



166-176 ST ANDREWS ROAD, VARROVILLE MACARTHUR MEMORIAL PARK Transport Impact Assessment

Prepared for:
Catholic Metropolitan Cemeteries

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Table of Contents

1	Introduction	1
1.1	Background	1
1.2	Purpose of this Report	1
1.3	Reference	1
2	Existing Transport Conditions	2
2.1	Site Location	2
2.2	Road Network	2
2.3	Existing Traffic Volumes	3
2.4	Public Transport Services	4
2.5	Pedestrian and Cyclist Facilities	5
2.6	Western Sydney Priority Growth Area	6
2.7	St Andrews Road Upgrade	6
2.8	Road Safety Review	7
2.9	Journey to Work Data	7
3	Development Proposal	8
3.1	Overview	8
3.2	External Access	10
3.3	Internal Roads	11
3.4	Parking Provision	14
3.5	Number of Staff	14
3.6	Opening Hours	14
3.7	Traffic Management	15
4	Parking Assessment	16
4.1.1	Parking Layout	18
4.1.2	Service Vehicles	18
5	Traffic Assessment	19
5.1	Estimated Mode Split	19
5.2	Traffic Generation	19
5.2.1	Sample Site: Liverpool Cemetery	20
5.2.2	Sample Site: Rookwood Cemetery	21
5.2.3	Macarthur Cemetery	21

5.3	Traffic Distribution.....	25
5.4	Performance of Key Intersections	27
5.4.1	Model Performance Indicators.....	27
5.4.2	Existing and Future Cases	28
5.4.3	Sensitivity Test	29
6	Conclusions	31

Tables

Table 2.1:	Existing Mode Share to and from Varroville (Travel Zone 3224).....	7
Table 3.1:	Car Park Provision	14
Table 4.1:	Parking Assessment for Key Parking Generators.....	16
Table 5.1:	Estimated Mode Share to and from the Proposed Site.....	19
Table 5.2:	Overview of the Similar Cemeteries and the Proposed Cemetery	20
Table 5.3:	Weekday Traffic Generation	23
Table 5.4:	Weekend Traffic Generation	23
Table 5.5:	Level of Service Criteria for Intersections	28
Table 5.6:	Intersection Modelling Results	29
Table 5.7:	Intersection Modelling Results – Sensitivity Test	30

Figures

Figure 2.1:	Subject Site and Its Surrounding Environs	2
Figure 2.2:	Existing Traffic Volumes	3
Figure 2.3:	Hourly Traffic Volumes (2017).....	4
Figure 2.4:	Bus Routes.....	5
Figure 2.5:	Western Sydney Priority Growth Area	6
Figure 3.1:	Proposed Site Layout.....	9
Figure 3.2:	Concept Design of Access Road B – Channelised Right Turn Treatment (CHR)	11
Figure 3.3:	Proposed Road as per RFS Specifications.....	13
Figure 5.1:	Existing Two-way Traffic Volumes at Liverpool Cemetery.....	20
Figure 5.2:	Existing Two-Way Traffic Volumes at Rookwood Cemetery	21
Figure 5.3:	Estimated Future Traffic Volumes (Weekday)	26
Figure 5.4:	Estimated Future Traffic Volumes (Weekend)	27

APPENDICES

- A. SWEPT PATH ASSESSMENT
- B. TRAFFIC SURVEY (ST ANDREWS ROAD)
- C. TRAFFIC SURVEY (ROOKWOOD CEMETERY)

1 Introduction

1.1 Background

This report relates to traffic and parking aspects of a proposed memorial park development at 166-176 St Andrews Road, Varroville.

A concept design has been developed for the proposed memorial park with consideration given to the external access locations and internal road configurations.

The Transport Planning Partnership (TPPP) was commissioned by Catholic Metropolitan Cemeteries Trust (CMCT) to undertake a transport impact assessment for the proposed development. The assessment will accompany a Development Application to Campbelltown City Council seeking approval 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 a consideration of the following:

- existing transport conditions surrounding the site
- the traffic generating characteristics of the proposed development
- suitability of the proposed parking provision and access arrangements
- the transport impact of the development on the surrounding road network.

1.3 Reference

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

- Campbelltown City Council Development Control Plan, 2015
- AS2890.1 Off-street Car Parking
- AS2890.6 Off-Street Parking for People with Disabilities
- Austroads Guide to Traffic Design Part 4A: Unsignalised Intersections
- RMS Guide to Traffic Generating Developments, 2002
- Macarthur Memorial Park Master Plan, Florence Jaquet, September 2015
- Macarthur Memorial Park, Proposed Road Design, Warren and Smith Partners, 30 March 2017
- Macarthur Memorial Park, Traffic Impact Assessment, GTA Consultants, 7 October 2015.

2 Existing Transport Conditions

This section presents the existing transport conditions of the surrounding road network.

2.1 Site Location

The subject site is approximately 113 ha in size and is located at 166-176 St Andrews Road, Varroville, within the Campbelltown LGA, as shown in Figure 2.1.

Figure 2.1: Subject Site and Its Surrounding Environs



Source: Warren Smith & Partners (22 February 2017)

2.2 Road Network

Access to the site is via St Andrews Road and Campbelltown Road.

St Andrews Road is a local road under the jurisdiction of Campbelltown City Council and is a two-lane undivided road with a posted speed limit of 70km/h. Kerbside parking is not permitted on St Andrews Road. A school zone is operational 8am-9.30am and 2.30pm-4pm in the sections north and south of Spitfire Drive.

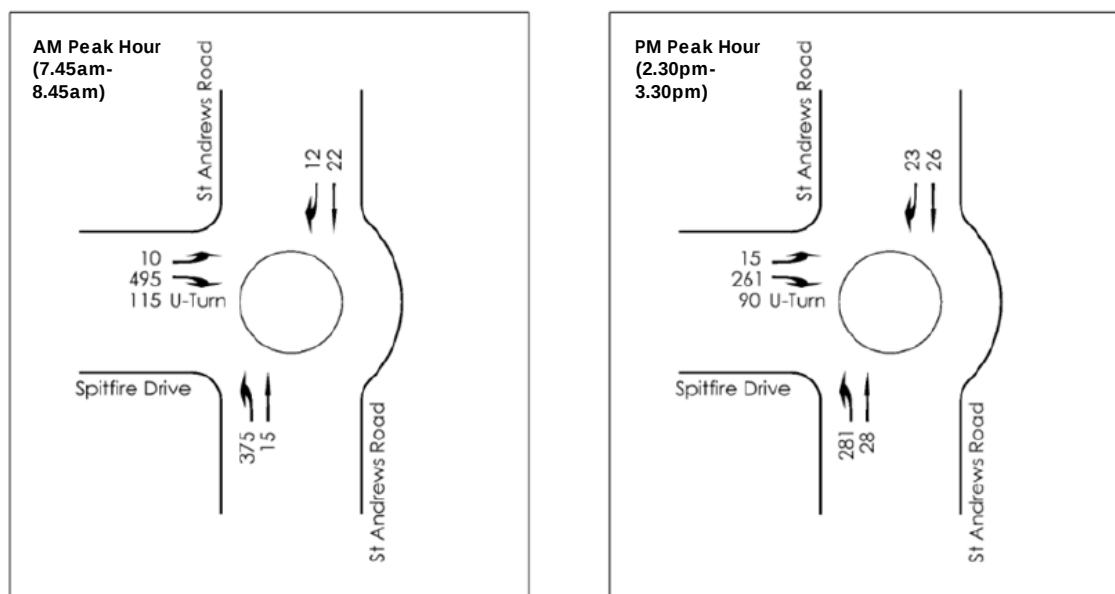
Spitfire Drive is a local road under the jurisdiction of Campbelltown City Council and is a two-lane undivided road with a posted speed limit of 60km/h. Spitfire Drive adjoins with St Andrews Road at a single-lane T-junction roundabout. Kerbside parking is not permitted on Spitfire Drive. A school zone is operational 8am-9.30am and 2.30pm-4pm in the section west of St Andrews Road. Bike lanes are generally provided on both sides of Spitfire Drive.

Campbelltown Road is a Roads and Maritime Services (RMS) main road (MR177) and is a two-lane undivided road in the vicinity of St Andrews Road. Campbelltown Road connects with Hume Highway in its northern end and Appin Road in its southern end. In the vicinity of St Andrews Road, Campbelltown Road has a sign posted speed limit of 70km/h. Campbelltown Road (3.5km south of St Andrews Road) carries approximately 45,252 vehicles per day, according to the RMS Traffic Volume Data 2016.

2.3 Existing Traffic Volumes

The traffic volumes collected in 18 August 2015 at the St Andrews Road/ Spitfire Drive intersection revealed the following traffic volumes as shown in Figure 2.2.

Figure 2.2: Existing Traffic Volumes



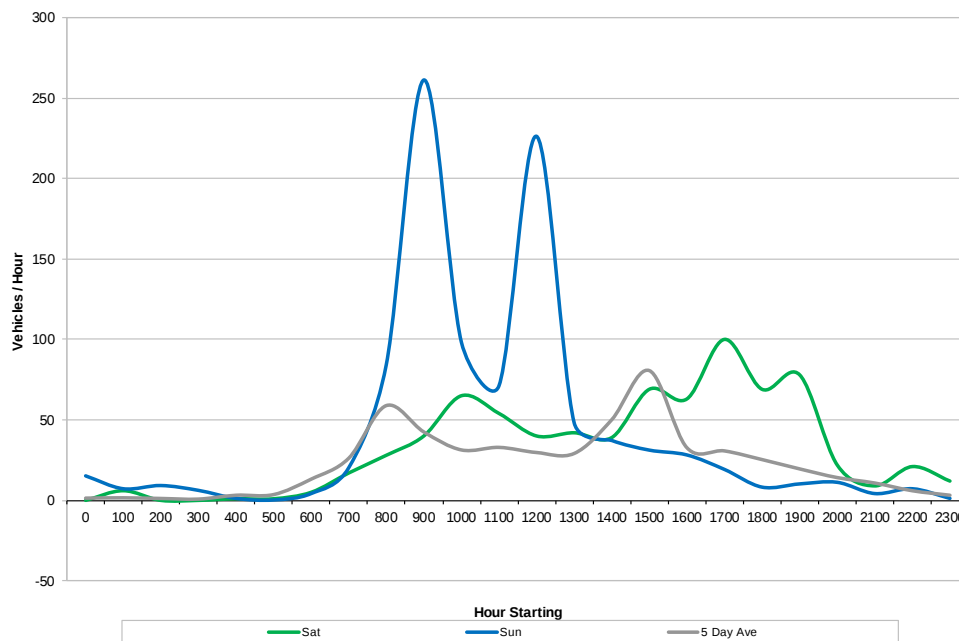
Source: GTA

GTA provided additional counts at the St Andrews Road/ Campbelltown Road intersection. The traffic volumes in St Andrews Road were some 185 vehicles northbound and 320 vehicles southbound during the morning peak hour; and some 340 vehicles northbound and 110 vehicles southbound during the evening peak hour.

