroville. The planning proposal seeks to enable cemetery development on the site as an additional permitted use under the existing and draft LEP land use zoning.

The NSW Department of Planning Environment issued a Gateway Determination to proceed on 19 June 2015. The determination contained 13 conditions. Condition 6 requires additional traffic assessment and is reproduced below:

"6. Prior to exhibition, an assessment of the capacity of the local roads and the need for any upgrading must be undertaken, having regard to the traffic generation patterns of a cemetery. This traffic study should be undertaken in consultation with Roads and Maritime Services and Transport for NSW."

GTA Consultants was commissioned by Catholic Metropolitan Cemeteries Trust (CMCT) to undertake a transport impact assessment for the proposed development.

1.2 Purpose of this Report

This report sets out an assessment of the anticipated transport implications of the proposed development, including consideration of the following:

i existing traffic and parking conditions surrounding the site
ii suitability of the proposed parking in terms of supply (quantum) and layout
iii service vehicle requirements
iv pedestrian and bicycle requirements
v the traffic generating characteristics of the proposed development
vi suitability of the proposed access arrangements for the site
vii the transport impact of the development proposal on the surrounding road network.

1.3 References

In preparing this report, reference has been made to the following:

- an inspection of the site and its surrounds
- Campbelltown City Council Development Control Plan (DCP)2014
- Australian Standard/ New Zealand Standard, Parking Facilities, Part 1: Off-Street Car Parking AS/NZS 2890.1:2004
- Australian Standard, Parking Facilities, Part 2: Off-Street Commercial Vehicle Facilities AS 2890.2:2002
- Australian Standard / New Zealand Standard, Parking Facilities, Part 6: Off-Street Parking for People with Disabilities AS/NZS 2890.6:2009
- traffic and car parking surveys undertaken by Tracsis as referenced in the context of this report
- other documents and data as referenced in this report.

2. Existing Conditions

The subject site is located at 166-176 St Andrews Road, Varroville. The entire site of approximately 113.27ha has a frontage of 2100m to 800m St Andrews Road/Hume Highway.

The surrounding properties predominantly include environmental management uses.

The location of the subject site and its surrounding environs is shown in Figure 2.1.

Figure 2.1: Subject Site and Its Environs

2.1 Road Network

St Andrews Road

St Andrews Road is classified as a local road and in the vicinity of the site is aligned in a north east direction. It is a two-way road configured with a single-lane, 8 metre wide carriageway, set within an approximate 20 metre wide road reserve. Kerbside parking is not permitted.

South of the site on the southern end of St Andrews Road the speed limit is 60km/hr which changes to 40km/hr at a shared school zone near the roundabout controlled intersection of Spitfire Drive. The speed limit along St Andrews Road within the vicinity of the site is 70km/hr.

Spitfire Drive

Spitfire Drive is classified as a local road and in the vicinity of the site is aligned in an east-west direction. It is a two-way road configured with a single-lane, 10 metre wide carriageway, set within an approximate 20 metre wide road reserve. Kerbside parking is not permitted.

The speed limit along Spitfire Drive is 40km/hr as it is within a shared zone of a school.

2.1.1 Surrounding Intersections

The following intersections currently exist in the vicinity of the site:

- St Andrews Road/Spitfire Drive (Roundabout-Control)
- St Andrews Road/St James Road (Priority-Control).

2.2 Traffic Volumes

GTA Consultants commissioned traffic movement counts on key roads, specifically St Andrews Road and Spitfire Drive, in the vicinity of the site on 18 August 2015 during the following peak periods:

- 7:00am and 9:30am
- 2:30pm and 6:30pm.

The AM and PM peak hour traffic volumes are summarised in Figure 2.2 and Figure 2.3 with full results contained in Appendix A.

Figure 2.2: Existing AM Peak Hour Traffic Volumes

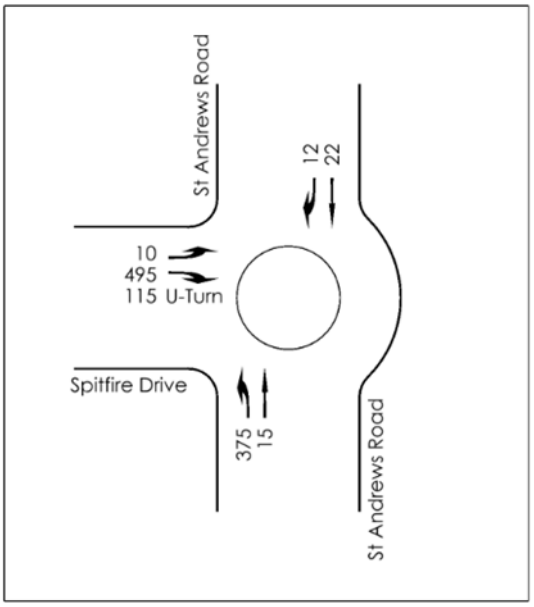
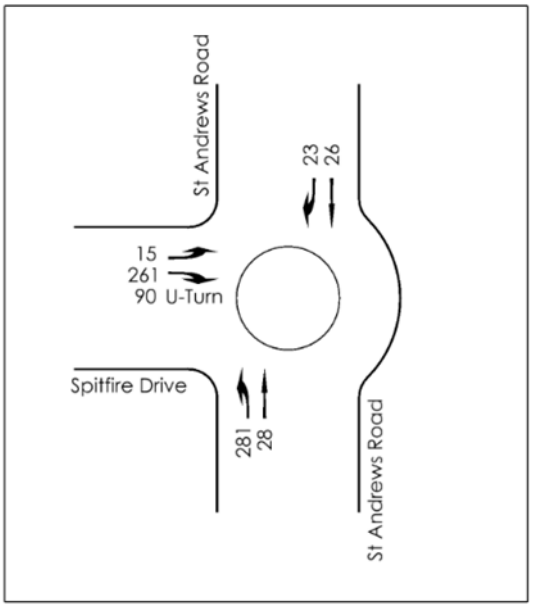


Figure 2.3: Existing PM Peak Hour Traffic Volumes



2.3 Intersection Operation

The operation of the key intersections within the study area have been assessed using SIDRA INTERSECTION[1], a computer based modelling package which calculates intersection performance.

The commonly used measure of intersection performance, as defined by the RMS, is vehicle delay. SIDRA INTERSECTION determines the average delay that vehicles encounter and provides a measure of the level of service.

Table 2.1 shows the criteria that SIDRA INTERSECTION adopts in assessing the level of service.

Table 2.1: SIDRA INTERSECTION Level of Service Criteria

Level of Service (LOS)	Average Delay per vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Sign
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Near capacity	Near capacity, accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

Table 2.2 presents a summary of the existing operation of the intersection, with full results presented in Appendix B of this report.

[1] Program used under license from Akcelik & Associates Pty Ltd.

Table 2.2: Existing Operating Conditions

Intersection	Peak	Leg	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
St Andrews Road/ Spitfire Drive	AM	South: St Andrews Road	0.34	6	15	A
		North: St Andrews Road	0.05	12	2	A
		West: Spitfire Drive	0.42	10	23	A
		Overall	**0.42**	**12**	**23**	**A**
	PM	South: St Andrews Road	0.27	6	12	A
		North: St Andrews Road	0.06	10	2	A
		West: Spitfire Drive	0.27	10	12	A
		Overall	**0.27**	**10**	**12**	**A**

On the basis of the above assessment, it is clear that the intersection of St Andrews Road/ Spitfire Drive currently operates well with minimal queues and delays on all approaches.

2.4 Public Transport

Bus services in the vicinity of the site are more than 850m walking distance. The closest bus stop is at St Andrews Road/Midlothian Road services run twice during the morning peak and once off peak.

The closet train service is Minto Railway Station on the T2 Inner West & South Line, more than 3km walking distance located southeast of the site. Services to the City run every10-25 minutes during peak and 30 minutes off peak.

2.5 Pedestrian & Cycle Infrastructure

No pedestrian or cycle facilities are provided along the site's frontages.

