

1 INTRODUCTION

onemilegrid has been requested by Kinglake Cemetery Trust to undertake a Transport Impact Assessment of the proposed cemetery at 265 Whittlesea-Kinglake Road, Kinglake Central.

As part of this assessment the subject site has been inspected with due consideration of the development proposal, traffic data has been sourced and relevant background reports have been reviewed.

Onemilegrid has previously prepared a Transport Impact Assessment for Kinglake Cemetery, which was submitted to VicRoads for review, prior the submission of a planning application.

VicRoads have since reviewed the previous Transport Impact Assessment and in response have raised a number of comments, as presented in Appendix C, which are addressed within this report and summarised directly later.

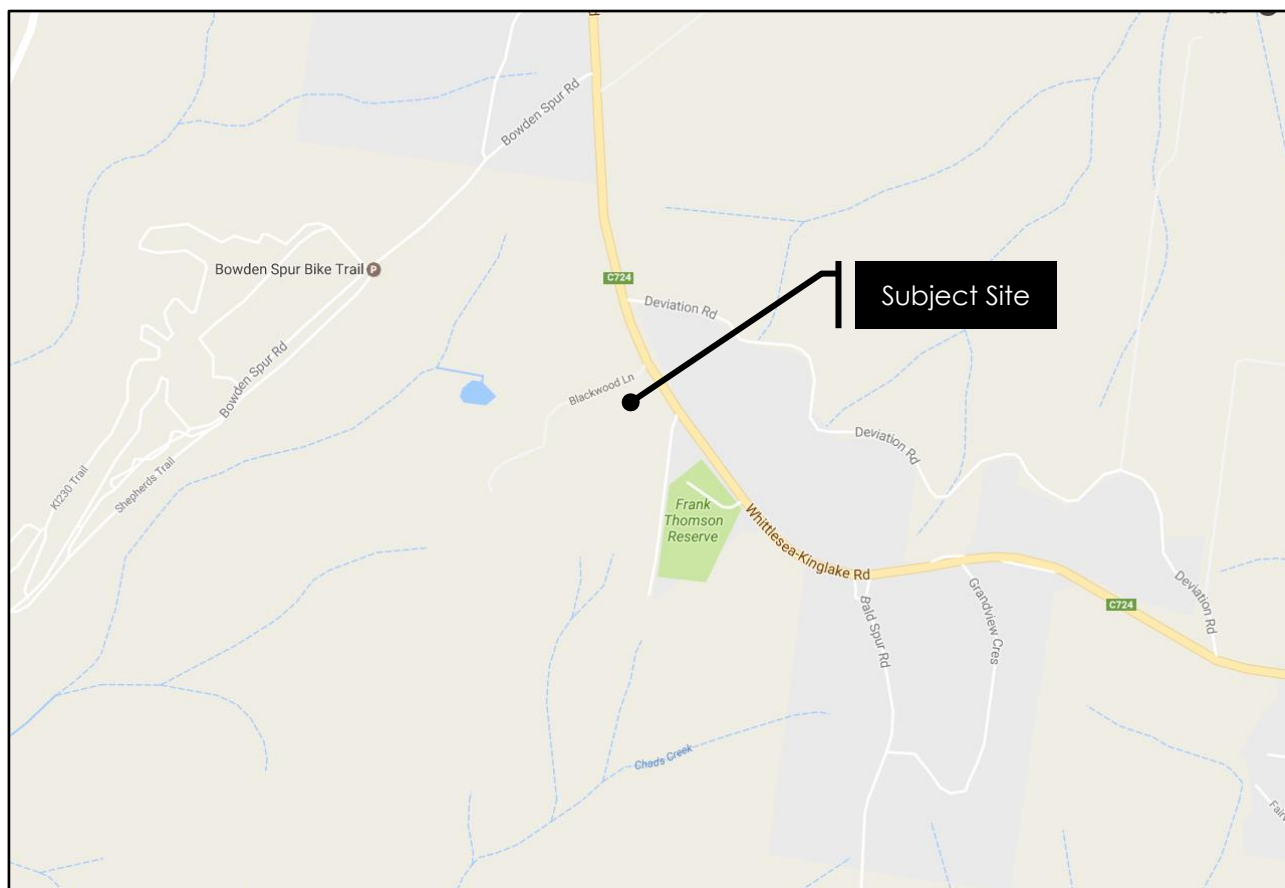
2 EXISTING CONDITIONS

2.1 Site Location

The subject site is located on the west side of Whittlesea-Kinglake Road, as shown in Figure 1. The subject site is currently vacant and has a frontage to Blackwood Lane.

Land use in the vicinity of the site is primarily farming along with residential uses to the east in Kinglake.