TTPP commissioned an automatic tube count for a seven day period between 9 June 2017 and 15 June 2017. The survey location was St Andrews Road north of Spitfire Drive.

Figure 2.3 shows the hourly traffic volumes for the average weekday, Saturday and Sunday.

Figure 2.3: Hourly Traffic Volumes (2017)



The AM and PM peak traffic volumes are in the order of 59 and 81 vehicles/hour respectively on an average weekday. The weekend traffic volumes are higher than an average weekday, with a peak of 261 vehicles/hour recorded at 9am on Sunday.

A comparison of the mid-block traffic volumes between the intersection movement counts (2015) and the tube counts (2017) indicate that the average weekday AM peak hour traffic volumes remained unchanged at 59 vehicles/hour, and the PM peak hour traffic volume reduced from 92 to 81 vehicles/hour.

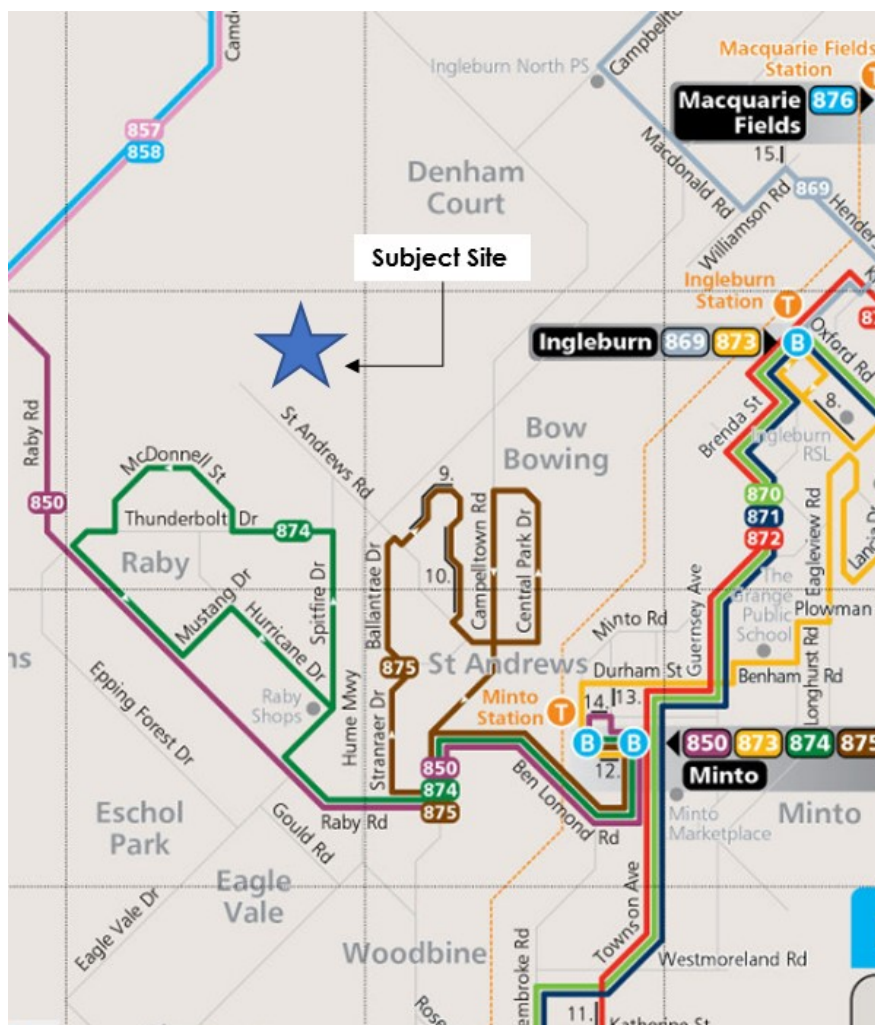
For the purposes of this traffic assessment, the intersection movement volumes recorded in 2015 have been adopted for intersection capacity analysis (refer to Section 5.4), despite a slight reduction in the weekday PM peak hour volumes in 2017.

2.4 Public Transport Services

The subject site is situated some 13–15-minute walk to the bus stop facilities located in Spitfire Drive, Ballantrae Drive and Thunderbolt Drive. The following bus routes generally provide half hourly services during the morning and afternoon peak periods (refer to Figure 2.4):

- Route 874: Raby - Minto
- Route 875: St Andrews – Bow Bowing – Minto.

Figure 2.4: Bus Routes



Minto Railway Station is located approximately 3.2km south east of the site, and is on the T2 Airport, T2 Inner West & South and T5 Cumberland line services. These services generally provide services with a frequency of 6-15 minutes during peak periods, and half hourly services during off-peak periods.

2.5 Pedestrian and Cyclist Facilities

No pedestrian and cycle facilities are provided along St Andrews Road, however, on-road bike lanes (2m wide) are provided on both sides of Spitfire Drive.

Pedestrian crossing facilities are provided in the following locations:

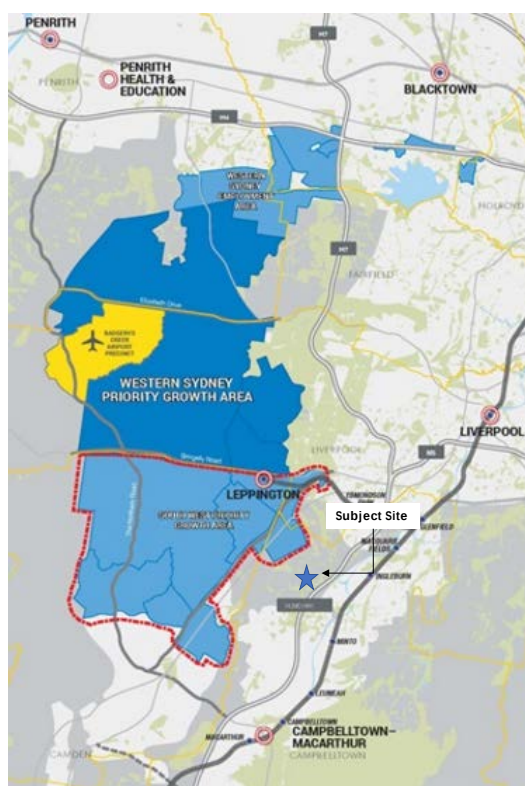
- St Andrews Road, north of Spitfire Drive (refuge island in roundabout splitter island)
- St Andrews Road, north of Hume Highway overpass (refuge island)
- St Andrews Road, south of Hume Highway overpass (refuge island).

2.6 Western Sydney Priority Growth Area

The subject site is located south east of the Western Sydney Priority Growth Area (refer to Figure 2.5). The Priority Growth Area is expected to significantly increase the population within the Campbelltown, Liverpool and Camden areas.

It is likely that the increase in population in the Priority Growth Area will in turn increase the traffic demand in the surrounding area.

Figure 2.5: Western Sydney Priority Growth Area



Source: Department of Planning and Environment (last visited in July 2017)

2.7 St Andrews Road Upgrade

The St Andrews Road intersection with Camden Valley Way has been signalled as part of the Camden Valley Way Upgrade, but there is no direct access from Camden Valley Way to the proposed site due to the disconnectivity of St Andrews Road in the vicinity of the water supply channel. In the long term, it is envisaged that St Andrews Road will relate to Campbelltown Road to the south and Camden Valley Way to the north. However, a schedule for this connection has not been published by the RMS and Campbelltown City Council.

2.8 Road Safety Review

The RMS provided a crash report for the five-year period between 1 July 2011 to 30 June 2016. The crash report was used to identify the frequency and contributory causes of crashes around the subject site. The dataset included all reported crashes that occurred on St Andrews Road, between St James Road and the Hume Motorway.

The following crash patterns have been identified:

- Three crashes have been reported on St Andrews Road, all of which were minor to moderate injury crashes.
- Two of these crashes (66%) involved single vehicles in straight path, off-road crashes that collided into a utility pole/tree/bush.
- One of these crashes (33%) involved a head-on collision between a car travelling southbound with a stationary truck in the opposite lane, while swerving to avoid hitting wildlife at night.

The most common crash type in St Andrews Road involved single-vehicle collisions with off-road objects. Of the two crashes of this description, one crash involved speed as a contributing factor.

2.9 Journey to Work Data

Table 2.1 provides a summary of the Bureau of Transport Statistics (BTS) Journey to Work (JTW) data from 2011.

Table 2.1: Existing Mode Share to and from Varroville (Travel Zone 3224)

Trips	Train	Bus	Car (Driver and Passenger)	Walked Only	Other	Total
Residents outbound work trips to other destinations	11%	1%	87%	1%	0%	100%
Workers inbound work trips from other destinations	1%	1%	93%	3%	2%	100%

It indicates that residents in the surrounding area travel to work predominately by car with an overall mode share of 87%, followed by public transport at 12%.

The majority of workers' inbound trips to Varroville are made by car with a mode share of 93%. This high level of car usage is attributed to the limited public transport facilities in the area. Only 2% of workers travel by train and bus.