Safe crossing points in vicinity of the site include the following pedestrian crossings:

- St Andrews Road/Spitfire Drive intersection

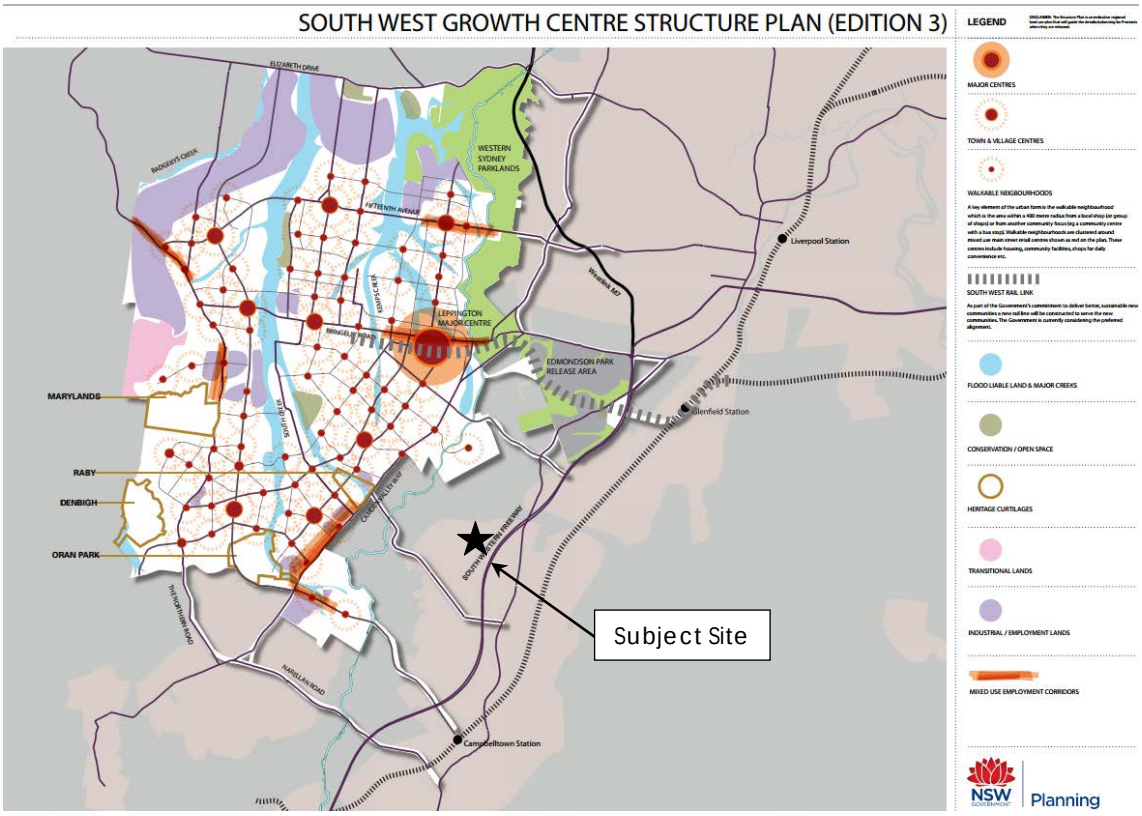
A 2m wide cycle lane is located along both sides of Spitfire Drive.

2.6 South West Growth Centre

Neighbouring the catchment area is the proposed South West Growth Centre (SWGC). This is expected to significantly increase the population within the Campbelltown, Liverpool and Camden areas. Currently Edmondson Park and Leppington have had land released.

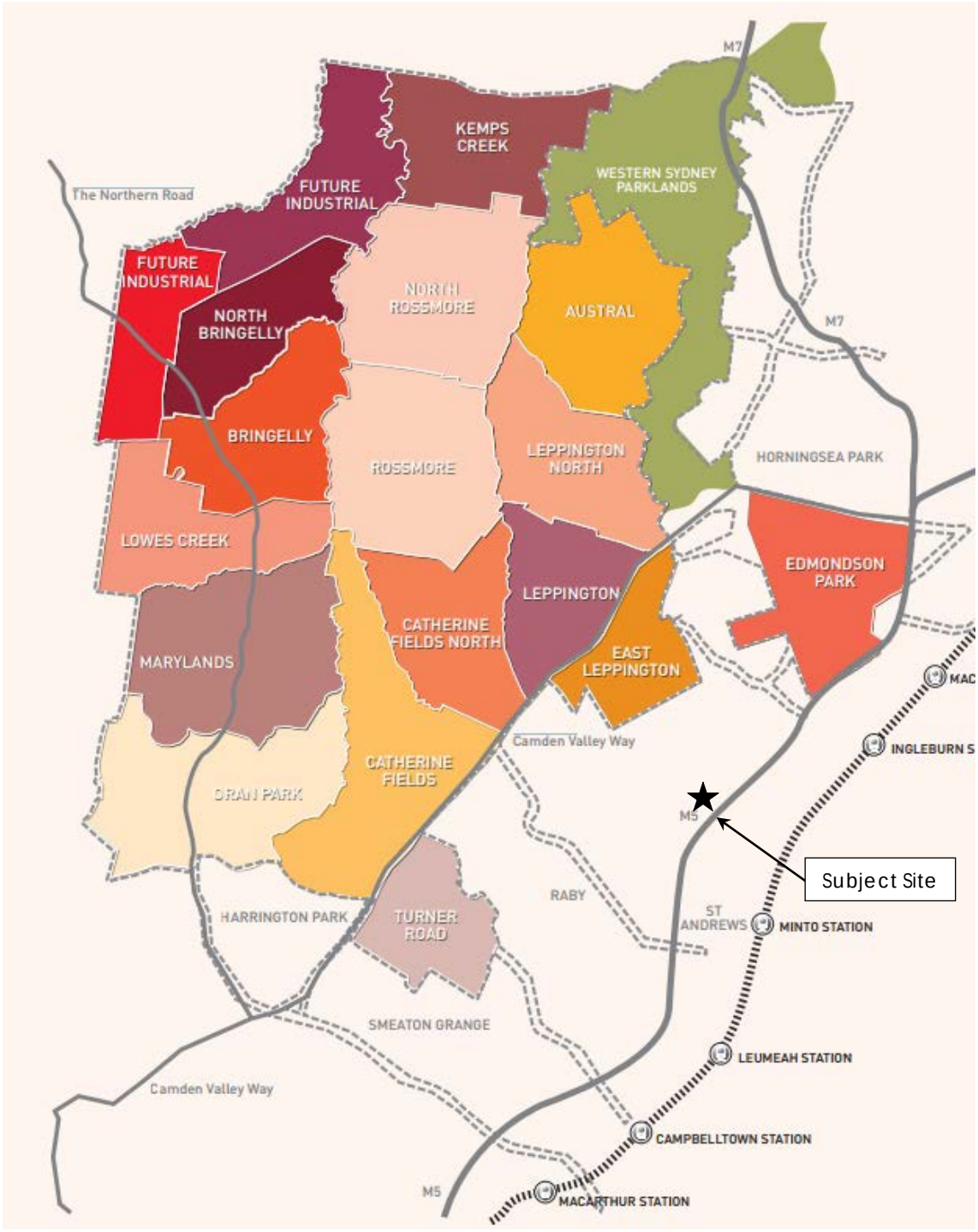
The subject site is neighbouring the South West Growth Centre (SWGC) as illustrated in Figure 2.4 and Figure 2.5.

Figure 2.4: South West Growth Centre Structure Plan



(Source: Planning & Environment NSW Government)

Figure 2.5: South West Growth Centre Precinct Plan



(Source: Planning & Environment NSW Government)

It is likely to be the case that the increase in population from the SWGC will in turn increase traffic along St Andrews Road.

2.7 St Andrews Road Upgrade

The Integrated Transport Strategy (ITS) for Glenfield to Macarthur was prepared by Cardno in 2015. It identifies travel demand opportunities and transport infrastructure improvements, which may be required to support future growth of SWGC and its surrounds.

The Glenfield to Macarthur Urban Renewal Corridor Strategy (integrated transport strategy) proposes a number of major roads, to provide links towards the Glenfield to Macarthur rail corridor. This includes an upgrade of St Andrews Road a sub arterial linking to Campbelltown Road. This is likely to result in an increase in traffic capacity along St Andrews Road.