Figure 1 Site Location

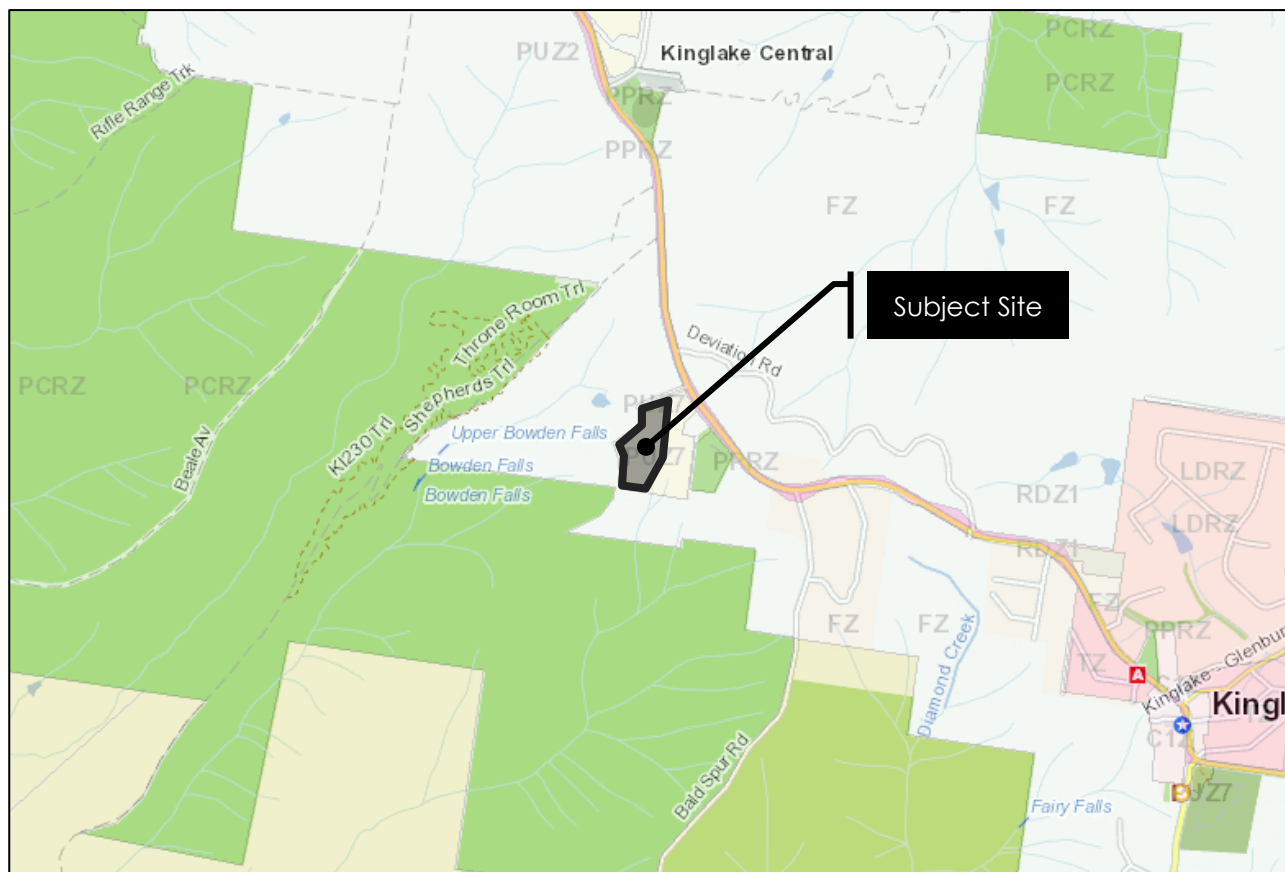


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2.2 Planning Zones

It is shown in Figure 2 that the site is located within a Public Use Zone (PUZ), for which the permitted uses are listed in Clause 36.01 of the Murrindindi Shire Planning Scheme.

Figure 2 Planning Scheme Zones



2.3 Road Network

Whittlesea-Kinglake Road is an arterial road generally aligned northeast-southwest, running between Kinglake in the southeast, and Whittlesea in the northwest. Whittlesea-Kinglake Road provides a single traffic lane in each direction adjacent to the site and an 80km/h speed limit applies to Whittlesea-Kinglake Road in the vicinity of the site.

Blackwood Lane is a mix of both public and private responsibility. The road is unsealed and generally aligned east-west, running from Whittlesea-Kinglake Road for approximately 400 metres south. Blackwood Lane provides a 3.5 metre wide unsealed roadway and the default 50km/h speed limit applies to Blackwood Lane for its entirety.

2.4 Existing Traffic Conditions

In order to ascertain accurate traffic data, **onemilegrid** commissioned Trans Traffic Surveys to conduct traffic movement counts for the intersection of Whittlesea-Kinglake Road and Blackwood Lane.

The counts were undertaken and recorded in 15-minute blocks on the following days and times:

Table 1 Turning Movement Survey Times

Day	Date	Time 1	Time 2
Thursday	01/12/2016	7:00am – 10:00am	3:00pm – 6:30pm
Sunday	04/12/2016	10:00am – 3:00pm	N/a

A summary of the peak hour counts for Thursday is shown in Figure 3 which was determined to occur between 8:30am and 9:30am in the morning and between 3:15pm and 4:15pm in the afternoon. Similarly, a summary of the peak hour counts for Sunday is shown in Figure 4 which was determined to occur between 10:45am and 11:45am in the morning and between 2:00pm and 3:00pm in the afternoon. It is noted that a Sunday survey was conducted due to VicRoads data showing the highest traffic volumes occurring on a Sunday.

As this survey was conducted in 2016, SCATS data was analysed in the vicinity of the site in order to attain a growth factor to reflect present day volumes. The general trend of SCATS data across multiple years indicated that traffic volumes were decreasing in the vicinity of the site. Therefore, as a conservative measure, traffic volumes obtained from the 2016 survey will be used for traffic analysis.