3 Development Proposal

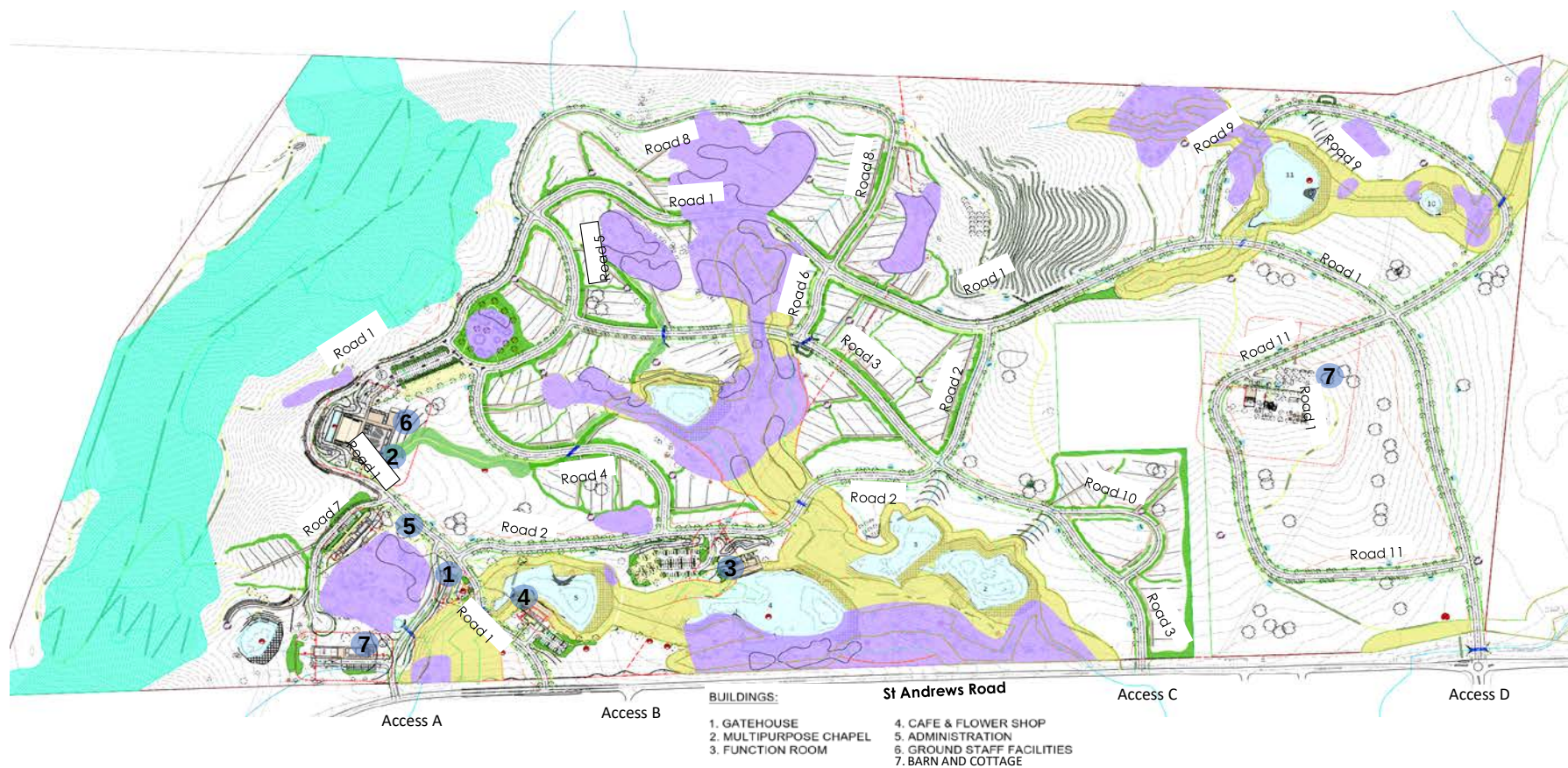
3.1 Overview

The development involves the transformation of the existing 113 ha site into a landscaped memorial park that would be developed on an “as needed” basis in 5-10 year increments. Ultimately the proposed development has the capacity to provide a total of 136,000 plots, to be developed over many years. Stage 1 development will provide burial capacity for the next 60 years.

Figure 3.1 presents the layout of the proposed development, with the internal roads numbered from 1 to 11. The design essentially involves the following features:

1. Gatehouse where funeral processions exchange paperwork and are led to the burial site.
2. Function room to welcome families after a funeral or service.
3. Multipurpose Chapel which can function as three small Chapels with a combined capacity to accommodate of 500 visitors.
4. Café and flower shop for cemetery and casual visitors.
5. Administration office for public enquires and administrative staff.
6. Mortuary facilities for funeral preparation, located close to the main Chapel.
7. Ground staff facilities with material and equipment storage.
8. Barn and Cottage (heritage buildings) to be restored and used as educational facilities, which may occasionally be manned by volunteers.

Figure 3.1: Proposed Site Layout



Source: Florence Jaquet Landscape Architect (8 August 2017)

3.2 External Access

Access to the site would be via St Andrews Road as shown in Figure 3.1, with suitable intersection treatments to be provided at each of the following access points (from north to south):

- Access A is a service road primarily for staff access to the ground facility. This intersection would allow full movements into and out of St Andrews Road.
- Access B connecting with Road 1 will be the main site access. As agreed with the RMS in the rezoning phase, this intersection will be provided in the form of a channelised right turn (CHR) treatment. A concept design has been developed for the proposed CHR layout in Figure 3.2 in accordance with Austroads Guide (2017). The layout involves road widening to enable a northbound through vehicle to pass a vehicle slowing to turn right into the site from St Andrews Road.
- Access C connecting with Road 3 will be the secondary site access as it will relieve some of the pressure, when necessary, at Access B. Given it is the first intersection that visitors will encounter when coming from the residential area in the south, they may use it in preference to Access B. Consequently, Access Point C may be limited to left in/left out.
- Access D connecting with Road 1 is located would emerge opposite the St Andrews Road/ Spitfire Drive roundabout. It is anticipated that this will not emerge onto St Andrews Road until after the completion of Masterplan Stage 1 (i.e. 2073). As St Andrews Road is likely to be upgraded to provide connection between Campbelltown Road and Camden Valley Way, the form of any intersection would be better decided at that time.

The available sight distance from Accesses A, B, C and D toward the north and south is obstructed by roadside vegetation, and does not currently meet the required Safe Intersection Sight Distance (SISD). This indicates inter-visibility is insufficient between approaching drivers on St Andrews Road (i.e. major road) and the vehicle driver exiting the site (i.e. minor road), meaning there is insufficient distance for a driver of a vehicle on St Andrews Road to observe a vehicle from the internal road approach moving into a collision situation, and to decelerate to a stop before reaching the collision point. The required SISD as specified in the Austroads Guide is:

- 151m in a road with a speed limit of 70km/h
- 181m in a road with a speed limit of 80km/h.

Relocation of the boundary treatments and trimming/ removal of the roadside vegetation will need to be undertaken to improve sight distance from the site accesses.

Pedestrian access towards the subject site is via St Andrews Road where existing crossing facilities are available at the Spitfire Drive roundabout and in the vicinity of the Hume Highway overpass. Additional crossing facilities in St Andrews Road are not

deemed necessary as the projected traffic volumes and the pedestrian volumes would not meet the RMS numeric warrants.

Figure 3.2: Concept Design of Access Road B – Channelised Right Turn Treatment (CHR)



Source: Austroads Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections (2017)

3.3 Internal Roads

The proposed widths of the internal roads have been designed in accordance with the Planning for Bushfire Protection specifications.

All two-way roads are provided with a minimum width of 6.5m (and up to 8.0m) based on the swept path analysis conducted with a 7.8m Medium Rigid Vehicle (MRV) Category 1 Tanker. This complies with the Planning for Bushfire Protection specifications and the NSW Rural Fire Services requirements.

One-way roads are 5.6m wide which are sufficient to allow a MRV to travel through bends at 10km/h. Although the trucks may cross into the parking lane by approximately 70mm, given all kerbs on site will be either flush or roll kerbs. This would allow any truck to mount the kerb for access should a car be parked directly on the bend.

As shown in Figure 3.3, the primary internal road will provide public access to the chapel from St Andrews Road (Access A). The width of primary internal roads (Roads 1, 7 and 11) would be 8m between kerbs, allowing two-way access and parallel parking

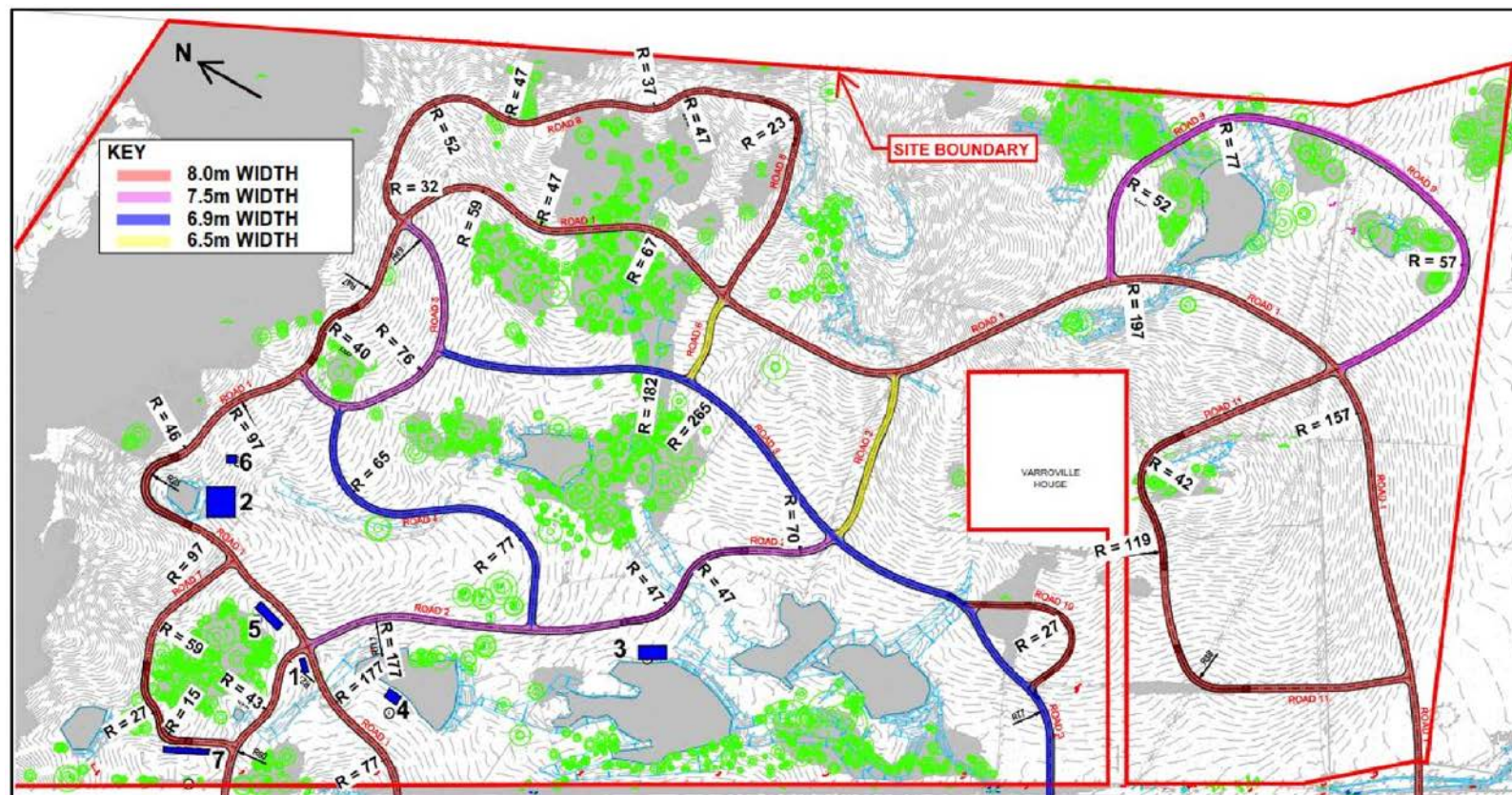
on both sides of the road. Roads 2, 5 and 9 would be 7.5m wide, also with parking permitted on both sides of the road.

The secondary roads include Roads 3 and 4 which are 6.9m wide, and Roads 2 and 6 which are 6.5m wide. Parking is also permitted on both sides of the roads.