3. Development Proposal

3.1 Land Uses

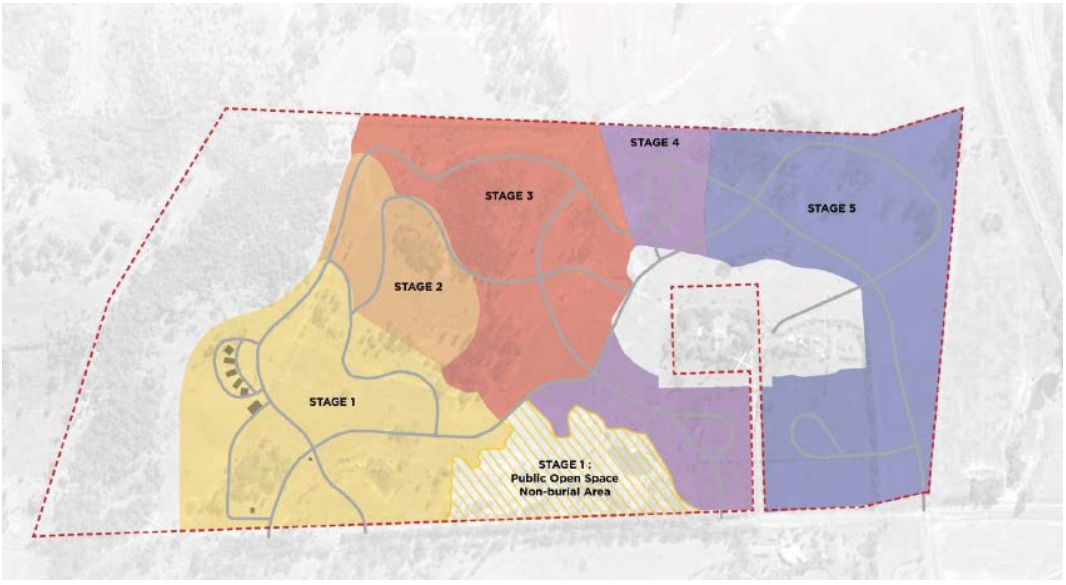
The planning proposal seeks to rezone to allow for the permitted use of a landscaped memorial garden and cemetery for the Greater Western Sydney region.

Stage 1 of the development, which has an approximate area of 27.5ha, is expected to be completed by 2073 and the subsequent stages (Stages 2-5) of development are planned over the period 2074 – 2163. The Staging proposals are shown in Figure 3.1 and Figure 3.2.

Figure 3.1: Macarthur Memorial Staging Plan

Year	Decade	ROB Predictions (No)	Masterplan Stage
2014-2023	1st	1121	1 (60 years)
2024-2033	2nd	3335	
2034-2043	3rd	5354	
2044-2053	4th	5913	
2054-2063	5th	6504	
2064-2073	6th	7157	
2074-2083	7th	7869	2 (20 years)
2084-2093	8th	8656	
2094-2103	9th	9522	3 (25 years)
2104-2113	10th	10474	
2114-2123	11th	11521	
2124-2133	12th	12673	4 (15 years)
2134-2143	13th	13940	5 (30 years)
2144-2153	14th	15334	
2154-2163	15th	16867	
Total		136,240	150 years

Figure 3.2: Macarthur Memorial Staging Plan



(Source: Catholic Metropolitan Cemeteries Trust Planning Proposal)

3.2 Vehicle Access

A single two-way vehicular crossover is proposed on St Andrews Road. The access has been designed to cater for vehicles to enter and exit the site and not obstruct the though traffic flow on the existing road.

The suitability of the proposed access arrangement is discussed in Section 5.3 of this report.

3.3 Car Parking

The proposed development will provide all parking on site through formal car parking facilities or kerb side parking along the internal road network. The latter is usual practice in cemeteries whereby people are able to park alongside the grave being visited.

4. Traffic Impact Assessment

4.1 Macarthur Memorial Park

As described in Section 3.1, the development will be completed over a 150 year period. The traffic modelling exercise has been undertaken to demonstrate that the proposed access arrangement is satisfactory to accommodate the traffic generated by Phase 1.

It is clearly not realistic to consider the full development of the site which will occur in stages over the next 150 years.

4.2 Traffic Generation

There is currently no traffic generation guidance given within the RMS "Guide to Traffic Generating Developments (2002)" in relation to traffic generated by cemeteries. Therefore the proposed development's traffic generation was determined based on an empirical assessment of the existing similar size cemetery (i.e. Liverpool Cemetery). Table 4.1 illustrates the similarities between the two sites.

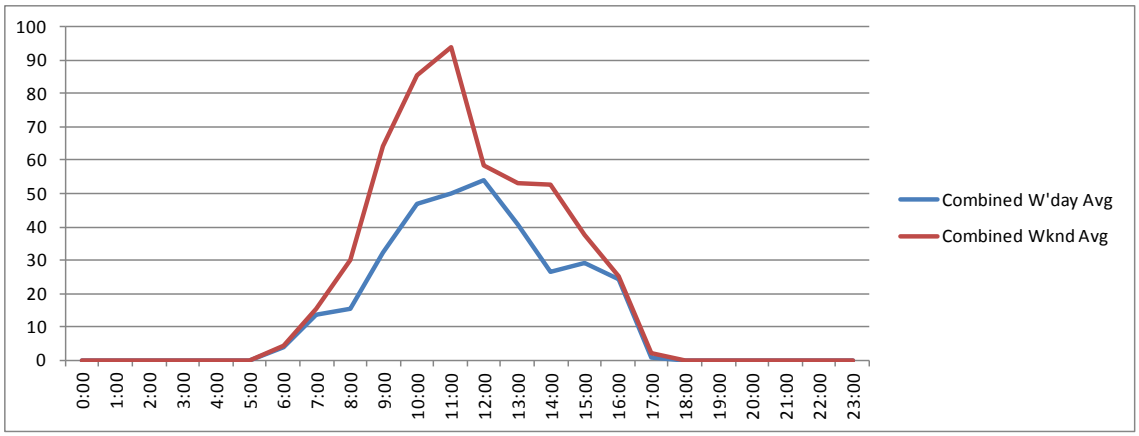
Table 4.1: Similarities between the sites

Site	Size of Site (Ha)	Graves	Supporting Facilities
Liverpool Cemetery	9.5	30,000	2 Chapels, Condolence Lounge, Mausoleum and Staff Office
Macarthur Memorial Cemetery	Stage 1 27.5	29,384	Public Open Space (Non-Burial Area), 2 Chapels, Condolence Room and Staff Office

The similarities of the two sites allow for the assumption that the proposed development and the current existing site generate similar traffic volumes. Whilst the area of the proposed cemetery is larger, it does propose a significant amount of public open space, which is not provided at the Liverpool site.

Traffic counts completed at Liverpool Cemetery access points indicate that there are between 40-45 trips generated in the weekday AM and PM peak hours. This traffic will have comprised any visitors to gravesides, use of the 2 chapels, the condolence room and staff.

Figure 4.1: Existing Two Way Traffic Volumes of Liverpool Cemetery Access



In order to validate the traffic counts survey, we have also undertaken an estimate of the traffic based upon first principles.

Based on information provided by the operators of Liverpool Cemetery, funerals taking place at a single chapel generate between 25-30 vehicles. Taking into account that the site has two chapels and assuming that both the chapels could run funeral services simultaneously, 50-60 trips could be generated. However, this peak would generally occur during mid/late morning (i.e. 10:00 -11:00am), which is confirmed by Figure 4.1, which shows a profile of weekday and weekday traffic volumes at Liverpool Cemetery.

In addition, it is assumed that the visits to the burial sites could generate additional traffic of up to say 45 additional trips by visitors (we have used the traffic generated by the whole Liverpool site as a worst case). This is considered a conservative approach as the Liverpool Cemetery that includes two chapels only generated 40-45 in the network peak hours and some 20 in the peak hours. Lastly, staff trips are assumed to be in the order of 10 trips in the peak hour.

Consequently, it is likely that the proposal would generate some 30 trips in the peak hours and up to 105 in the busiest hour.

136,240 burial sites would be provided over the next 150 years so assuming the same traffic generating characteristics occur over that period, at worst this might generate 139 trips in the road network peak hour and some 486 in the off peak periods hour in the year 2163 when the development is complete.

For the purposes of traffic modelling, we have only looked at Stage 1 (which will take until 2073 to be fully developed). However, in order to provide a worst case scenario we have assumed that:

- A traffic model 10 years from now will be assembled which is a reasonable time frame for assessment.
- Notwithstanding the fact that Stage 1 will not be completed before 2073, we have assumed that all 29,384 burial sites will be provided before the 2026 modelling horizon.
- That the chapel visits, burial site visits and staff arrivals would be all occur in the network peak hour periods.