Figure 3 Existing Traffic Volumes – Thursday 1 December 2016

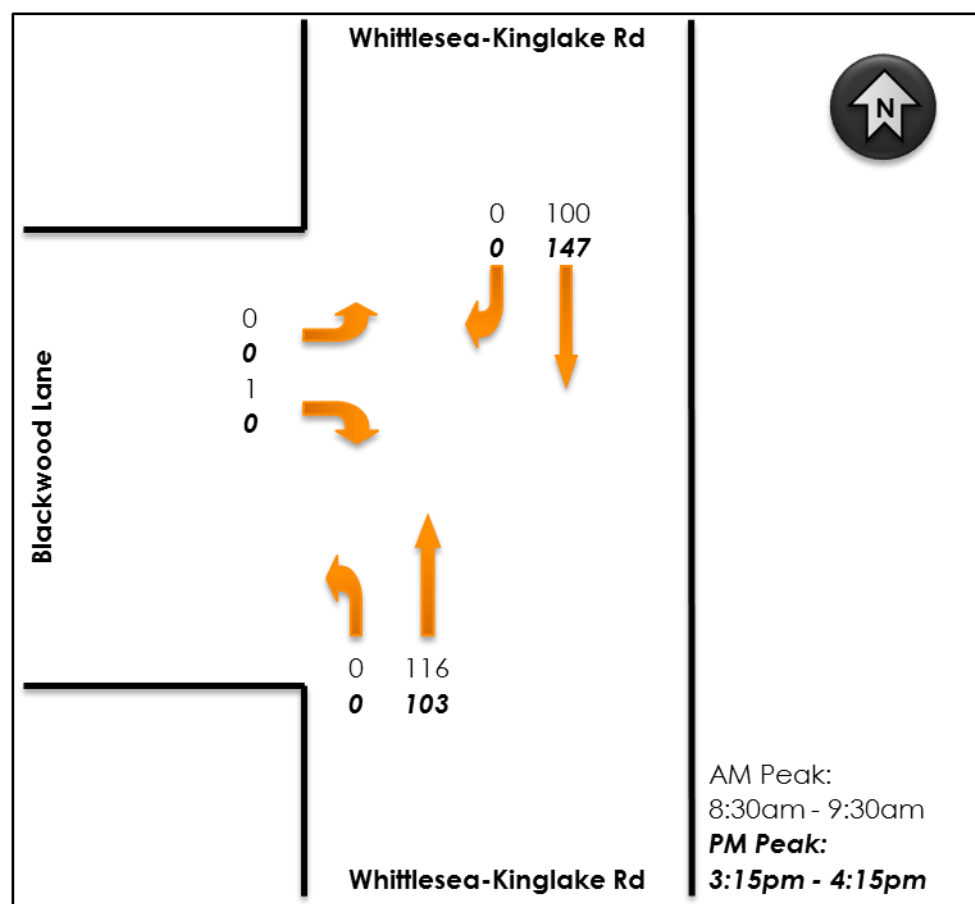
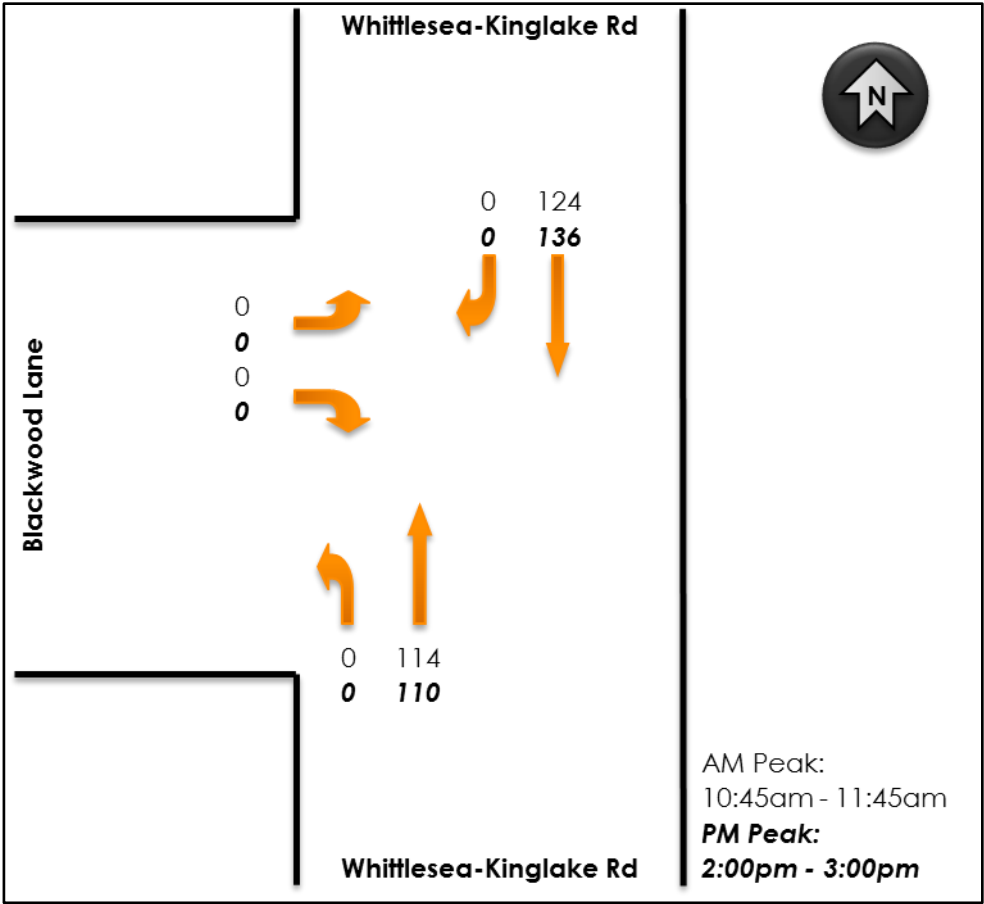


Figure 4 Existing Traffic Volumes – Sunday 4 December 2016



3 DEVELOPMENT PROPOSAL

3.1 General

It is proposed to develop the subject site for the purposes of a public cemetery. The cemetery will cater for a capacity for 5,350 burials and cremation lots on the subject site, to be undertaken in stages.

Vehicle access to the site is proposed via a one-way internal circulating road from Blackwood Lane, as shown below in Figure 5.