Roads 8 and 10 are one-way roads with a width of 5.6m between kerbs, incorporate a 3.5m wide travel lane, and a 2.1m parking lane on one side of the road.

In the short term, vehicular access to the heritage buildings (Barn and Cottage) will be limited to be the existing driveway until the main road is built which will take into account the bushfire requirements. In the long term, a formal vehicular access would be provided with footpath routes placed within future roads corridors.

Figure 3.3: Proposed Road as per RFS Specifications



Source: Warren Smith & Partners (26 July 2017)

3.4 Parking Provision

A number of on-site car parks would be provided adjacent to each building within the site. The proposed parking provision is shown in Table 3.1.

Table 3.1: Car Park Provision

Building	GFA (m²)	Parking Provision
Multi function and catholic chapel building	750	198 (93 basement and 105 on grade)
Mortuary facilities	40	2
Function room	610	90
Flower shop/ café	275	20
Administration office	310	18
Ground staff facilities	637	12
Barn and Cottage	-	5
Total	2,622	345

The site would provide a total of 345 formal parking spaces within the internal car parks, plus kerbside parking spaces that are available throughout the site. Overall the site would provide plenty of parking opportunities within the site.

3.5 Number of Staff

Based on the information provided by the client, the proposed memorial park would require a workforce of 30-40 staff. A breakdown is shown below:

- Mortuary: at least 2 staff work stations
- Admin office: maximum of 10 staff
- Ground staff: initially 4 staff, expand to 12 staff
- Gatehouse: 3 employees + 1 funeral director
- Other facilities including chapel, function room and flower shop/ cafe: not specified but assume a total of 10 staff.

3.6 Opening Hours

Although not specified in the available information, memorial parks typically open from dawn until dusk, and the exact opening and closing times will vary with the seasons. This indicates that the staff arriving at work and departing from work predominantly occurs outside the network AM and PM peak hours as identified in Section 2.3.

3.7 Traffic Management

An internal road network has been proposed to allow access between facilities and graves within the site. The Masterplan indicates the following measures for traffic management within the development:

- All intersections within the subject site will be priority control with traffic on primary internal roads having high priority over secondary roads, except for the roundabout that provides access to the chapel and car parks.
- The primary internal roads will have their own material (e.g. concrete), whilst minor roads will be laid in a different material (e.g. asphalt).
- The intersection between primary and secondary internal roads will have a threshold treatment of natural stone set into the pavement, acting as a ‘rumble strip’ and marking the transition between these road types.
- The internal roads would be signposted at a maximum of 20km/h to produce a low speed environment.
- Wayfinding signage will be provided in the internal roads for directional guidance to various key locations within the cemetery including the chapels, mortuary, function hall, administration office and various car parks.

4 Parking Assessment

Parking will be provided through on site car parks as well as by means of kerbside parking in the internal road network. Two-way roads are proposed to provide parallel parking on both sides and one-way roads to provide parallel parking on one side.

The key parking generators of the proposed development consist:

- Flower shop (typically flowers are pre-ordered in-store, several days before attending a funeral).
- Three chapels that hold funerals and ceremonies with a combined seating capacity of 500.
- General visitation in the cemetery.
- Staff parking surrounding the offices and other work areas.

The function room is considered as ancillary to the proposed cemetery use as it would not generate parking demand on its own.

The assessment of parking provision is provided in Table 4.1. The Campbelltown Development Control Plan (2015) was used to determine some of the parking requirements at the subject site. A first principle approach was adopted where appropriate.

Table 4.1: Parking Assessment for Key Parking Generators

Key Parking Generator	GFA (m ²)	Parking Requirement		Parking Requirement	Proposed Parking Provision
		Campbelltown DCP Parking Rate	First Principle Approach		
Flower shop/ cafe	275 Assume the flower shop and cafe are 50%-50% in GFA	- Flower shop: 1 space per 25m² - Café: 1.5 spaces per 10m² - Assume 25% discount for multi-purpose parking	-	Flower shop: 6 Café: 20 Total: 20 (with 25% discount)	20
Chapels	750	-	- Maximum seating capacity 500 if chapels are combined for a single funeral - With a typical average of 2.5 people per car given people tend to travel in groups for funeral attendance	200	198
Cemetery	-	-	General visitors based on the Liverpool cemetery are	25	Car spaces

Key Parking Generator	GFA (m ²)	Parking Requirement		Parking Requirement	Proposed Parking Provision
		Campbelltown DCP Parking Rate	First Principle Approach		
			estimated to require 50 two-way trips (i.e. 25 vehicles) during the mid-day peak hour		can be provided kerbside
Offices and work areas	-	1 space per 25m ²	According to the Masterplan, a total of 26 staff will be working in the admin office, as ground staff and the gatehouse, and assuming 1 p/car	26	30
Barn and Cottage	-	-	- Say the expected visitation to the heritage buildings is some 10-15 people with a comfortable population density. - Typical average of 2.5 people per car given people tend to travel in groups for funeral attendance/ visitation.	5	5

These key parking generators would require 276 spaces and the provision of 253 spaces plus ample kerbside parking would sufficiently accommodate these parking needs. Any overflow parking that may occur when the chapels are used at full capacity, the parking demand could be accommodated by kerbside parking around the facilities within a walking distance of some 100m.

For other facilities within the proposed development, the parking needs and provision are discussed as follows:

- The **mortuary facilities** are expected to generate a small number of delivery vehicles per day, with typically one to two vehicles occurring concurrently. As such, the provision of two parking spaces is considered sufficient to accommodate the parking needs.
- The **function rooms** are designed to welcome families after a funeral or service, and therefore only a proportion of the family members/ visitors are required to be catered for. It is not anticipated that exclusive or additional trips would be generated by the function room itself. The function room has a capacity to accommodate 300 people, and thus the provision of 90 spaces (i.e. 45% of the 198 parking spaces provided for the chapels) is considered sufficient to accommodate the parking needs. In addition, family members/visitors may leave their cars at the car park adjacent to the chapel and join other peoples' cars (i.e. higher car occupancy) and reduce the parking demand associated with the use of the function room. Notwithstanding, any overflow parking can be provided on the kerbside along Road 2, within a short walking distance.

4.1.1 Parking Layout

The internal car parks have been designed in accordance with AS2890.1 Off-street Car Parking for the dimensional requirements in the bays and aisles for Class 3 Users (short term parking).

Class 3 requires an aisle width of 5.8m and spaces to have dimensions of 2.6m wide by 5.4m long. The minimum bay length is 4.8m if a 600mm clear overhang could be provided. The proposed bay lengths are in compliance to AS2890.1. Where low cover planting is proposed adjacent to the parking bays, 4.8m long bays are acceptable.

The car park review also assessed the following design elements:

- Provision for turning movements has been made for blind aisles in accordance with AS2890.1.
- All columns are located outside of the parking space design envelope.
- A 300mm clearance is provided if the bay is adjacent to a wall.

Accessible spaces are designed to include adjacent shared areas with dimensions 2.4m wide by 5.4m long and are in compliance with AS2890.6.

The ramp associated with the basement car park is to design will a maximum gradient of 16.7% (1 in 6) to be compliant with AS2890.1 for public car park. Sufficient headroom has been allowed to accommodate the design vehicle (e.g. hearse).

It is considered that the proposed parking layout generally complies with design requirements set out in the Australian Standard for car parking facilities in AS2890.1. Therefore, the proposed car park is satisfactory.

4.1.2 Service Vehicles

Given the nature of the subject development, a number of service vehicles are expected to access the site on regular basis for refuse collection and delivery to the mortuary facilities.

Service vehicles would enter the site via the main access at Access A and B. The internal roads would be of sufficient width to accommodate a fire truck with passing traffic (if any).

A swept path analysis has been undertaken for a hearse accessing the mortuary. Refer to Appendix A for the swept path analysis.

5 Traffic Assessment

This section assesses the potential traffic generation and impacts associated with the proposed development.

5.1 Estimated Mode Split

As discussed in Section 2.9, the JTW data (2011) shows the workers' mode of travel to travel zone 3224 was 93% by vehicles either as drivers or passengers. The utilisation of public transport was 1% for trains and 1% for buses.

Given the nature of the proposed land use, it is assumed all staff and visitor trips to and from the site would be solely dependent on vehicles as shown in Table 5.1, without utilising public transport services due to the low accessibility to public transport facilities.

Table 5.1: Estimated Mode Share to and from the Proposed Site

Trips	Train	Bus	Car (Driver and Passenger)	Walked Only	Other	Total
Workers inbound work trips from other destinations	0%	0%	100%	0%	0%	100%
Visitors inbound trips	0%	0%	100%	0%	0%	100%

A typical car occupancy rate of 2.5 people per vehicle has been adopted for analytical purposes. This rate is considered reasonable given the nature of the proposed land use as families and friends tend to travel together for grave visitation and funeral ceremonies.

5.2 Traffic Generation

There is currently no traffic generation guidance given within the RMS "*Guide to Traffic Generating Developments*" (2002) that outlines the traffic generation by cemeteries. However, the traffic generation can be determined through comparison with a similar site at the Liverpool and Rookwood Cemeteries where access to public transport is limited. Table 5.2 outlines their land size and chapel capacity as follows.

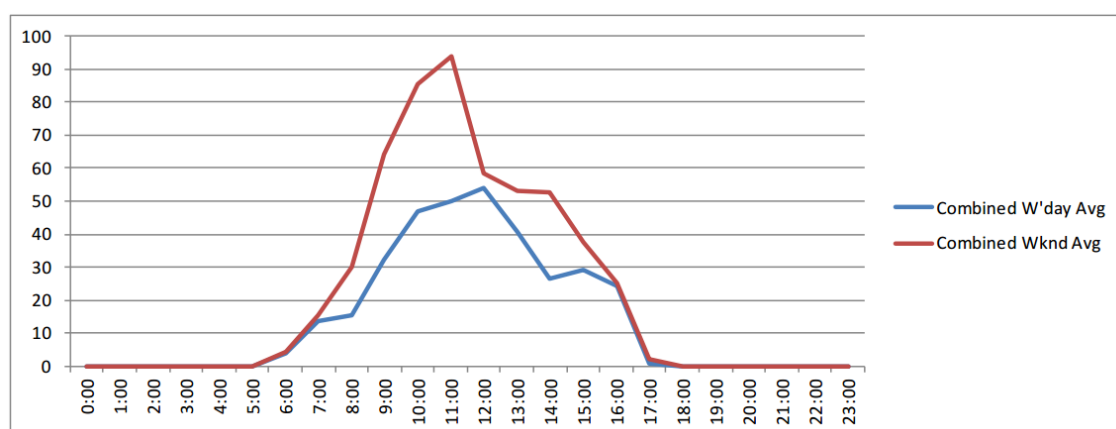
Table 5.2: Overview of the Similar Cemeteries and the Proposed Cemetery

Site	Size (Ha)	Burial Plots	Chapel Capacity
Liverpool Cemetery	8	24,000	Seated: 180 Standing: 70
Rookwood Cemetery	286	Unknown	Crematorium chapel 162 seats SACRED Heart 80 seats St Michaels 60 seats Mausoleum 200 seats Total: 502 seats
Macarthur Memorial Cemetery	27.5	29,384	Seated: 500

5.2.1 Sample Site: Liverpool Cemetery

A separate Traffic Impact Assessment undertaken by GTA Consultants provided traffic counts at the access points of the Liverpool Cemetery, as shown below in Figure 5.1.