4.3 Distribution and Assignment

The directional distribution and assignment of traffic generated by the proposed development will be influenced by a number of factors, including the:

i configuration of the arterial road network in the immediate vicinity of the site
ii existing operation of intersections providing access between the local and arterial road network
iii distribution of households in the vicinity of the site
iv likely distribution of visitor's residences in relation to the site
v configuration of access points to the site.

Having consideration to the above, for the purposes of estimating vehicle movements, the following directional distributions have been assumed:

At Site Access:

- 100% to the South

At Spitfire Drive Roundabout:

- St Andrews Road 70%
- Spitfire Drive 30%.

It is recognised that this may change when South West Growth Centre proceeds but the analysis performed represents a worst case scenario.

In addition, the directional split of traffic (i.e. the ratio between the inbound and outbound traffic movements) was determined based on traffic surveys at the Liverpool Cemetery and would be:

- AM Peak hour: 75% inbound/ 25% outbound
- PM Peak hour: 50% inbound/ 50% outbound.

For the purposes of modelling, we have assumed that the worst peak hour generation form the cemetery will coincide with the road network peak.

Based on the above, Figure 4.2 and Figure 4.3 have been prepared to show the estimated marginal increase in turning movements in the vicinity of the subject property following Phase 1 site development.

Figure 4.2: AM Peak Hour Site Generated Traffic Volumes

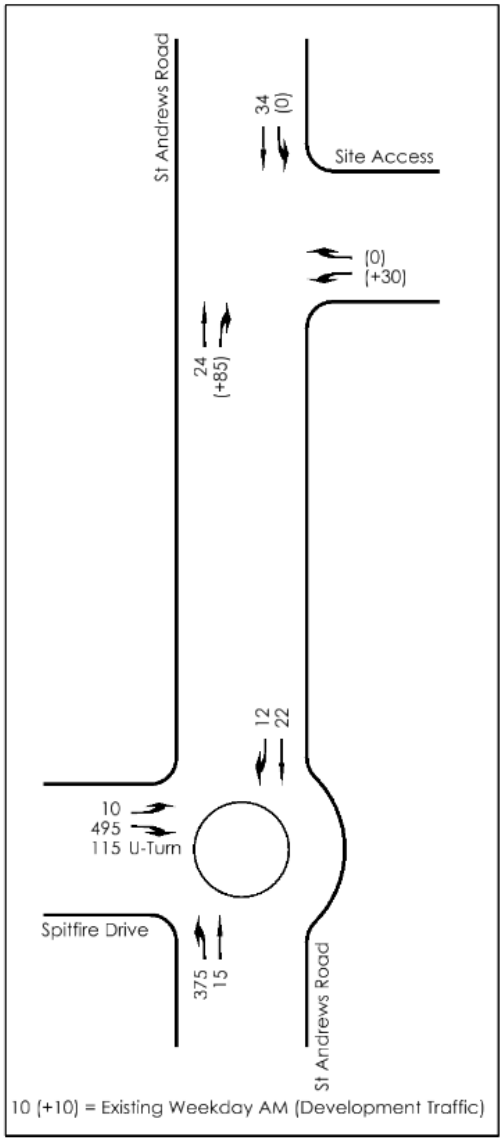
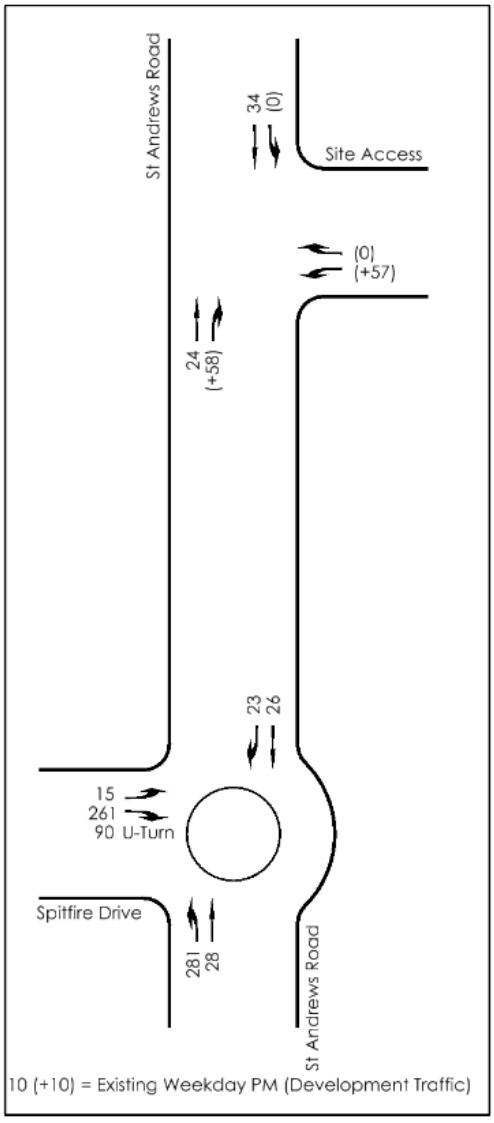


Figure 4.3: PM Peak Hour Site Generated Traffic Volumes



4.4 Traffic Impact

Table 4.2 is a summary of the post development operation of St Andrews Road at the Site Access and at the priority controlled roundabout intersection of St Andrews Road/Spitfire Drive during the weekday AM and PM peak with full results provided in Appendix B.

Table 4.2: Post Development Operating Conditions

Intersection	Peak	Leg	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
St Andrews Road/ Spitfire Drive	AM	South: St Andrews Road	0.39	6	19	A
		North: St Andrews Road	0.09	12	4	A
		West: Spitfire Drive	0.50	10	31	A
		Overall	**0.50**	**12**	**31**	**A**
	PM	South: St Andrews Road	0.31	6	14	A
		North: St Andrews Road	0.12	10	5	A
		West: Spitfire Drive	0.31	10	15	A
		Overall	**0.31**	**10**	**15**	**A**

On the basis of the above assessment, Table 4.2 shows the intersection of the St Andrews Road / Spitfire Drive is expected to continue to operate well with the worst level of service remaining the same as the existing conditions.

The increase in traffic capacity proposed along St Andrews Road in the future is likely to be more than enough to accommodate the anticipated future traffic increases resulting from the cemetery beyond 2074.

The additional traffic generated by the proposed development could not be expected to compromise the safety or function of the surrounding road network.

4.5 Link Capacity

The traffic counts recorded in Section 2.3 indicate that the 2 way traffic volumes on St Andrews Road passing the site frontage are 59 (AM) and 92 (PM).

The link capacity of a 2 way rural road if often considered to be around 900 vehicles per hour/ lane. Consequently, even with the addition of up to 100 vehicles per hour from the cemetery, St Andrews Road will continue to operate well below capacity.

5. Car Parking

5.1 Car Parking Requirements

There are currently no parking requirements within the Campbelltown Council's DCP 2014 in relation to parking required for cemeteries. Therefore the proposed development's car parking was determined based on an empirical assessment of the existing similar size cemetery, Liverpool Cemetery.

The development will provide car parking onsite which will be a provision of formal parking facilities and kerb side parking along the internal road network. Considering the peak demand of traffic generated by the proposed site, parking demand of around 100 to 150 vehicles could be generated during the busiest period. This will mean that about 600 – 900 metres of kerbside parking will be required (based upon a car park length dimension of 6 metre) although it is likely that a small amount of this, say 20 spaces, might be provided in a formal car park.

5.2 Adequacy of Parking Supply

On the basis of the empirical assessment of the demand, the on-site car parking provision is expected to be capable of accommodating the car parking demands associated with the proposed development.

5.3 Site Access

As mentioned above within Section 5.1 the traffic generated in our worst case scenario during the site peak periods will be 100 – 200 vehicles per hour between 10am and 3pm, this will occur outside of the road network peaks.