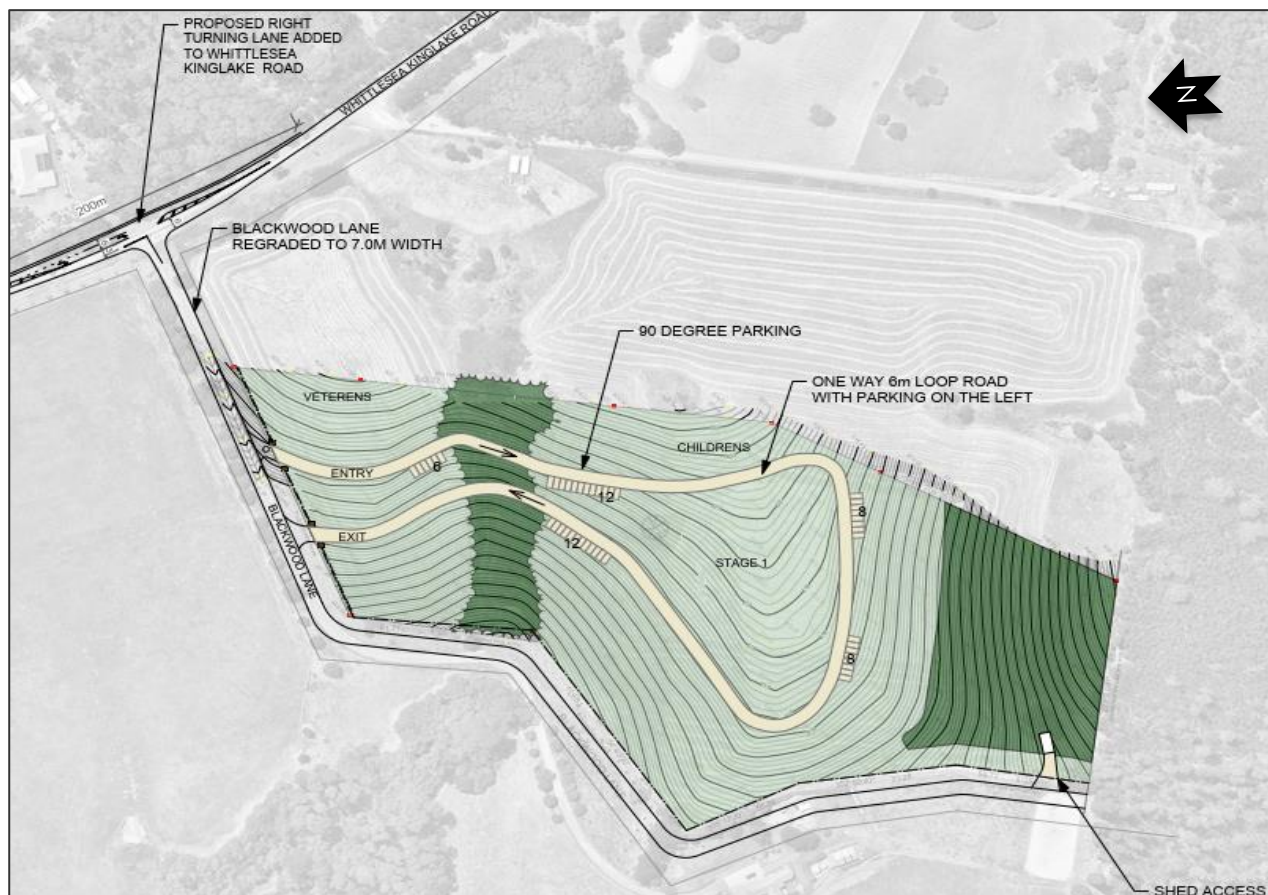
The internal road will have a carriageway width of 6 metres, an approximate length of 700 metres and will operate in a clockwise direction. It is proposed to provide 46 indented 90-degree parking spaces along the internal road. In addition, parallel parking will be permitted along the length of the internal roadway, outside the areas of the 90-degrees spaces, allowing for approximately 90 parking spaces. Therefore, a total of 136 spaces will be provided for the cemetery.

Access to an open garden shed at the western end of the site will be provided via a roadway diverging from Blackwood Lane.

Furthermore, it is proposed to provide a basic left turn treatment and a short channelised right turn treatment on Whittlesea-Kinglake Road at the intersection with Blackwood Lane.

It is understood that previously during the Planning Scheme Amendment C59 submission, a Bushfire Memorial and Multi-Purpose Facility were proposed to be constructed upon the adjacent lot, where access was to be provided via the cemetery's internal road. As advised by the applicant, the Bushfire Memorial has since been relocated within Thompsons Reserve to the east and the Multi-Purpose Facility proposal has been cancelled.

Figure 5 Internal Road Layout



3.2 Operation of Cemetery

The proposed operation of the Cemetery, as advised by the applicant, which is relevant to the traffic analyses undertaken, is outlined following:

- Initially it is anticipated that the Kinglake Cemetery, will cater for approximately 25-30 burials per year;
- In keeping with general Cemetery practice the Cemetery will be closed to visitation from sunset to sunrise (i.e. night time). The principal hours of operation will be between 9 am and 5 pm when public visitation might be expected. However, most burials will occur between 10 am and 4 pm;
- Generally, only one service would be held on any one day; and
- It is understood that the number of attendees at most burials is expected to be between 60 and 80. However for larger funerals, this number could increase to between 100 and 150.

For the purposes of traffic analyses, the following event scenarios have been considered:

- 'Large' Event = 100 attendees
- 'Extra-Large' Event = 150 attendees
- 'Extraordinary Large' Event = 200 attendees

4 BICYCLE PARKING CONSIDERATIONS

The bicycle parking requirements for the subject site are identified in Clause 52.34 of the Murrindindi Shire Planning Scheme. The Planning Scheme does not specifically refer to parking requirements for cemetery uses, therefore, no bicycle parking is required.

5 CAR PARKING CONSIDERATIONS

5.1 Statutory Car Parking Requirements – Clause 52.06

The car parking requirements for the subject site are identified in Clause 52.06 of the Murrindindi Shire Planning Scheme. The Planning Scheme does not specifically refer to parking requirements for cemetery uses, therefore, the parking provision must be to the satisfaction of the responsible authority.

To determine the anticipated parking demands of the proposal, the following parking demand assessment has been undertaken.

5.2 Car Parking Demand Assessment

To determine the car parking demands generated by the proposed development, a first principles assessment has been undertaken under the various design scenarios, based upon an assumed car occupancy rate of 2.0 persons per vehicle. The results of this assessment are summarised in Table 1 below and demonstrate that the anticipated maximum parking demand (up to 100 vehicles) is expected to be accommodated within the proposed level of provision (108 spaces).

Table 2 Anticipated Parking Demand

<i>Design Event</i>	<i>Number of Attendees</i>	<i>Anticipated Parking Demand</i>	<i>Proposed Parking Capacity</i>
'Large' Event	100 people	50 vehicles	136 vehicles
'Extra-large' Event	150 people	75 vehicles	
'Extraordinary' Event	200 people	100 vehicles	

In summary, the proposed level of on-site parking is anticipated to be more than adequate to cater for the expected demand, even under an 'extraordinary' event scenario.

5.3 Review of Car Parking Provision

It is proposed to provide a total of 136 car parking spaces to service the proposed development, which is in excess of the anticipated parking demand outlined above.