Figure 5.1: Existing Two-way Traffic Volumes at Liverpool Cemetery



Source: GTA Consultants

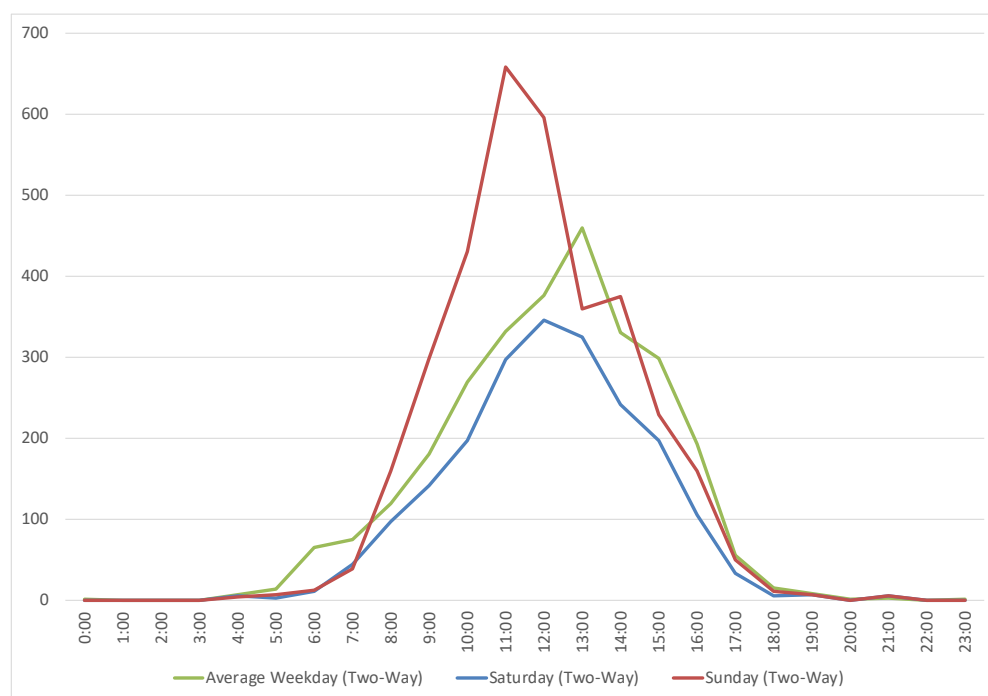
Traffic surveys undertaken at the Liverpool cemetery indicate the traffic generation was in the order of 30-40 trips during the network AM and PM peak hours. These traffic volumes would involve staff trips, service vehicle trips and grave visitation etc., before and after the busiest operational hours of the cemetery.

Typically, funeral ceremonies are held anytime between 10am and 2pm. This is demonstrated in Figure 5.1 where the site activity peak hour occurred between 12pm and 1pm, with 50-60 trips recorded. These traffic volumes would involve visitors to the graves, chapels and function room.

5.2.2 Sample Site: Rookwood Cemetery

TTPP undertook automatic tube counts at the access points of another cemetery with similar capacity in chapels. Figure 5.2 shows the two-way traffic movements at Rookwood Cemetery.

Figure 5.2: Existing Two-Way Traffic Volumes at Rookwood Cemetery



Traffic surveys undertaken at the Rookwood cemetery indicate the traffic generation was in the order of 460 trips during the site peak hour on an average weekday, and 660 trips on Sunday. These traffic volumes would involve visitors to the graves, chapels and function hall.

5.2.3 Macarthur Cemetery

5.2.3.1 Stage 1 Development

Weekday

Correlating Table 5.2 and Figure 5.1 enables a preliminary estimate using a pro-rata method for the likely traffic generation, based on the chapel capacity and number of burial plots in the Liverpool and Macarthur sites.

On this basis, the preliminary estimate of the traffic generation for mid-day peak hour is estimated to be:

- 73 trips (two-way) based on the rate derived using the number of burial plots, or

- 120 trips (two-way) based on the rate derived using the capacity of the chapels.

However, the above estimates are understated when compared with the estimates using the first principle approach which is discussed below:

- Assuming all 500 visitors attending the funeral(s) would arrive in private vehicles, with a car occupancy of 2.5 people per car, the chapel would generate 200 vehicles. Arrival trips would occur within an hour prior to the start of the funeral, and departure trips would occur over 1-2 hours after the event, depending on the length of the funeral ceremony and the length of stay at the function room after the funeral. This results in a total of 200 inbound trips and 80 outbound trips occurring during the first hour of the event (given the capacity of the function room is 60% of the chapels, thus 40% of the visitors are likely to leave the site). The remaining 120 outbound trips would leave the site during the second hour of the event.
- Given the Liverpool site generates 30-40 trips (two-way) during the network peak hours in relation to the staff and grave visitation trips. Projecting these trips based on the number of burial plots in the Liverpool site, it is estimated that 50 trips (two-way) may occur in relation to visitation at the graves and the flower shop for pre-ordering flowers days prior to attending a funeral. It is also assumed that these visitors would leave the site within one hour.
- Potential back-to-back funeral ceremonies would result in visitors' arrival and departure trips concentrating during a short time period for consecutive ceremonies. On this basis, it is estimated that 320 inbound and 80 outbound trips may occur during the site activity peak hour.

Comparing the pro-rate method and the first principle method, the higher, more conservative estimate is taken as 450 trips (345 trips inbound and 105 trips outbound) for the site activity peak hour that would occur around mid-day. In the subsequent hour, there would also be 450 trips (225 inbound and 225 outbound) as a result of the back to back funeral ceremonies. These estimates have been validated by the surveyed traffic volumes in Rookwood Cemetery (460 trips during site peak hour) and therefore are considered robust estimates in this traffic assessment. For the network AM and PM peak hours, it is estimated 50 trips (25 trips inbound and 25 trips outbound) would occur in relation to grave visitation and staff trips. This has been estimated based on the number of burial plots in the Liverpool and Macarthur sites.

Table 5.3 provides a summary of the weekday traffic generation.

Table 5.3: Weekday Traffic Generation

Peak Hour	Inbound	Outbound	Two-Way
AM Peak (Background Traffic)	25	25	50
AM Peak (Site Activity)	345	105	450
PM Peak (Site Activity)	225	225	450
PM Peak (Background Traffic)	25	25	50

Weekend

As the weekday traffic generation has been validated by the traffic survey undertaken at Rookwood Cemetery, the weekend traffic generation is estimated based upon the surveyed peak hour traffic volumes at the Rookwood Cemetery access points. Table 5.4 provides a summary of the weekend traffic generation. The peak hour traffic generation is in the order of 600 to 660 movements per hour on a Sunday.

Table 5.4: Weekend Traffic Generation

Peak Hour	Inbound	Outbound	Two-Way
AM Peak	350	310	660
PM Peak	270	330	600

5.2.3.2 Full Development

A total of 136,240 burial sites would be provided over the next 150 years so assuming the same traffic generating characteristics occurring in long term over that period, at worst the projected traffic generation by year 2163 would be:

- 232 trips during the network AM and PM peak hours, and 2,086 trips during the site activity peak hour around mid-day on a weekday.
- 3,060 trips during the network AM and PM peak hours, and 2,782 trips during the site activity peak hour around mid-day on a weekend.

However, these are overly conservative estimates given the capacity of the chapels would be unchanged over the years. Nevertheless, additional access points would be provided in the long term to disperse traffic in relieving some of the pressure at the northern main access (Access A).

5.2.3.3 Modelling Assumptions

For the purposes of traffic modelling, only Stage 1 development (to be developed by year 2073 or so) was assessed based on the following assumptions:

- A 10-year planning horizon is a realistic timeframe for the assessment, albeit the traffic generation considered the full total of 29,384 burial plots for the completion of stage 1 scheduled to complete in 2073.
- All vehicular trips associated with grave visitation, chapel attendance, staff arrival and departure to be superimposed on the relatively higher background traffic volume in the network AM and PM peak hours. The sum of the network AM and PM peak hour traffic volume and the mid-day traffic generation is considered a conservative approach to assess the operational conditions of the key intersections:

Weekday

- Superimpose 450 trips (345 inbound and 105 outbound) associated with chapel attendance and grave visitation to the network AM peak hour background traffic volumes.

Superimpose 450 trips (225 inbound and 225 outbound) associated with the grave visitation and the visitors' departure from the function room to the network PM peak hour background traffic volumes.

Weekend

- Superimpose 660 trips (350 inbound and 310 outbound) associated with chapel attendance and grave visitation to the network AM peak hour background traffic volumes.
- Superimpose 600 trips (270 inbound and 330 outbound) associated with the grave visitation and the visitors' departure from the function hall to the network PM peak hour background traffic volumes.
- In the absence of the intersection movement counts for the weekend, the background traffic volumes have been estimated based on the Sunday mid-block flows in St Andrews Road, and the weekday PM turning movements at the St Andrew Road/ Spitfire Drive intersection as shown in Section 2.3.
- Only one access point has been assessed so all site-related inbound and outbound traffic would be concentrated in the northern main access, without dispersing to other access locations.
- The surrounding network is assumed to be the same as per the existing conditions. Traffic forecast in relation to the potential future connection with Camden Valley Way is subject to RMS' detailed area wide modelling to appreciate the increase in through traffic, and is therefore beyond the scope of this assessment. Notwithstanding this, a sensitivity test has been carried out to determine the likely level of additional through traffic that could be loaded at

the key intersections with St Andrews Road while maintaining an acceptable level of service.

5.3 Traffic Distribution

Based on the wider road network, the following directional distributions have been assumed. These distributions represent the worst-case scenario:

- At the northern site access (Access A):
 - o 100% from the south at St Andrews Road
- At the Spitfire Drive roundabout:
 - o 70% from St Andrews Road
 - o 30% from Spitfire Drive

Figure 5.3 shows the estimated increase in turning movements near the subject site following Phase 1 Site Development.