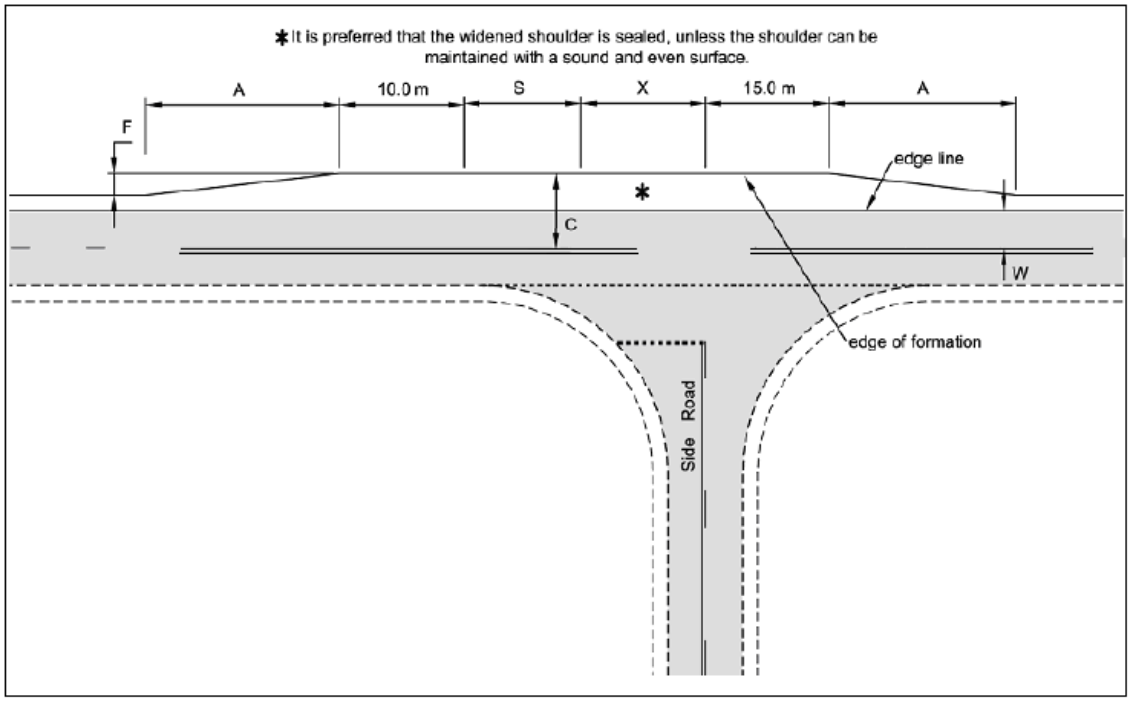
In regards to traffic capacity a simple tee/priority intersection would be acceptable for the site access. However in relation to providing increased road safety, it is recommended to provide a passing bay/lane as a basic right turn lane treatment (BAR). This will allow vehicles turning into the proposed development to not obstruct the through road traffic along St Andrews Road.

Site inspections have indicated that there will be no issues providing adequate sight distances to and from this access/egress point.

The principle of access at this point has been discussed with Roads and Maritime Services (RMS) which is part of Transport for New South Wales (TfNSW).

A sketch of an intersection layout is shown below in Figure 5.1.

Figure 5.1: Intersection layout sketch of a Rural Basic right turn treatment (BAR)



(Source: Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections 2010)

6. Conclusion

Based on the analysis and discussions presented within this report, the following conclusions are made:

i The proposed site can clearly accommodate the parking requirements of the subject site.

ii Access into the site will be provided by means of a rural basic right turn treatment (BAR).

iii Stage 1 of the development of Macarthur Memorial, which will take place up until 2073, is expected to generate some 30 trips in the peak hours and up to 105 in the busiest hour.

iv Ultimately, the full development of the site, (assuming the same traffic generating characteristics occur over that period) might generate 139 trips in the road network peak hour and some 486 in the off peak periods hour in the year 2163 when the development is complete.

v There is adequate capacity in the surrounding road network to cater for the traffic generated by the proposed development.

vi The Glenfield to Macarthur Urban Renewal Corridor Strategy proposes an upgrade of St Andrews Road to a sub arterial linking to Campbelltown Road. This is likely to result in an increase in traffic capacity along St Andrews Road which even allowing for potential future traffic growth along this corridor, should be more than adequate to accommodate traffic from the proposed cemetery.

Appendix A

Survey Results

Job No	N1921
Client	GTA
Road	Maclean St Access to Cemetery
Location	Varroville
Site No.	1
Start Date	19-Aug-15
Description	Volume Summary
Direction	Combined

Average Weekday	191
7 Day Average	230

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	24-Aug	25-Aug	19-Aug	20-Aug	21-Aug	22-Aug	23-Aug		
AM Peak	17	28	36	50	34	53	62		
PM Peak	15	43	25	41	47	29	47		
0:00	0	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0
4:00	0	0	0	0	0	0	0	0	0
5:00	0	0	0	0	0	0	0	0	0
6:00	0	2	2	4	2	3	2	2	2
7:00	5	9	9	4	10	10	10	7	8
8:00	10	5	15	11	4	20	20	9	12
9:00	12	16	18	24	17	33	56	17	25
10:00	17	28	36	29	34	53	59	29	37
11:00	7	25	36	50	30	51	62	30	37
12:00	15	43	25	41	47	29	42	34	35
13:00	11	24	19	31	29	29	47	23	27
14:00	10	23	11	13	18	20	38	15	19
15:00	13	7	8	16	15	25	20	12	15
16:00	7	11	10	25	10	23	6	13	13
17:00	0	0	0	0	0	2	0	0	0
18:00	0	0	0	0	0	0	0	0	0
19:00	0	0	0	0	0	0	0	0	0
20:00	0	0	0	0	0	0	0	0	0
21:00	0	0	0	0	0	0	0	0	0
22:00	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0
Total	107	193	189	248	216	298	362	191	230

7-19	107	191	187	244	214	295	360	189	228
6-22	107	193	189	248	216	298	362	191	230
6-24	107	193	189	248	216	298	362	191	230
0-24	107	193	189	248	216	298	362	191	230

Job No	N1921
Client	GTA
Road	Moore St Western Access to Cemetery
Location	Varroville
Site No.	2
Start Date	19-Aug-15
Description	Volume Summary
Direction	Combined

Average Weekday	141
7 Day Average	153

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	24-Aug	25-Aug	19-Aug	20-Aug	21-Aug	22-Aug	23-Aug		
AM Peak	13	18	22	24	35	42	29		
PM Peak	18	31	17	24	26	22	25		
0:00	0	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0
4:00	0	0	0	0	0	0	0	0	0
5:00	0	0	0	0	0	0	0	0	0
6:00	1	3	2	3	1	3	1	2	2
7:00	3	9	5	2	9	6	5	6	6
8:00	10	4	9	5	4	3	13	6	7
9:00	13	13	10	14	23	9	27	15	16
10:00	7	18	21	15	24	30	29	17	21
11:00	7	12	22	24	35	42	29	20	24
12:00	6	31	17	24	16	20	25	19	20
13:00	5	19	16	17	26	14	15	17	16
14:00	8	19	8	6	12	22	25	11	14
15:00	18	14	13	15	24	11	19	17	16
16:00	16	12	10	11	8	14	6	11	11
17:00	0	1	1	1	1	1	1	1	1
18:00	0	0	0	0	0	0	0	0	0
19:00	0	0	0	0	0	0	0	0	0
20:00	0	0	0	0	0	0	0	0	0
21:00	0	0	0	0	0	0	0	0	0
22:00	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0
Total	94	155	134	137	183	175	195	141	153

7-19	93	152	132	134	182	172	194	139	151
6-22	94	155	134	137	183	175	195	141	153
6-24	94	155	134	137	183	175	195	141	153
0-24	94	155	134	137	183	175	195	141	153

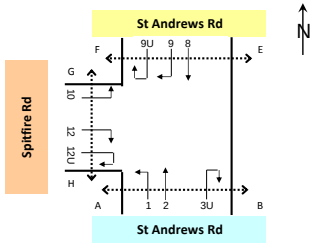
Job No	N1921
Client	GTA
Road	Moore St Eastern Access to Cemetery
Location	Varroville
Site No.	3
Start Date	19-Aug-15
Description	Volume Summary
Direction	Combined