The provision of car parking is therefore considered to be appropriate to satisfy the parking demands generated by the development.

6 TRAFFIC CONSIDERATIONS

6.1 Traffic Generation

A first principles assessment of traffic generation of the proposed Cemetery has been undertaken to assess the traffic impact.

As outlined in the car parking assessment, it is assumed that the services generate parking demand at a rate 2.0 persons per vehicle. Furthermore, based on the proposed various design scenarios, it is assumed the following traffic will be generated preceding the service and proceeding will occur within the same hour interval.

<i>Design Event</i>	<i>Number of Attendees</i>	<i>Anticipated Parking Demand</i>	<i>Traffic Generation Rate</i>
'Large' Event	100 people	50 vehicles	0.83 per vehicle/minute
'Extra-large' Event	150 people	75 vehicles	1.25 per vehicle/minute
'Extraordinary' Event	200 people	100 vehicles	1.67 per vehicle/minute

6.2 Traffic Distribution

Three churches are located within the surrounding area to the cemetery, which are expected to provide the funeral service prior to the burial service occurring at the cemetery.

- St Peter's Anglican Church, Kinglake – Approximately 600m southeast
- St Mary's Church, Kinglake - Approximately 1.8km southeast; and
- Uniting Church, Kinglake West – Approximately 9.0 km northwest.

As advised by the applicant, majority of services are expected to occur at the at the St Peter's Anglican Church and St Mary's Church, therefore it has been assumed that traffic is distributed as below.

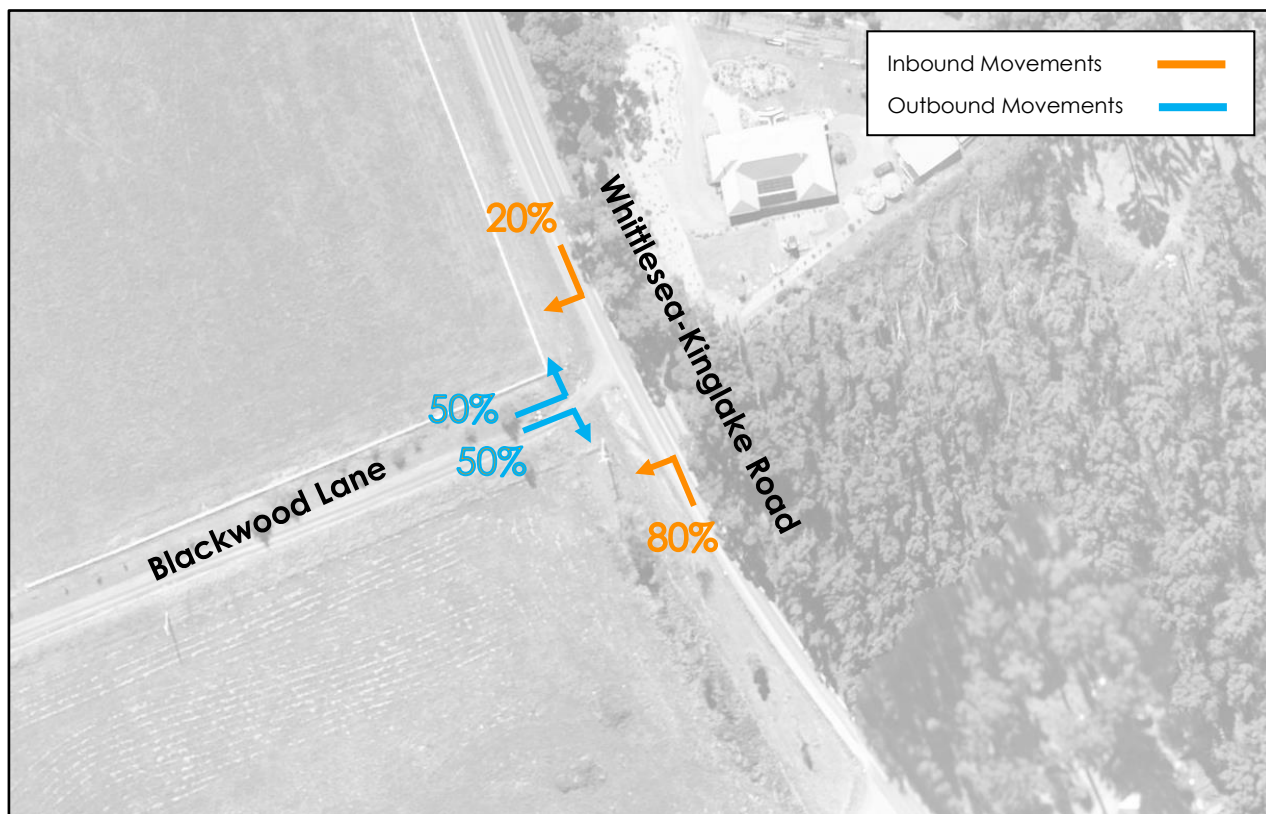
- 20% of the traffic movements to the site will be eastbound and 80% westbound.
- Traffic movements from the site will be distributed evenly to the east and west.

The peak hour traffic generated by the cemetery is distributed along Whittlesea-Kinglake Road as shown in Table 3 and a visual representation of the traffic distribution is shown in Figure 6.

Table 3 Anticipated Peak Hour Traffic Distribution

<i>Scenario</i>	<i>Inbound Movements</i>		<i>Outbound Movements</i>	
	Eastbound	Westbound	Eastbound	Westbound
'Large' Event	10	40	25	25
'Extra-Large' Event	15	60	37	38
'Extraordinary Large' Event	20	80	50	50

Figure 6 Traffic Distribution



6.3 Traffic Impact

As noted in Section 3.2, there are three design scenarios of site operation that have been proposed including:

- 'Large' Event = 100 attendees
- 'Extra-Large' Event = 150 attendees
- 'Extraordinary Large' Event = 200 attendees

In order to provide a conservative assessment, only the impact of the 'Extraordinary Large' event has been assessed.

To assess the existing operation of the site access points, the anticipated 'Extraordinary Large' post-development traffic volumes have been input into SIDRA Intersection, a traffic modelling software package.