Figure 5.3: Estimated Future Traffic Volumes (Weekday)

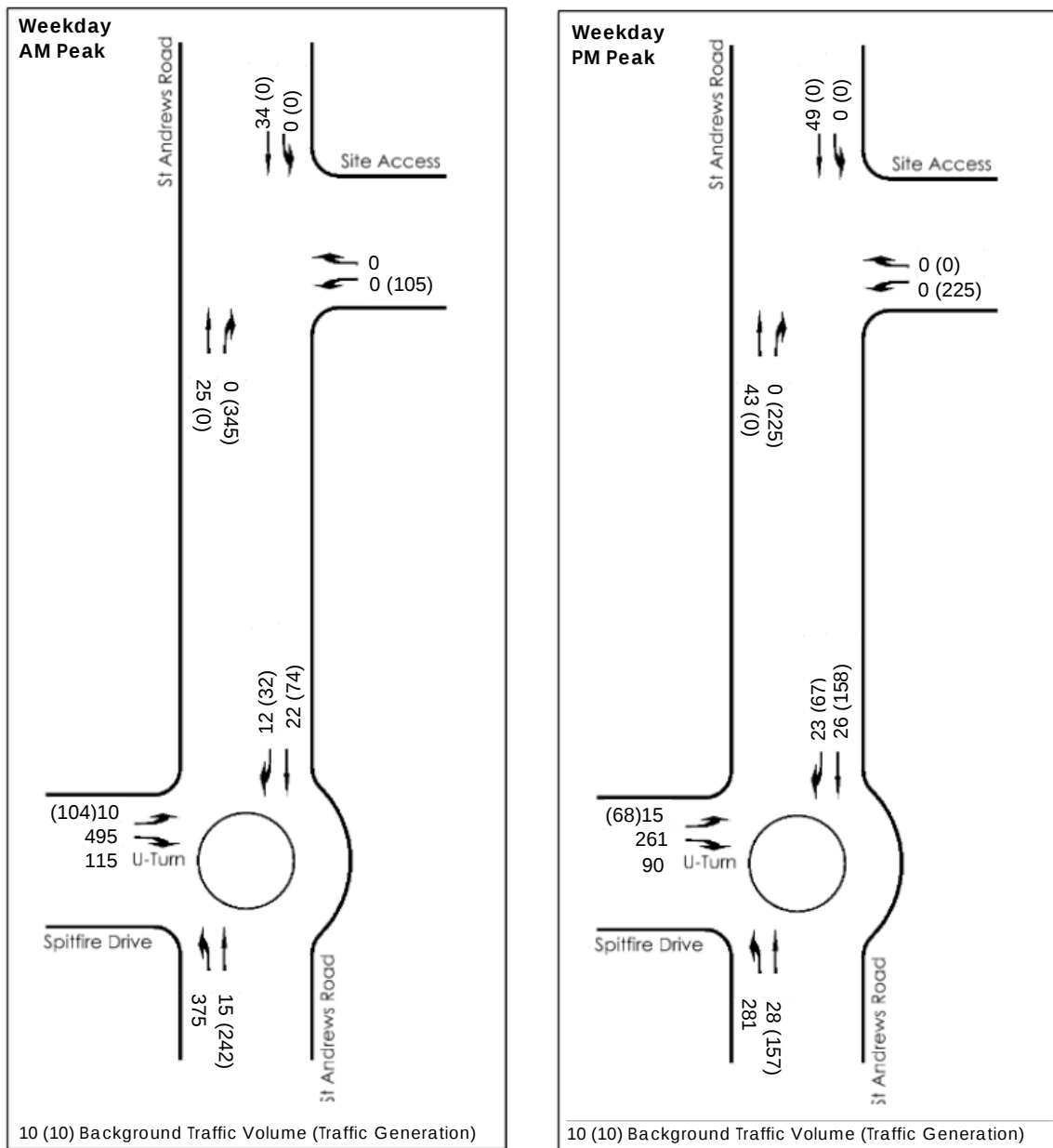
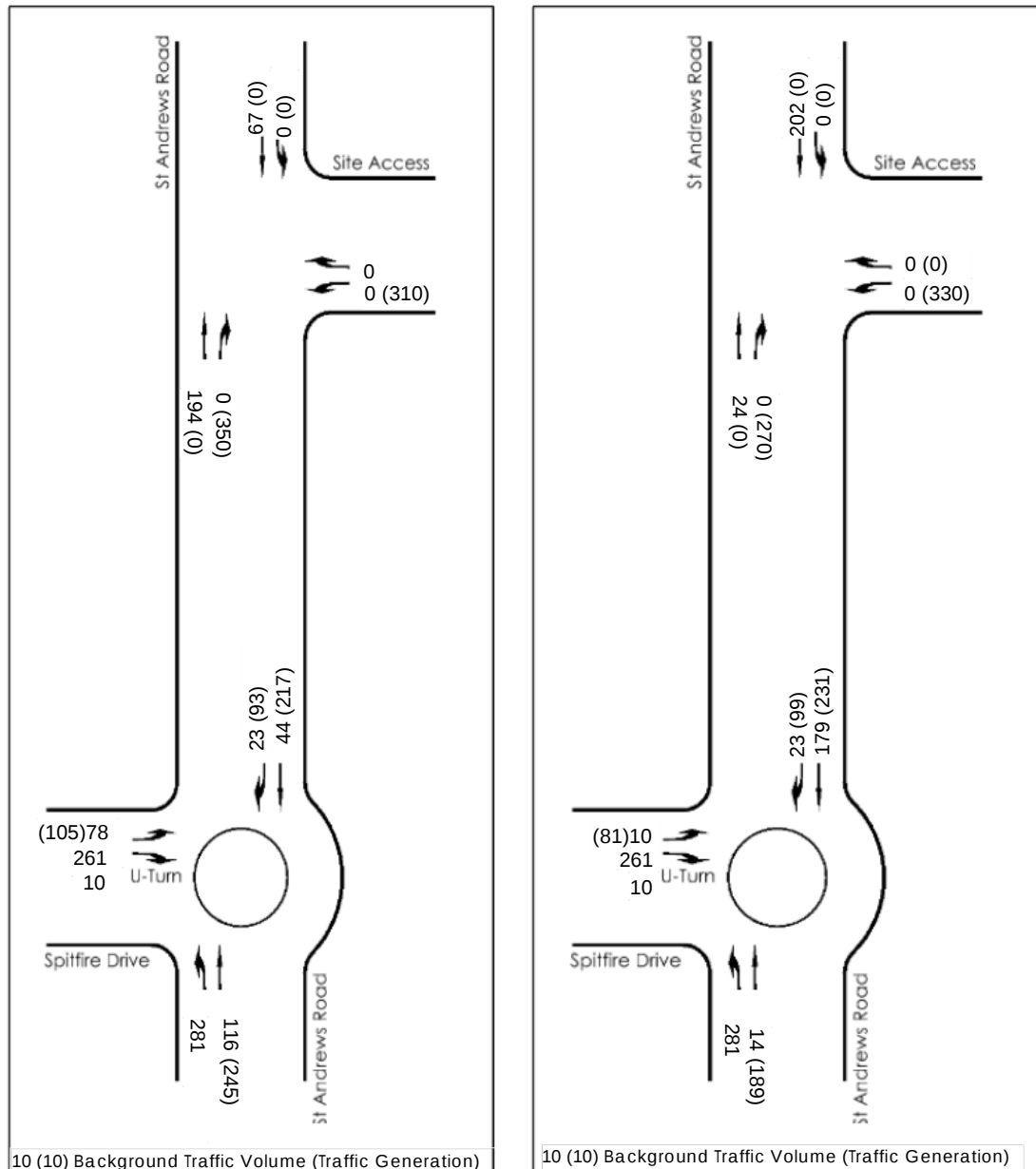


Figure 5.4: Estimated Future Traffic Volumes (Weekend)



5.4 Performance of Key Intersections

The operation of the key intersections has been assessed using SIDRA Intersection 7, a computer based modelling package which assesses intersection performance under prevailing traffic conditions.

5.4.1 Model Performance Indicators

SIDRA Intersection 7 modelling provides several useful indicators to determine the level of intersection performance.

5.4.1.1 Level of Service (LoS)

LoS is a basic performance parameter used to describe the operation of an intersection. Levels of service indicators range from A (indicating good intersection operation) to F (indicating over-saturated conditions with long delays and queues). At priority controlled (give-way and stop controlled) and roundabout intersections, the LoS is based on the modelled delay (seconds per vehicle) for the most delayed movement (refer to Table 5.5).

Table 5.5: Level of Service Criteria for Intersections

Level of Service	Average Delay (seconds per vehicle)	Traffic Signals, Roundabout	Give Way and Stop Signs
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	operating near capacity	near capacity and 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 71	unsatisfactory with excessive queuing	unsatisfactory with excessive queuing; requires other control mode

Source: RMS Guide to Traffic Generating Developments, 2002

5.4.1.2 Average Delay

Delay is the difference between interrupted and uninterrupted travel times through the intersection and is measured in seconds per vehicle. At priority controlled intersections and roundabouts, the average delay for the most delayed movement is usually reported.

5.4.2 Existing and Future Cases

Intersection analysis was conducted for the Spitfire Drive/ St Andrews Road intersection, operating under the existing and future conditions using the peak hour flows presented in Figure 2.2 and Figure 5.3. The newly created northern main access (Access A) was also assessed based on the estimated future traffic volumes presented in Figure 5.3. The analysis results for traffic conditions are presented in Table 5.6.

Table 5.6: Intersection Modelling Results

Weekday / Weekend	Intersection	Scenario	AM Peak Hour		PM Peak Hour	
			Delay (sec/veh)	Level of Service	Delay (sec/veh)	Level of Service
Weekday	Spitfire Drive/ St Andrews Road	Existing	10	A	8	A
		Future with development	12	A	8	A
	Northern Main Access	Future with development	8	A	7	A
Weekend	Spitfire Drive/ St Andrews Road	Existing	8	A	7	A
		Future with development	11	A	8	A
	Northern Main Access	Future with development	13	A	10	A

Note: Intersection delays and LoS for signalised intersections are based on average intersection delays, whilst priority controlled intersections and roundabouts are based on the highest average delay.

The analysis results indicate that the Spitfire Drive/ St Andrews Road roundabout currently operates satisfactorily at LoS A on both weekday and weekend, and it also has ample capacity to accommodate future traffic growth, including the subject development.

In the future case, both intersections would operate satisfactorily at LoS A on both weekday and weekend. The additional traffic associated with the proposed development would not adversely impact on the operational conditions.

5.4.3 Sensitivity Test

A sensitivity test was undertaken to determine how much through traffic could be loaded in the St Andrews Road intersections before the worst movement at any intersection would tip over to an unacceptable LoS E. The purpose of the sensitivity test is to determine whether these intersections could accommodate the potential traffic increase due to the connection with Camden Valley Way in a future year to be determined.

The analysis results for existing traffic conditions are presented in Table 5.7.