Average Weekday	6
7 Day Average	6

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	24-Aug	25-Aug	19-Aug	20-Aug	21-Aug	22-Aug	23-Aug		
AM Peak	1	1	0	1	4	4	2		
PM Peak	1	3	0	1	4	1	0		
0:00	0	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0
4:00	0	0	0	0	0	0	0	0	0
5:00	0	0	0	0	0	0	0	0	0
6:00	0	0	0	0	0	0	0	0	0
7:00	1	1	0	0	1	0	0	1	0
8:00	0	0	0	1	0	4	0	0	1
9:00	1	0	0	0	1	2	1	0	1
10:00	0	1	0	0	4	0	0	1	1
11:00	0	0	0	0	1	2	2	0	1
12:00	0	2	0	1	1	1	0	1	1
13:00	0	2	0	1	4	1	0	1	1
14:00	0	3	0	0	1	0	0	1	1
15:00	1	0	0	0	2	0	0	1	0
16:00	0	1	0	0	0	1	0	0	0
17:00	0	0	0	0	0	0	0	0	0
18:00	0	0	0	0	0	0	0	0	0
19:00	0	0	0	0	0	0	0	0	0
20:00	0	0	0	0	0	0	0	0	0
21:00	0	0	0	0	0	0	0	0	0
22:00	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0
Total	3	10	0	3	15	11	3	6	6

7-19	3	10	0	3	15	11	3	6	6
6-22	3	10	0	3	15	11	3	6	6
6-24	3	10	0	3	15	11	3	6	6
0-24	3	10	0	3	15	11	3	6	6

Job No.	: N1921
Client	: GTA
Suburb	: Varroville
Location	: St Andrews Rd / Spitfire Rd
Day/Date	: Tue, 18th August 2015
Weather	: Fine
Description	: Classified Intersection Count
	: 15 mins Data



Tracsis
Traffic Data Australia

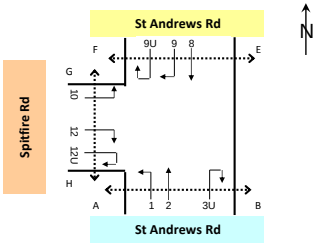
	Class 1	Class 2	Class 3
Classifications	Cars	Trucks	Buses

Approach	St Andrews Rd											
Direction	Direction 1 (Left Turn)				Direction 2 (Through)					Direction 3U (U Turn)		
Time Period	Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total		Cars	Trucks	Buses	Total
7:00 to 7:15	16	0	0	**16**	3	0	0	**3**		0	0	0	**0**
7:15 to 7:30	23	1	0	**24**	5	0	0	**5**		0	0	0	**0**
7:30 to 7:45	40	2	0	**42**	0	0	0	**0**		1	0	0	**1**
7:45 to 8:00	57	1	1	**59**	2	0	0	**2**		0	0	0	**0**
8:00 to 8:15	106	1	2	**109**	2	0	0	**2**		0	0	0	**0**
8:15 to 8:30	121	2	1	**124**	7	0	0	**7**		0	0	0	**0**
8:30 to 8:45	79	1	0	**80**	3	0	0	**3**		1	0	0	**1**
8:45 to 9:00	39	0	0	**39**	10	0	0	**10**		0	0	0	**0**
9:00 to 9:15	34	0	0	**34**	6	0	0	**6**		0	0	0	**0**
9:15 to 9:30	32	0	0	**32**	2	0	0	**2**		0	0	0	**0**
AM Totals	**547**	**8**	**4**	**559**	**40**	**0**	**0**	**40**		**2**	**0**	**0**	**2**
14:30 to 14:45	52	2	1	**55**	8	1	0	**9**		5	0	0	**5**
14:45 to 15:00	74	0	0	**74**	10	0	0	**10**		7	0	0	**7**
15:00 to 15:15	76	1	1	**78**	5	0	0	**5**		0	0	0	**0**
15:15 to 15:30	66	2	6	**74**	3	1	0	**4**		1	0	0	**1**
15:30 to 15:45	71	1	1	**73**	1	0	0	**1**		0	0	0	**0**
15:45 to 16:00	96	0	0	**96**	3	1	0	**4**		1	0	0	**1**
16:00 to 16:15	92	2	0	**94**	3	0	0	**3**		0	0	0	**0**
16:15 to 16:30	98	1	0	**99**	3	0	0	**3**		0	0	0	**0**
16:30 to 16:45	98	1	0	**99**	2	0	0	**2**		0	0	0	**0**
16:45 to 17:00	99	1	0	**100**	1	0	0	**1**		0	0	0	**0**
17:00 to 17:15	103	2	0	**105**	4	0	0	**4**		0	0	0	**0**
17:15 to 17:30	140	2	0	**142**	5	0	0	**5**		0	0	0	**0**
17:30 to 17:45	123	1	0	**124**	1	0	0	**1**		0	0	0	**0**
17:45 to 18:00	95	3	0	**98**	2	0	0	**2**		0	0	0	**0**
18:00 to 18:15	87	1	0	**88**	5	0	0	**5**		0	0	0	**0**
18:15 to 18:30	78	1	0	**79**	2	0	0	**2**		0	0	0	**0**
PM Totals	**1,448**	**21**	**9**	**1,478**	**58**	**3**	**0**	**61**		**14**	**0**	**0**	**14**

Approach	St Andrews Rd												Spitfire Rd								Crossing Pedestrians								
Direction		Direction 8 (Through)				Direction 9 (Right Turn)				Direction 9U (U Turn)				Direction 10 (Left Turn)					Direction 12 (Right Turn)				Direction 12U (U Turn)								
Time Period		Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total		Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	A	B		E	F	G	H	Total
7:00 to 7:15		3	1	0	**4**	2	0	0	**2**	0	0	0	**0**	1	0	0	**1**		47	1	0	**48**	0	0	0	**0**	0	0		1	0	0	0	**1**
7:15 to 7:30		3	0	0	**3**	2	0	0	**2**	0	0	0	**0**	4	0	0	**4**		46	0	0	**46**	0	0	0	**0**	0	0		0	0	0	0	**0**
7:30 to 7:45		5	0	0	**5**	1	0	0	**1**	0	0	0	**0**	2	0	0	**2**		56	2	0	**58**	0	0	0	**0**	0	0		0	0	0	0	**0**
7:45 to 8:00		1	0	0	**1**	0	0	0	**0**	0	0	0	**0**	0	1	0	**1**		83	1	2	**86**	1	0	0	**1**	0	0		0	0	0	0	**0**
8:00 to 8:15		10	1	0	**11**	7	0	0	**7**	0	0	0	**0**	3	0	0	**3**		128	0	0	**128**	24	0	0	**24**	0	0		1	5	0	0	**6**
8:15 to 8:30		4	0	0	**4**	0	0	1	**1**	0	0	0	**0**	1	0	1	**2**		151	1	1	**153**	38	2	0	**40**	0	0		0	0	0	0	**0**
8:30 to 8:45		6	0	0	**6**	4	0	0	**4**	0	0	0	**0**	3	1	0	**4**		124	2	2	**128**	50	0	0	**50**	0	0		0	3	0	0	**3**
8:45 to 9:00		0	0	0	**0**	2	0	0	**2**	0	0	0	**0**	5	0	0	**5**		58	3	1	**62**	1	0	0	**1**	0	0		0	0	0	0	**0**
9:00 to 9:15		1	0	0	**1**	0	0	0	**0**	0	0	0	**0**	1	0	0	**1**		48	1	0	**49**	0	0	0	**0**	0	0		0	0	0	0	**0**
9:15 to 9:30		2	0	0	**2**	2	0	0	**2**	0	0	0	**0**	2	0	0	**2**		42	1	0	**43**	0	0	0	**0**	0	0		0	0	0	0	**0**
AM Totals		**35**	**2**	**0**	**37**	**20**	**0**	**1**	**21**	**0**	**0**	**0**	**0**	**22**	**2**	**1**	**25**		**783**	**12**	**6**	**801**	**114**	**2**	**0**	**116**	**0**	**0**		**2**	**8**	**0**	**0**	**10**
14:30 to 14:45		3	0	0	**3**	5	0	0	**5**	0	0	0	**0**	6	0	0	**6**		30	2	3	**35**	9	0	0	**9**	0	0		1	0	0	0	**1**
14:45 to 15:00		14	0	0	**14**	6	1	0	**7**	0	0	0	**0**	4	0	0	**4**		108	1	1	**110**	72	0	0	**72**	0	0		31	0	0	0	**31**
15:00 to 15:15		5	0	0	**5**	11	0	0	**11**	0	0	0	**0**	3	0	0	**3**		65	1	2	**68**	7	0	0	**7**	0	0		2	0	0	0	**2**
15:15 to 15:30		3	1	0	**4**	0	0	0	**0**	0	0	0	**0**	2	0	0	**2**		44	0	4	**48**	2	0	0	**2**	0	0		0	0	0	0	**0**
15:30 to 15:45		2	0	0	**2**	1	0	0	**1**	0	0	0	**0**	2	0	0	**2**		32	1	4	**37**	0	0	0	**0**	0	0		0	0	0	0	**0**
15:45 to 16:00		5	0	0	**5**	1	0	0	**1**	0	0	0	**0**	3	0	0	**3**		43	0	0	**43**	0	0	0	**0**	0	0		0	0	0	0	**0**
16:00 to 16:15		2	0	0	**2**	2	0	0	**2**	0	0	0	**0**	2	0	0	**2**		36	0	0	**36**	1	0	0	**1**	0	0		0	1	0	0	**1**
16:15 to 16:30		2	0	0	**2**	3	0	0	**3**	0	0	0	**0**	2	0	0	**2**		43	0	0	**43**	0	0	0	**0**	0	0		2	0	0	0	**2**
16:30 to 16:45		1	0	0	**1**	2	0	0	**2**	0	0	0	**0**	3	0	0	**3**		39	0	0	**39**	0	0	0	**0**	0	0		0	0	0	0	**0**
16:45 to 17:00		3	0	0	**3**	2	0	0	**2**	0	0	0	**0**	1	0	0	**1**		35	0	0	**35**	0	0	0	**0**	0	0		0	0	0	0	**0**
17:00 to 17:15		2	0	0	**2**	4	0	0	**4**	0	0	0	**0**	7	0	0	**7**		35	1	0	**36**	0	0	0	**0**	0	0		0	0	0	0	**0**
17:15 to 17:30		3	0	0	**3**	2	0	0	**2**	0	0	0	**0**	2	0	0	**2**		43	1	0	**44**	0	0	0	**0**	0	0		0	0	0	0	**0**
17:30 to 17:45		0	0	0	**0**	4	0	0	**4**	0	0	0	**0**	2	0	0	**2**		33	0	0	**33**	0	0	0	**0**	0	0		0	0	0	0	**0**
17:45 to 18:00		1	0	0	**1**	0	0	0	**0**	0	0	0	**0**	3	0	0	**3**		30	0	0	**30**	0	0	0	**0**	0	0		1	0	0	0	**1**
18:00 to 18:15		1	0	0	**1**	4	0	0	**4**	0	0	0	**0**	2	0	0	**2**		29	0	0	**29**	0	0	0	**0**	0	0		0	0	0	0	**0**
18:15 to 18:30		1	0	0	**1**	3	0	0	**3**	0	0	0	**0**	0	0	0	**0**		27	0	0	**27**	0	0	0	**0**	0	0		0	1	0	0	**1**
PM Totals		**48**	**1**	**0**	**49**	**50**	**1**	**0**	**51**	**0**	**0**	**0**	**0**	**44**	**0**	**0**	**44**		**672**	**7**	**14**	**693**	**91**	**0**	**0**	**91**	**0**	**0**		**37**	**2**	**0**	**0**	**39**