The SIDRA Intersection software package has been developed to provide information on the capacity of an intersection with regard to a number of parameters. Those parameters considered relevant are, Degree of Saturation (DoS), 95th Percentile Queue, and Average Delay as described in Table 4 below.

It is further conservatively assumed that the inbound movements prior to the burial service and the outbound movements following will occur within the same hour.

Table 4 SIDRA Intersection Parameters

Parameter	Description
Degree of Saturation (DoS)	The DoS represents the ratio of the traffic volume making a particular movement compared to the maximum capacity for that particular movement. The value of the DoS has a corresponding rating depending on the ratio as shown below.

The anticipated post-development site access intersection operating conditions are outlined in Table 5 below.

Table 5 Whittlesea-Kinglake Road / Blackmore Lane – Future Conditions

<i>Approach</i>	<i>DoS</i>	<i>Avg. Delay (sec)</i>	<i>Queue (m)</i>
Weekday AM Peak			
Whittlesea-Kinglake Road (east)	0.110	2.3	0.0
Whittlesea-Kinglake Road (west)	0.070	2.9	1.0
Blackwood Lane	0.089	6.3	2.3
Weekday PM Peak			
Whittlesea-Kinglake Road (east)	0.103	2.4	0.0
Whittlesea-Kinglake Road (west)	0.096	0.8	1.1
Blackwood Lane	0.090	6.3	2.3
Sunday AM Peak			
Whittlesea-Kinglake Road (east)	0.109	2.3	0.0
Whittlesea-Kinglake Road (west)	0.083	1.0	1.1
Blackwood Lane	0.090	6.3	2.3
Sunday PM Peak			
Whittlesea-Kinglake Road (east)	0.107	2.3	0.0
Whittlesea-Kinglake Road (west)	0.090	0.9	1.1
Blackwood Lane	0.090	6.3	2.3

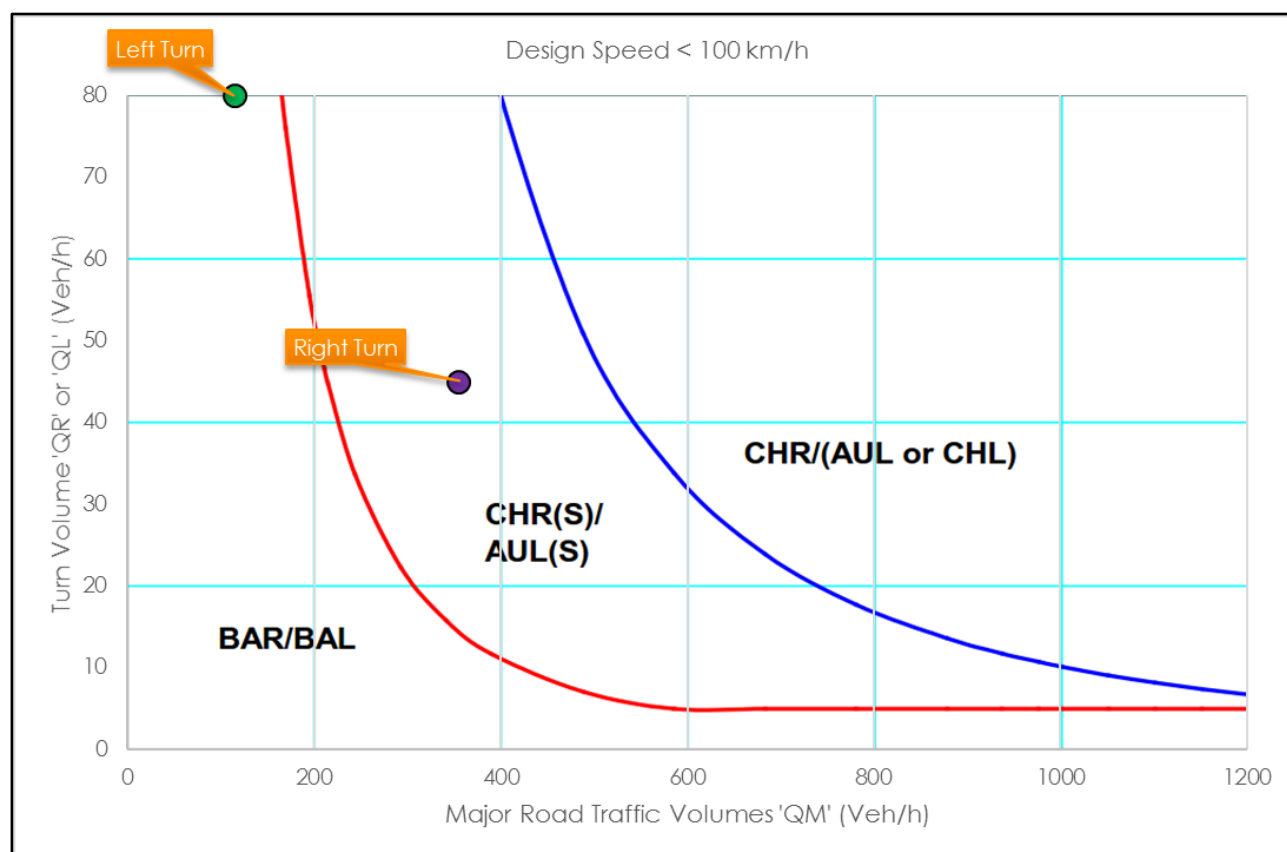
The analysis shows that the intersection is expected to operate under 'excellent' conditions with minimal queues and delays on each leg.

6.4 Austroads Turn Lane Warrants

In determining an appropriate configuration and requirement for mitigation works at the intersection of the primary site access with Blackwood Lane via Whittlesea-Kinglake Road, reference is made to the *Austroads Guide for Road Design Part 4A: Unsignalised and Signalised Intersections* which outlines what physical form of turn treatment will provide an appropriate level of safety at priority controlled intersections, balanced with additional construction costs associated with higher level treatments.

A review of the warrants for Basic, Auxiliary and Channelised turn treatments has been undertaken with the results of the assessment demonstrated within Figure 7.