Table 5.7: Intersection Modelling Results – Sensitivity Test

Weekday / Weekend	Intersection	AM Peak Hour			PM Peak Hour		
		Additional Through Traffic in St Andrews Road	Delay (sec/veh)	Level of Service	Additional Through Traffic in St Andrews Road	Delay (sec/veh)	Level of Service
Weekday	Spitfire Drive/ St Andrews Road	360 vehicles northbound and 360 vehicles southbound	54	D	412 vehicles northbound and 412 vehicles southbound	14	A
	Northern Main Access		27	B		54	D
Weekend	Spitfire Drive/ St Andrews Road	323 vehicles northbound and 323 vehicles southbound	11	A	325 vehicles northbound and 325 vehicles southbound	11	A
	Northern Main Access		56	D		56	D

The sensitivity test result indicates up to 720 vehicles and 824 vehicles (two-way) could be added to St Andrews Road intersections in the weekday AM and PM peak hours respectively. For weekends, another 646 vehicles and 650 vehicles (two-way) could be added in the AM and PM peak hours, respectively.

Note that this is a conservative analysis considering the adopted site-related traffic volumes are higher than actual, because the site activity peak hour traffic generation that would occur around mid-day has been added to the background traffic volumes to represent the network AM and PM peak hour.

In reality, the practical capacity of the St Andrews Road intersections is expected to be sufficient to cater for even more traffic than anticipated above. More spare capacity would be available due to the reduction in background traffic (e.g. school traffic) during the weekday mid-day period, and similarly less site-related traffic would occur in the network AM and PM peak periods on weekdays.

6 Conclusions

This transport impact assessment report accompanies a development application for the proposed new memorial park located at 166-176 St Andrews Road, Varroville.

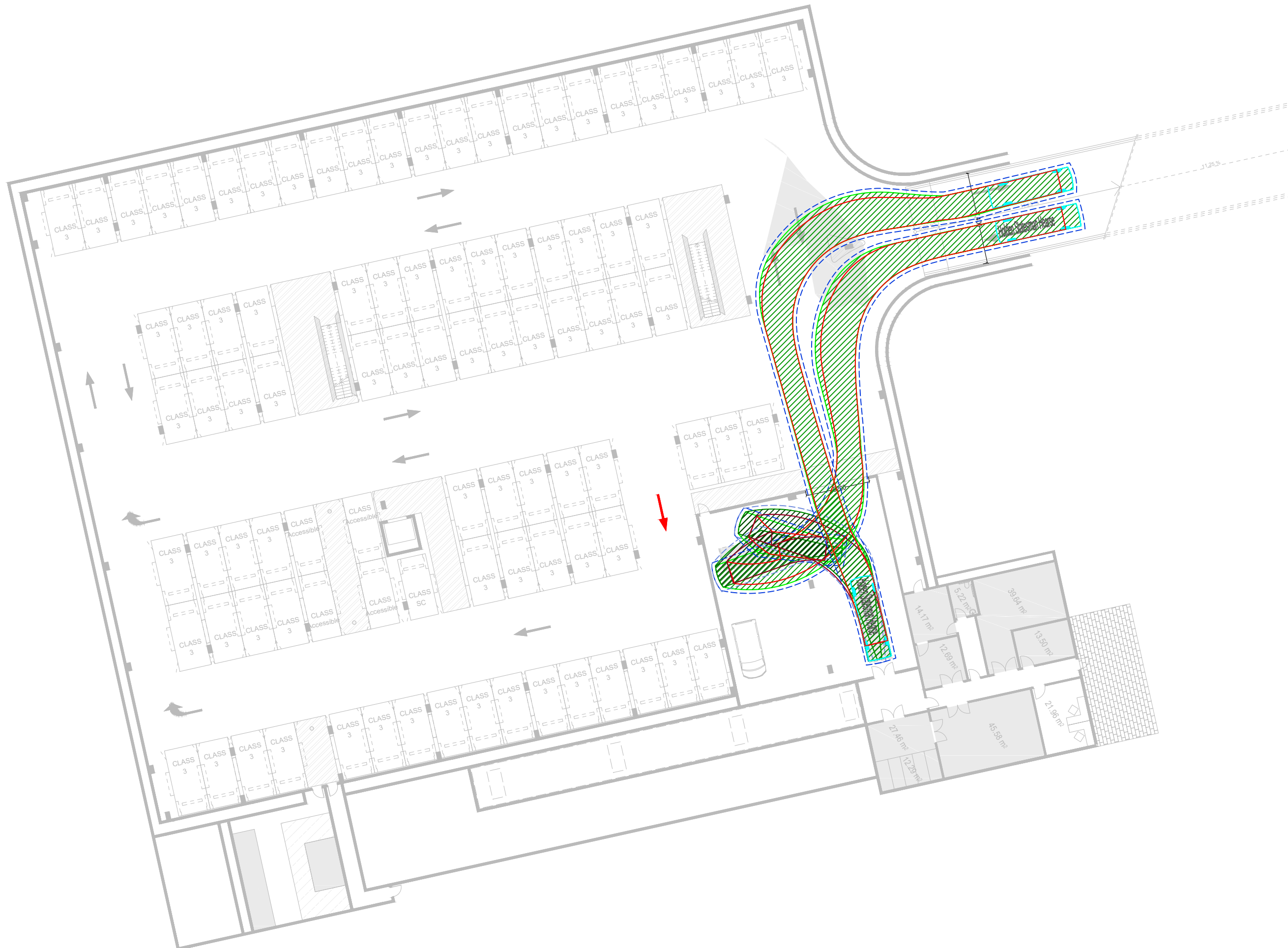
The key findings from this transport impact assessment are provided below:

- There is Insufficient SISD at the site access points because of roadside vegetation. Consideration should be given to trimming/ removal of the roadside vegetation to improve sight distance from the site accesses.
- Internal road widths satisfy NSW Rural Fire Services requirements as well as swept path analysis.
- There are sufficient internal car parking spaces and the availability of kerbside parking spaces provides excellent parking provision for people wanting to park alongside graves.
- Internal car parks will be designed in accordance with AS2890.1 and AS2890.6.
- Swept path analysis has shown that the proposed road widths are sufficient for service vehicles that regularly access the site.
- The newly created northern main access and the Spitfire Road/ St Andrews Road have sufficient capacity to accommodate the expected traffic volumes including the additional traffic associated with the proposed development in a worst-case scenario.
- The sensitivity test indicates these intersections could accommodate additional through traffic of up to 824 vehicles per hour on a weekday at the key intersections a worst-case scenario.
- This indicates the key intersections in their existing/proposed layouts would have spare capacity to cater for the traffic increase due to the potential upgrade of St Andrews Road to allow the northern connection with Camden Valley Road.
- Overall there will be no adverse traffic and parking implications associated with the proposal.

Appendix A

Swept Path Assessment

Filename: 16220DA09 CAR PARK REVIEW 170809.dwg Date: 9 August 2017 By: Lalaine Mahlan



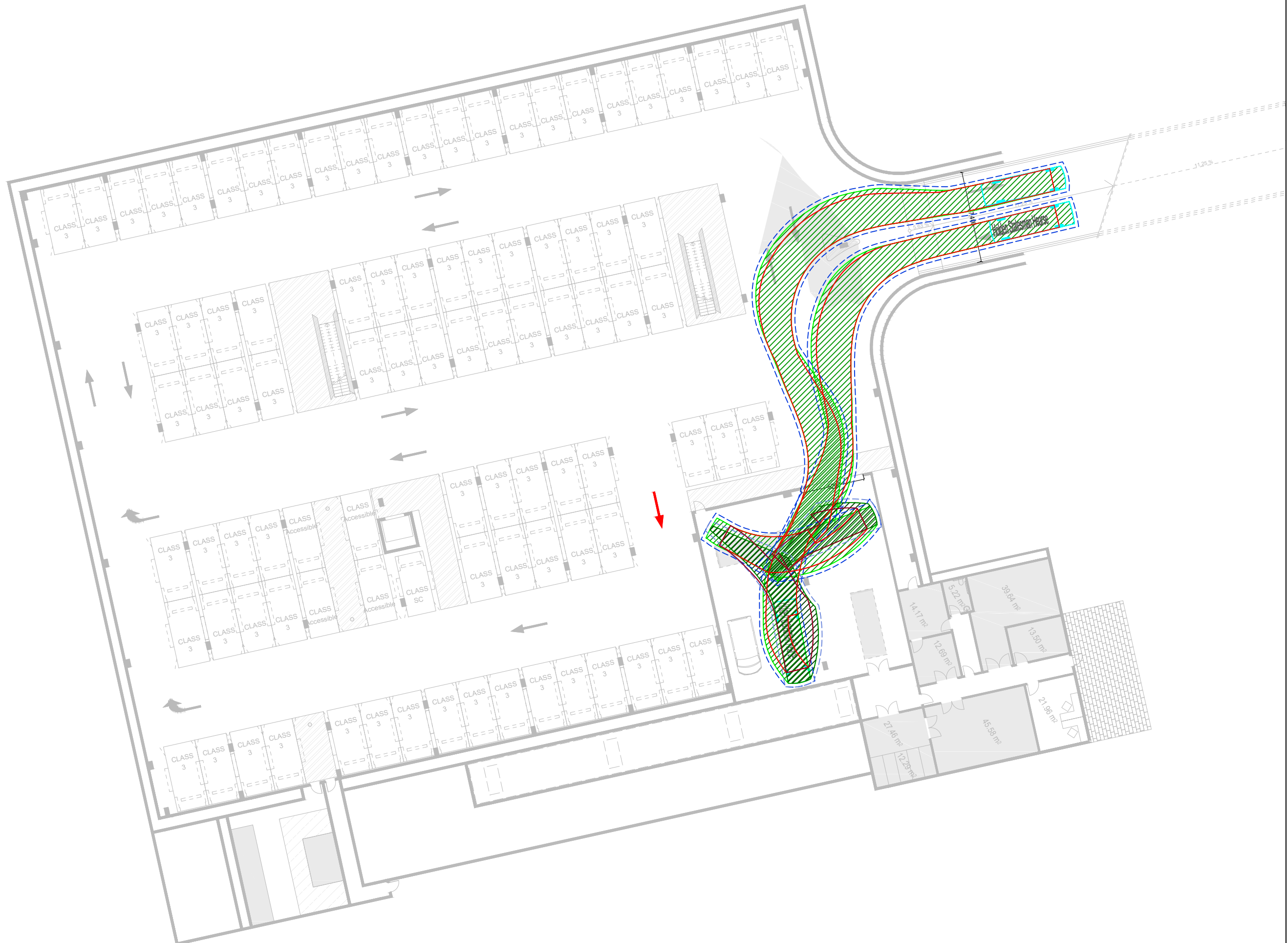
REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	LM	DL	KH	09/08/17

**The Transport
Planning Partnership**

Suite 402, 22 Alchison Street
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PROJECT	MACARTHUR MEMORIAL PARK			DWG No.	FIGURE 2	
TITLE	HOLDEN STATESMAN HEARSE SWEPT PATH			DATE STAMP	09 AUGUST 2017	
				PROJECT No.	SCALE	REV.
				16220	1:300 (@A3)	A