Job No. : N1921
Client : GTA
Suburb : Varroville
Location : St Andrews Rd / Spitfire Rd

Day/Date : Tue, 18th August 2015
Weather : Fine
Description : Classified Intersection Count
: Hourly Summary



SKYHIGH - THE TRAFFIC SURVEY COMPANY

Approach	St Andrews Rd											
Direction	Direction 1 (Left Turn)				Direction 2 (Through)				Direction 3U (U Turn)			
Time Period	Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total
7:00 to 8:00	136	4	1	**141**	10	0	0	**10**	1	0	0	**1**
7:15 to 8:15	226	5	3	**234**	9	0	0	**9**	1	0	0	**1**
7:30 to 8:30	324	6	4	**334**	11	0	0	**11**	1	0	0	**1**
7:45 to 8:45	363	5	4	**372**	14	0	0	**14**	1	0	0	**1**
8:00 to 9:00	345	4	3	**352**	22	0	0	**22**	1	0	0	**1**
8:15 to 9:15	273	3	1	**277**	26	0	0	**26**	1	0	0	**1**
8:30 to 9:30	184	1	0	**185**	21	0	0	**21**	1	0	0	**1**
AM Totals	**547**	**8**	**4**	559	**40**	**0**	**0**	**40**	**2**	**0**	**0**	**2**
14:30 to 15:30	268	5	8	**281**	26	2	0	**28**	13	0	0	**13**
14:45 to 15:45	287	4	8	**299**	19	1	0	**20**	8	0	0	**8**
15:00 to 16:00	309	4	8	**321**	12	2	0	**14**	2	0	0	**2**
15:15 to 16:15	325	5	7	**337**	10	2	0	**12**	2	0	0	**2**
15:30 to 16:30	357	4	1	**362**	10	1	0	**11**	1	0	0	**1**
15:45 to 16:45	384	4	0	**388**	11	1	0	**12**	1	0	0	**1**
16:00 to 17:00	387	5	0	**392**	9	0	0	**9**	0	0	0	**0**
16:15 to 17:15	398	5	0	**403**	10	0	0	**10**	0	0	0	**0**
16:30 to 17:30	440	6	0	**446**	12	0	0	**12**	0	0	0	**0**
16:45 to 17:45	465	6	0	**471**	11	0	0	**11**	0	0	0	**0**
17:00 to 18:00	461	8	0	**469**	12	0	0	**12**	0	0	0	**0**
17:15 to 18:15	445	7	0	**452**	13	0	0	**13**	0	0	0	**0**
17:30 to 18:30	383	6	0	**389**	10	0	0	**10**	0	0	0	**0**
PM Totals	**1,448**	**21**	**9**	1,478	**58**	**3**	**0**	**61**	**14**	**0**	**0**	**14**

Approach	St Andrews Rd												Spitfire Rd								Crossing Pedestrians								
Direction		Direction 8 (Through)				Direction 9 (Right Turn)				Direction 9U (U Turn)				Direction 10 (Left Turn)					Direction 12 (Right Turn)				Direction 12U (U Turn)									
Time Period		Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total		Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	A	B		E	F	G	H	Total
7:00 to 8:00		12	1	0	**13**	5	0	0	**5**	0	0	0	**0**	7	1	0	**8**		232	4	2	**238**	1	0	0	**1**	0	0		1	0	0	0	**1**
7:15 to 8:15		19	1	0	**20**	10	0	0	**10**	0	0	0	**0**	9	1	0	**10**		313	3	2	**318**	25	0	0	**25**	0	0		1	5	0	0	**6**
7:30 to 8:30		20	1	0	**21**	8	0	1	**9**	0	0	0	**0**	6	1	1	**8**		418	4	3	**425**	63	2	0	**65**	0	0		1	5	0	0	**6**
7:45 to 8:45		21	1	0	**22**	11	0	1	**12**	0	0	0	**0**	7	2	1	**10**		486	4	5	**495**	113	2	0	**115**	0	0		1	8	0	0	**9**
8:00 to 9:00		20	1	0	**21**	13	0	1	**14**	0	0	0	**0**	12	1	1	**14**		461	6	4	**471**	113	2	0	**115**	0	0		1	8	0	0	**9**
8:15 to 9:15		11	0	0	**11**	6	0	1	**7**	0	0	0	**0**	10	1	1	**12**		381	7	4	**392**	89	2	0	**91**	0	0		0	3	0	0	**3**
8:30 to 9:30		9	0	0	**9**	8	0	0	**8**	0	0	0	**0**	11	1	0	**12**		272	7	3	**282**	51	0	0	**51**	0	0		0	3	0	0	**3**
AM Totals		**35**	**2**	**0**	**37**	**20**	**0**	**1**	**21**	**0**	**0**	**0**	**0**	**22**	**2**	**1**	**25**		**783**	**12**	**6**	**801**	**114**	**2**	**0**	**116**	**0**	**0**		**2**	**8**	**0**	**0**	**10**
14:30 to 15:30		25	1	0	**26**	22	1	0	**23**	0	0	0	**0**	15	0	0	**15**		247	4	10	**261**	90	0	0	**90**	0	0		34	0	0	0	**34**
14:45 to 15:45		24	1	0	**25**	18	1	0	**19**	0	0	0	**0**	11	0	0	**11**		249	3	11	**263**	81	0	0	**81**	0	0		33	0	0	0	**33**
15:00 to 16:00		15	1	0	**16**	13	0	0	**13**	0	0	0	**0**	10	0	0	**10**		184	2	10	**196**	9	0	0	**9**	0	0		2	0	0	0	**2**
15:15 to 16:15		12	1	0	**13**	4	0	0	**4**	0	0	0	**0**	9	0	0	**9**		155	1	8	**164**	3	0	0	**3**	0	0		0	1	0	0	**1**
15:30 to 16:30		11	0	0	**11**	7	0	0	**7**	0	0	0	**0**	9	0	0	**9**		154	1	4	**159**	1	0	0	**1**	0	0		2	1	0	0	**3**
15:45 to 16:45		10	0	0	**10**	8	0	0	**8**	0	0	0	**0**	10	0	0	**10**		161	0	0	**161**	1	0	0	**1**	0	0		2	1	0	0	**3**
16:00 to 17:00		8	0	0	**8**	9	0	0	**9**	0	0	0	**0**	8	0	0	**8**		153	0	0	**153**	1	0	0	**1**	0	0		2	1	0	0	**3**
16:15 to 17:15		8	0	0	**8**	11	0	0	**11**	0	0	0	**0**	13	0	0	**13**		152	1	0	**153**	0	0	0	**0**	0	0		2	0	0	0	**2**
16:30 to 17:30		9	0	0	**9**	10	0	0	**10**	0	0	0	**0**	13	0	0	**13**		152	2	0	**154**	0	0	0	**0**	0	0		0	0	0	0	**0**
16:45 to 17:45		8	0	0	**8**	12	0	0	**12**	0	0	0	**0**	12	0	0	**12**		146	2	0	**148**	0	0	0	**0**	0	0		0	0	0	0	**0**
17:00 to 18:00		6	0	0	**6**	10	0	0	**10**	0	0	0	**0**	14	0	0	**14**		141	2	0	**143**	0	0	0	**0**	0	0		1	0	0	0	**1**
17:15 to 18:15		5	0	0	**5**	10	0	0	**10**	0	0	0	**0**	9	0	0	**9**		135	1	0	**136**	0	0	0	**0**	0	0		1	0	0	0	**1**
17:30 to 18:30		3	0	0	**3**	11	0	0	**11**	0	0	0	**0**	7	0	0	**7**		119	0	0	**119**	0	0	0	**0**	0	0		1	1	0	0	**2**
PM Totals		**48**	**1**	**0**	**49**	**50**	**1**	**0**	**51**	**0**	**0**	**0**	**0**	**44**	**0**	**0**	**44**		**672**	**7**	**14**	**693**	**91**	**0**	**0**	**91**	**0**	**0**		**37**	**2**	**0**	**0**	**39**