Figure 7 Turn Lane Warrants – Design Speed < 100 km/h



The turn lane warrants are within the range for a basic left turn treatment and a short channelised right turn treatment to be provided on Whittlesea-Kinglake Road.

Examples of these treatments are provided in Figure 8 and Figure 9 below.

Figure 8 Rural Basic BAL Turn Treatment

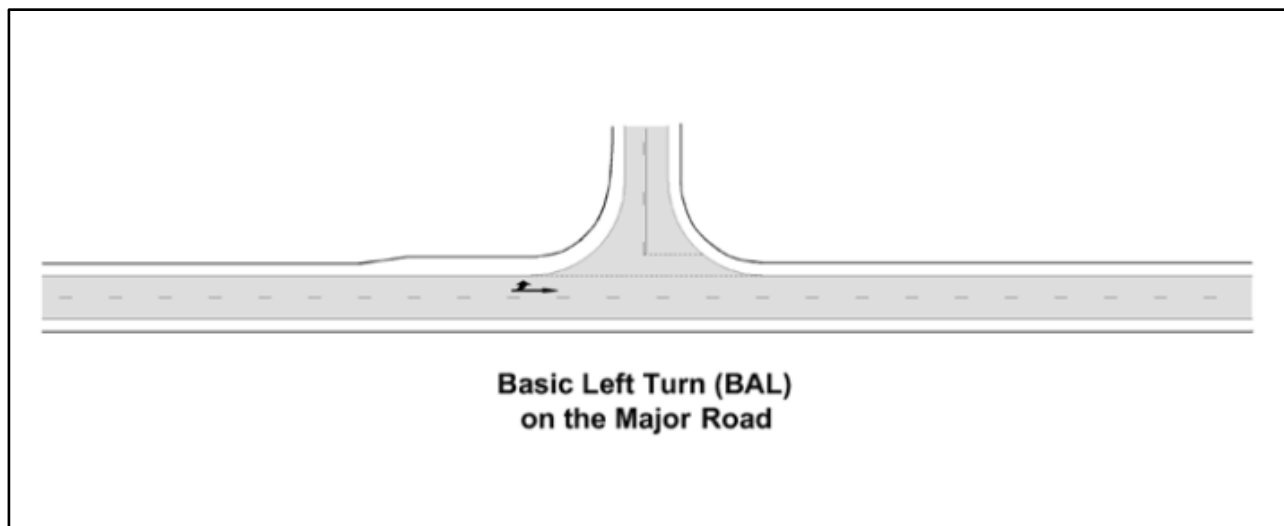
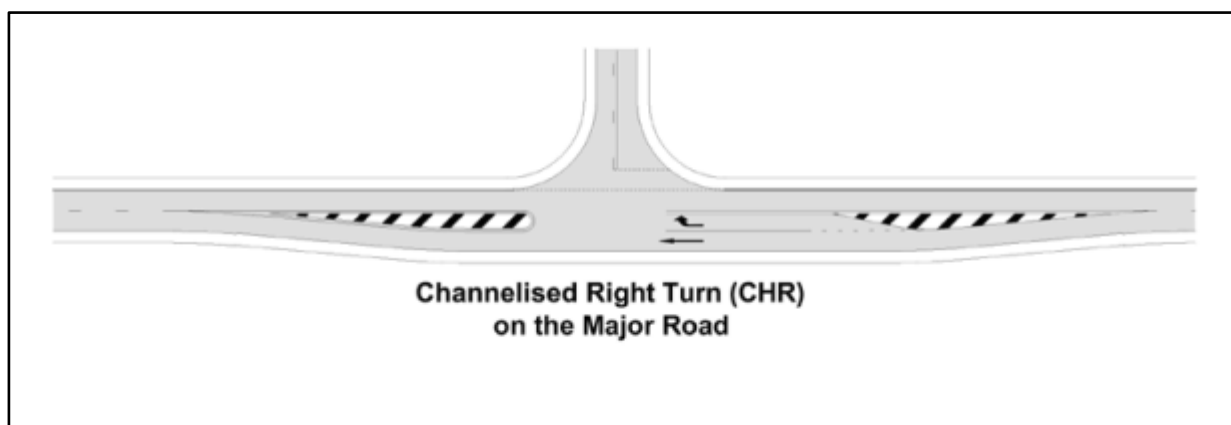


Figure 9 Rural Channelised CHR Turn Treatment



It is noted that the general Kinglake area is susceptible to heavy fog conditions throughout the year, which can impact upon motorists utilising the road network. In order to address such prevailing climate conditions in the vicinity of the site, it is proposed to provide intersection warning signage as part of the mitigating works at the intersection of Blackwood Road / Whittlesea-Kinglake Road, appropriately at both northwest and southeast approaches, to encourage motorists to drive in a manner that is appropriate to the conditions.

6.5 Austroads Sight Distance Requirements

The Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections also includes requirements for the Safe Intersection Sight Distance (SISD) which is the minimum sight distance that should be provided on the major road to any intersection, and the Minimum Gap Sight Distance (MGSD) which is the minimum sight distance that allows vehicles sufficient time to execute crossing or turning manoeuvres at any intersection.

Sight distance measurements at the Whittlesea-Kinglake Road and Blackwood Lane were undertaken on Friday 3rd February 2017 with the following observations:

- The sight distance northwest of the Blackwood Road / Whittlesea-Kinglake Road intersection is unrestricted for a distance of approximately 300 metres;
- The sight distance for a driver of a vehicle approaching northbound on Whittlesea-Kinglake Road to Blackwood Road was measured at 222 metres; and
- The sight distance for a driver of a vehicle executing a right-hand turn from Whittlesea-Kinglake Road to Blackwood Road was measured at 159 metres.

The measurements taken are as shown in the aerial photo seen in Figure 10 below.

It is to be noted that sight distance measurements have not changed since 2017.

Figure 10 Sight distance Measurements – Friday 3rd October 2017



The SISD provides sufficient distance for a driver of a vehicle on the major road to observe a vehicle on a minor road (subject site access) moving into a collision situation and to decelerate to a stop before reaching the collision point.