Filename: 16220DA09_CAR PARK REVIEW_170809.dwg Date: 9 August 2017 By: Lalaine Mahlan



REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	LM	DL	KH	09/08/17

**The Transport
Planning Partnership**

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PROJECT	MACARTHUR MEMORIAL PARK			DWG No.	FIGURE 3	
TITLE	HOLDEN STATESMAN HEARSE SWEPT PATH			DATE STAMP	09 AUGUST 2017	
PROJECT No.	16220	SCALE	1:300 (@A3)	REV.	A	

Appendix B

Traffic Survey (St Andrews Road)

Job No N3125
Client TTPP
Site St Andrews Rd - north of Spitfire rd
Location Varroville
Site No 1
Start Date 9-Jun-17
Description Volume Summary
Direction NB

Hour	Day of Week							W'Day	7 Day
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
Starting	12-Jun	13-Jun	14-Jun	15-Jun	16-Jun	17-Jun	18-Jun		
AM Peak	14	41	32	28	57	50	194	Ave	Ave
PM Peak	15	42	55	56	49	73	24	279	325
0:00	2	1	1	1	0	0	6	3	2
1:00	4	1	1	2	0	4	3	2	2
2:00	0	0	2	0	0	0	4	0	1
3:00	0	0	1	0	1	0	1	0	0
4:00	0	1	0	1	2	0	1	1	1
5:00	1	0	2	1	0	0	0	1	1
6:00	8	6	2	8	12	2	1	7	6
7:00	12	17	14	15	8	10	14	13	13
8:00	11	41	33	28	57	16	62	34	35
9:00	9	15	26	12	48	21	194	21	46
10:00	11	18	14	16	18	50	67	15	28
11:00	14	16	17	12	12	38	20	14	18
12:00	11	20	22	14	13	24	24	16	18
13:00	12	18	13	18	15	18	14	15	15
14:00	12	42	21	13	26	16	16	23	21
15:00	15	25	55	56	49	16	13	40	33
16:00	12	11	20	25	15	22	16	17	17
17:00	12	16	15	15	24	73	10	16	24
18:00	10	15	19	15	19	38	3	16	17
19:00	3	5	17	14	9	14	5	10	10
20:00	5	6	6	8	9	12	5	7	7
21:00	2	6	5	4	7	6	3	5	5
22:00	1	6	2	3	6	8	4	4	4
23:00	2	0	1	5	1	5	1	2	2
Total	169	284	309	286	346	393	487	279	325

Job No N3125
Client TTPP
Site St Andrews Rd - north of Spitfire rd
Location Varroville
Site No 1
Start Date 9-Jun-17
Description Volume Summary
Direction SB

Hour	Day of Week							W'Day	7 Day
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
Starting	12-Jun	13-Jun	14-Jun	15-Jun	16-Jun	17-Jun	18-Jun		
AM Peak	15	30	29	32	32	19	67	Ave	Ave
PM Peak	15	47	45	63	56	64	202	276	327
0:00	3	0	0	0	0	0	9	1	2
1:00	1	0	0	0	0	2	4	0	1
2:00	1	1	3	0	0	0	5	1	1
3:00	0	0	1	1	1	0	5	1	1
4:00	0	4	3	4	2	1	0	3	2
5:00	2	3	4	4	2	1	0	3	2
6:00	4	8	5	9	5	3	3	6	5
7:00	8	16	10	14	18	7	6	13	11
8:00	10	30	27	32	27	12	22	25	23
9:00	19	20	29	15	26	19	97	22	28
10:00	13	22	23	7	16	15	31	16	18
11:00	14	16	20	13	32	16	51	19	23
12:00	12	18	14	13	13	16	202	14	41
13:00	13	13	17	18	12	24	34	15	19
14:00	9	47	17	16	49	21	21	28	26
15:00	11	30	45	63	56	53	18	41	39
16:00	15	10	18	21	18	41	12	16	19
17:00	11	11	19	17	15	27	9	15	16
18:00	7	13	11	8	11	31	5	10	12
19:00	9	4	12	14	12	64	5	10	17
20:00	5	6	12	8	7	10	6	8	8
21:00	2	3	10	3	13	3	1	6	5
22:00	2	3	1	4	3	13	3	3	4
23:00	1	1	0	4	2	7	0	2	2
Total	172	279	301	288	340	388	519	276	327

Job No N3125
Client TTPP
Site St Andrews Rd - north of Spitfire rd
Location Varroville
Site No 1
Start Date 9-Jun-17
Description Volume Summary
Direction Combined

Hour	Day of Week							W'Day	7 Day
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
Starting	12-Jun	13-Jun	14-Jun	15-Jun	16-Jun	17-Jun	18-Jun		
AM Peak	28	71	60	60	84	65	263	Ave	Ave
PM Peak	27	89	100	119	105	100	226	555	652
0:00	5	1	1	1	0	0	15	2	3
1:00	5	1	1	2	0	6	7	2	3
2:00	1	1	5	0	0	0	9	1	2
3:00	0	0	2	1	2	0	6	1	2
4:00	0	5	3	5	4	1	1	3	3
5:00	3	3	6	5	2	1	0	4	3
6:00	12	14	7	17	17	5	4	13	11
7:00	20	33	24	29	26	17	20	26	24
8:00	21	71	60	60	84	28	84	59	58
9:00	28	35	55	27	69	40	263	43	74
10:00	24	40	37	23	34	65	98	32	46
11:00	28	32	37	25	44	54	71	33	42
12:00	23	38	36	27	26	40	226	30	59
13:00	25	29	30	36	27	42	48	29	34
14:00	21	89	38	29	75	39	37	50	47
15:00	26	55	100	119	105	69	31	81	72
16:00	27	21	38	46	33	63	28	33	37
17:00	23	27	34	32	39	100	19	31	39
18:00	17	28	30	23	30	69	8	26	29
19:00	12	9	29	28	21	78	10	20	27
20:00	10	12	18	16	16	22	11	14	15
21:00	4	9	15	7	20	9	4	11	10
22:00	3	9	3	7	9	21	7	6	8
23:00	3	1	1	9	3	12	1	3	4
Total	341	563	610	574	686	781	1006	555	652

Appendix C

Traffic Survey (Rookwood Cemetery)

Client TTPP
Site Rookwood - all access points
Location Rookwood
Site No 2
Start Date 9-Jun-17
Description Volume Summary
Direction INBOUND

Hour Starting	Day of Week							W/Day	7 Day
	Mon 12-Jun	Tue 13-Jun	Wed 14-Jun	Thu 15-Jun	Fri 16-Jun	Sat 17-Jun	Sun 18-Jun		
0:00	0	0	2	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	3	5	3	3	3	3	2	3	3
5:00	2	9	11	10	15	2	4	9	8
6:00	7	56	44	58	43	6	8	42	32
7:00	12	49	46	57	60	25	24	45	39
8:00	43	60	65	86	68	53	92	64	67
9:00	83	49	87	118	163	71	159	100	104
10:00	131	59	124	250	188	109	238	150	157
11:00	176	67	196	186	213	152	346	168	191
12:00	167	105	217	238	284	197	267	202	211
13:00	165	141	174	239	439	134	186	232	211
14:00	166	127	100	146	166	117	177	141	143
15:00	140	144	65	87	178	89	108	123	116
16:00	83	142	51	78	74	52	70	86	79
17:00	11	28	20	32	25	14	20	25	23
18:00	4	7	9	6	6	2	4	6	5
19:00	4	4	4	6	3	3	3	4	4
20:00	2	0	1	0	0	0	0	1	0
21:00	0	2	1	2	1	2	3	1	2
22:00	0	0	2	0	0	0	0	0	0
23:00	0	0	2	0	0	0	0	0	0
Total	1199	1054	1233	1602	1929	1031	1711	1403	1394

Client TTPP
Site Rookwood - all access points
Location Rookwood
Site No 2
Start Date 9-Jun-17
Description Volume Summary
Direction OUTBOUND

Hour Starting	Day of Week							W/Day	7 Day
	Mon 12-Jun	Tue 13-Jun	Wed 14-Jun	Thu 15-Jun	Fri 16-Jun	Sat 17-Jun	Sun 18-Jun		
0:00	0	0	2	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	3	5	3	3	3	3	2	3	3
5:00	2	4	8	5	6	1	3	5	4
6:00	5	33	21	29	27	5	4	23	18
7:00	9	28	39	36	38	19	15	30	26
8:00	29	59	59	76	53	44	68	55	55
9:00	78	56	79	97	93	70	139	81	87
10:00	123	70	118	175	109	88	193	119	125
11:00	153	81	145	216	229	145	312	165	183
12:00	163	95	168	208	234	149	326	174	192
13:00	166	183	241	247	305	191	173	228	215
14:00	173	154	147	199	273	124	198	189	181
15:00	143	203	105	149	278	108	121	176	158
16:00	105	105	65	103	158	53	90	107	97
17:00	21	35	34	36	28	20	30	11	29
18:00	5	10	11	7	10	3	7	9	8
19:00	4	3	4	8	3	4	4	4	4
20:00	2	0	0	0	0	0	0	0	0
21:00	0	2	3	2	2	3	2	2	2
22:00	0	0	1	0	0	0	0	0	0
23:00	0	0	2	0	0	0	0	0	0
Total	1186	1126	1255	1596	1849	1030	1689	1402	1390

Client TTPP
Site Rookwood - all access points
Location Rookwood
Site No 2
Start Date 9-Jun-17
Description Volume Summary
Direction TWO-WAY

Hour Starting	Day of Week							Ave W/Day	Ave 7 Day
	Mon 12-Jun	Tue 13-Jun	Wed 14-Jun	Thu 15-Jun	Fri 16-Jun	Sat 17-Jun	Sun 18-Jun		
0:00	0	0	4	0	0	0	0	1	1
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	6	10	6	6	6	6	4	7	6
5:00	4	13	19	15	21	3	7	14	12
6:00	12	89	65	87	70	11	12	65	49
7:00	21	77	85	93	98	44	39	75	65
8:00	72	119	124	162	121	97	160	120	122
9:00	161	105	166	215	256	141	298	181	192
10:00	254	129	242	425	297	197	431	269	282
11:00	329	148	341	402	442	297	658	332	374
12:00	330	200	385	446	518	346	595	376	401
13:00	331	324	415	486	744	325	359	460	426
14:00	339	281	247	345	439	241	375	330	324
15:00	283	347	170	236	456	197	229	298	274
16:00	188	247	116	181	232	105	160	193	176
17:00	34	63	63	68	53	34	50	56	52
18:00	9	17	20	13	16	5	11	15	13
19:00	8	7	8	14	6	7	7	9	8
20:00	4	0	1	0	0	0	0	1	1
21:00	0	4	4	4	3	5	5	3	4
22:00	0	0	3	0	0	0	0	1	0
23:00	0	0	4	0	0	0	0	1	1
Total	2385	2180	2488	3198	3778	2061	3400	2806	2784

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