Appendix B

SIDRA INTERSECTION Results

MOVEMENT SUMMARY

Site: St Andrews Rd/Spitfire Rd Ex AM

St Andrews Road/ Spitfire Road, Varroville
Existing Weekday AM
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: St Andrews Road South											
1	L2	392	2.4	0.337	5.5	LOS A	2.1	15.0	0.37	0.56	53.1
2	T1	16	6.7	0.337	5.7	LOS A	2.1	15.0	0.37	0.56	54.0
Approach		407	2.6	0.337	5.5	LOS A	2.1	15.0	0.37	0.56	53.1
North: St Andrews Road North											
8	T1	23	4.5	0.049	8.7	LOS A	0.3	1.8	0.63	0.69	51.2
9	R2	13	8.3	0.049	12.1	LOS A	0.3	1.8	0.63	0.69	50.7
Approach		36	5.9	0.049	9.9	LOS A	0.3	1.8	0.63	0.69	51.0
West: Spitfire Dr											
10	L2	11	30.0	0.416	5.0	LOS A	3.3	23.4	0.13	0.63	50.2
12	R2	521	1.8	0.416	8.1	LOS A	3.3	23.4	0.13	0.63	51.8
12u	U	121	1.7	0.416	9.8	LOS A	3.3	23.4	0.13	0.63	52.3
Approach		653	2.3	0.416	8.4	LOS A	3.3	23.4	0.13	0.63	51.8
All Vehicles		1096	2.5	0.416	7.3	LOS A	3.3	23.4	0.23	0.60	52.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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: St Andrews Rd/Spitfire Rd Ex PM

St Andrews Road/ Spitfire Road, Varroville
Existing Weekday PM
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: St Andrews Road South											
1	L2	296	4.6	0.271	5.3	LOS A	1.6	11.5	0.33	0.55	53.1
2	T1	29	7.1	0.271	5.5	LOS A	1.6	11.5	0.33	0.55	54.1
Approach		325	4.9	0.271	5.4	LOS A	1.6	11.5	0.33	0.55	53.2
North: St Andrews Road North											
8	T1	27	3.8	0.056	6.8	LOS A	0.3	2.0	0.49	0.64	52.2
9	R2	24	4.3	0.056	10.1	LOS A	0.3	2.0	0.49	0.64	51.8
Approach		52	4.1	0.056	8.3	LOS A	0.3	2.0	0.49	0.64	52.0
West: Spitfire Dr											
10	L2	16	6.7	0.268	4.8	LOS A	1.7	12.4	0.16	0.62	50.9
12	R2	275	5.4	0.268	8.2	LOS A	1.7	12.4	0.16	0.62	51.5
12u	U	95	1.1	0.268	9.8	LOS A	1.7	12.4	0.16	0.62	52.2
Approach		385	4.4	0.268	8.5	LOS A	1.7	12.4	0.16	0.62	51.7
All Vehicles		762	4.6	0.271	7.1	LOS A	1.7	12.4	0.25	0.59	52.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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: St Andrews Rd/Spitfire Rd Ex+Development AM

St Andrews Road/ Spitfire Road, Varroville
Existing Weekday AM + Development Traffic
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: St Andrews Road South											
1	L2	392	2.4	0.393	5.6	LOS A	2.7	19.3	0.42	0.56	52.9
2	T1	79	1.3	0.393	5.7	LOS A	2.7	19.3	0.42	0.56	53.9
Approach		471	2.2	0.393	5.6	LOS A	2.7	19.3	0.42	0.56	53.1
North: St Andrews Road North											
8	T1	45	2.3	0.094	8.7	LOS A	0.5	3.8	0.67	0.73	51.3
9	R2	22	4.8	0.094	12.1	LOS A	0.5	3.8	0.67	0.73	50.8
Approach		67	3.1	0.094	9.9	LOS A	0.5	3.8	0.67	0.73	51.1
West: Spitfire Dr											
10	L2	37	8.6	0.503	5.3	LOS A	4.3	30.8	0.36	0.61	50.4
12	R2	521	1.8	0.503	8.6	LOS A	4.3	30.8	0.36	0.61	51.2
12u	U	121	1.7	0.503	10.3	LOS A	4.3	30.8	0.36	0.61	51.8
Approach		679	2.2	0.503	8.7	LOS A	4.3	30.8	0.36	0.61	51.3
All Vehicles		1217	2.2	0.503	7.6	LOS A	4.3	30.8	0.40	0.60	51.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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: St Andrews Rd/Spitfire Rd Ex+Development PM

St Andrews Road/ Spitfire Road, Varroville
Existing Weekday PM + Development Traffic
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: St Andrews Road South											
1	L2	296	4.6	0.311	5.5	LOS A	1.9	13.8	0.37	0.55	52.9
2	T1	72	2.9	0.311	5.6	LOS A	1.9	13.8	0.37	0.55	54.0
Approach		367	4.3	0.311	5.5	LOS A	1.9	13.8	0.37	0.55	53.1
North: St Andrews Road North											
8	T1	69	1.5	0.121	6.9	LOS A	0.6	4.5	0.52	0.66	52.3
9	R2	42	2.5	0.121	10.2	LOS A	0.6	4.5	0.52	0.66	51.9
Approach		112	1.9	0.121	8.1	LOS A	0.6	4.5	0.52	0.66	52.2
West: Spitfire Dr											
10	L2	35	3.0	0.309	5.0	LOS A	2.0	14.7	0.27	0.62	50.9
12	R2	275	5.4	0.309	8.5	LOS A	2.0	14.7	0.27	0.62	51.3
12u	U	95	1.1	0.309	10.1	LOS A	2.0	14.7	0.27	0.62	52.0
Approach		404	4.2	0.309	8.6	LOS A	2.0	14.7	0.27	0.62	51.5
All Vehicles		883	3.9	0.311	7.2	LOS A	2.0	14.7	0.35	0.60	52.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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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