The SISD for Whittlesea-Kinglake Road (80km/h) is listed within Table 3.2 of Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections as 181m.

The sight distance in excess of 300m to the northwest is considered satisfactory. Furthermore, with a measured sight distance of 222m to the southeast, drivers are considered to have sufficient sight lines for vehicles exiting Blackwood Lane to meet the requirements for SISD. A view to the west on Whittlesea-Kinglake Road from the approximate sight distance to Blackwood Lane is provided below in Figure 11.

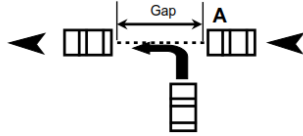
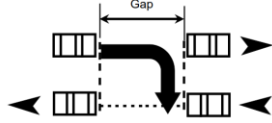
Figure 11 Sight Distance from Whittlesea-Kinglake Road to Blackwood Lane



The MGSD provides sufficient critical acceptance gap times for drivers to execute various manoeuvres into, from and across various through carriageway widths for both one-way and two-way traffic.

The critical acceptance gaps and follow-up head ways are listed within Table 3.4 of Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections as below in Table 6.

Table 6 Critical Acceptance Gaps and Follow-Up Headways

Movement	Diagram	Description	T_a	T_f
Left-hand turn		Not interfering with A	14-40 sec	2-3 sec
		Requiring A to slow	5 sec	2-3 sec
Right-hand turn		Across one lane	4 sec	2 sec

Note: t_a = critical acceptance gap and t_f = follow up headway

The MGSD for Whittlesea-Kinglake Road (80km/h) is listed within Table 3.5 of Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections, which for a MGSD of 159m, allows a critical gap of at least 7 seconds.

Figure 12 Table of MGSD (metres) for various speeds

Critical gap acceptance time (ta) (secs)	85th percentile speed of approaching vehicle (km/h)										
	10	20	30	40	50	60	70	80	90	100	110
4	11	22	33	44	55	67	78	89	100	111	122
5	14	28	42	55	69	83	97	111	125	139	153
6	17	33	50	67	83	100	117	133	150	167	183
7	19	39	58	78	97	117	136	155	175	194	214
8	22	44	67	89	111	133	155	178	200	222	244
9	25	50	75	100	125	150	175	200	225	250	275
10	28	56	83	111	139	167	194	222	250	278	305

The critical gap acceptance time of 7 seconds is available at the Whittlesea-Kinglake Road and Blackwood Lane intersection, allowing for vehicles to safely execute left and right-hand turns, demonstrating sufficient sight lines.

7 RESPONSE TO VICROADS TIA REVIEW

onemilegrid has reviewed the traffic and parking related comments provided by VicRoads review of the proposed development and provides the responses in Table 7 to the direct comments. The VicRoads review is shown attached within Appendix C.

Table 7 VicRoads Review Response

Comment Number	Issue Raised	Response
1	Section 4.1 incorrectly refers to Nillumbik Planning Scheme	The traffic report has been amended to reflect the development's location within the Murrindindi Shire Council.
2	Section 5.2 incorrectly lists St Peter's Anglican Church being located 1.8km south east which is actually approximately 0.6km and does not include the St Mary Catholic Church, which is located approximately 1.8km south east	Section 5.2 has been amended to reflect the locations of both St Peter's and St Mary's Churches.
3	Section 5.4 notes on the turn lane warrants diagram that a Channelised short right turn treatment CHR(s) is required, however the report then indicates that a short auxiliary right turn treatment is required but does not indicate the reasons for the why an AUR right turn treatment has been chosen. VicRoads supplement to the Austroads Guide does provide for the use of an AUR treatment in lieu of a CHR(s) but reasons need to be stated as to why the CHR(s) cannot be achieved or why it is not desirable to use a CHR(s). As stated in the supplement VicRoads should be consulted when considering the use of a CHR(S) versus a AUR treatment.	The intersection design has been amended to propose a CHR(s) treatment to Whittlesea-Kinglake Road at the intersection with Blackwood Lane. The CHR(s) treatment is considered to be a safer alternative to AUR(s). It is noted that there is no alteration to the geometry between the CHR (s) and the previously proposed AUR(s).
4	Section 5.5 assess the sight distance at the intersection and while the report has assessed the sight distance to the south east there is no reference to sight distance to the north west. It is understood that sight distance may be satisfactory to the north west and if this is the case the report should include details confirming that sight distance in that direction meets the requirements of the Austroads Guide. The diagram in Table 6 for the right turn appears to be an inverted mirror image which should be corrected.	Noted. The report has been amended to reflect the sight distance in excess of 300m provided from the intersection of Blackwood Lane / Whittlesea-Kinglake Road to the northwest. The diagram in Figure 10 has been amended.

5	<p>Council has advised that objectors have raised concerns regarding heavy fog. I have advised Karen Girvan at Council that this climatic condition can effect many locations and motorist should drive in a manner that is appropriate for the prevailing climatic conditions. However, it would be appropriate for a recommendation to install intersection warning signs as part of the mitigating works at this intersection.</p>	<p>Noted. The report has been amended to adopt VicRoads suggestion of intersection warning signage as shown in Section 6.4 of the report.</p>
6	<p>The site location plan on Page 4 has been included to show where the development is proposed to occur and Figure 2 Planning Zones shows Deviation Road which should address the objectors concerns about lack of detail shown on the site location plan.</p>	<p>The site location plan has been updated to accurately reflect the location of Deviation road.</p>

8 CONCLUSIONS

It is proposed to develop the subject site for the purposes of a public cemetery, with a provision of 136 car parking spaces.

Considering the analysis presented above, it is concluded that:

- The proposed car parking and access design is considered appropriate;
- The supply of car parking is appropriate for the proposed development;
- The anticipated traffic volumes generated by the development is not expected to have an impact on the operation of the Whittlesea-Kinglake Road or the surrounding road network;
- It is recommended that Whittlesea-Kinglake Road undergoes basic left turn treatment and a short channelised right turn treatment in accordance with the requirements of Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections; and
- The sight lines at the proposed access points are considered to have sufficient distance to meet the requirements of Austroads.

Appendix A Swept Path Diagrams

