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TRAFFIC ENGINEERING

Cyril Beechey Lane – Residential Subdivision

Transport Impact Assessment



170073TIA002A-F

1 November 2018

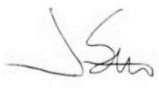
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1 INTRODUCTION

onemile**grid** has been requested by KLM Spatial to undertake a Transport Impact Assessment of the proposed rezoning of land for the purposes of residential subdivisions at 39-45 Cyril Beechey Lane and 40-46 Cyril Beechey Lane, Cranbourne.

This Transport Impact Assessment has particularly assessed the change in use of the sites from Farming Zone to Residential Use and the anticipated impacts of additional vehicle movements to be generated by these uses. An application to develop the land will be submitted at a later date.

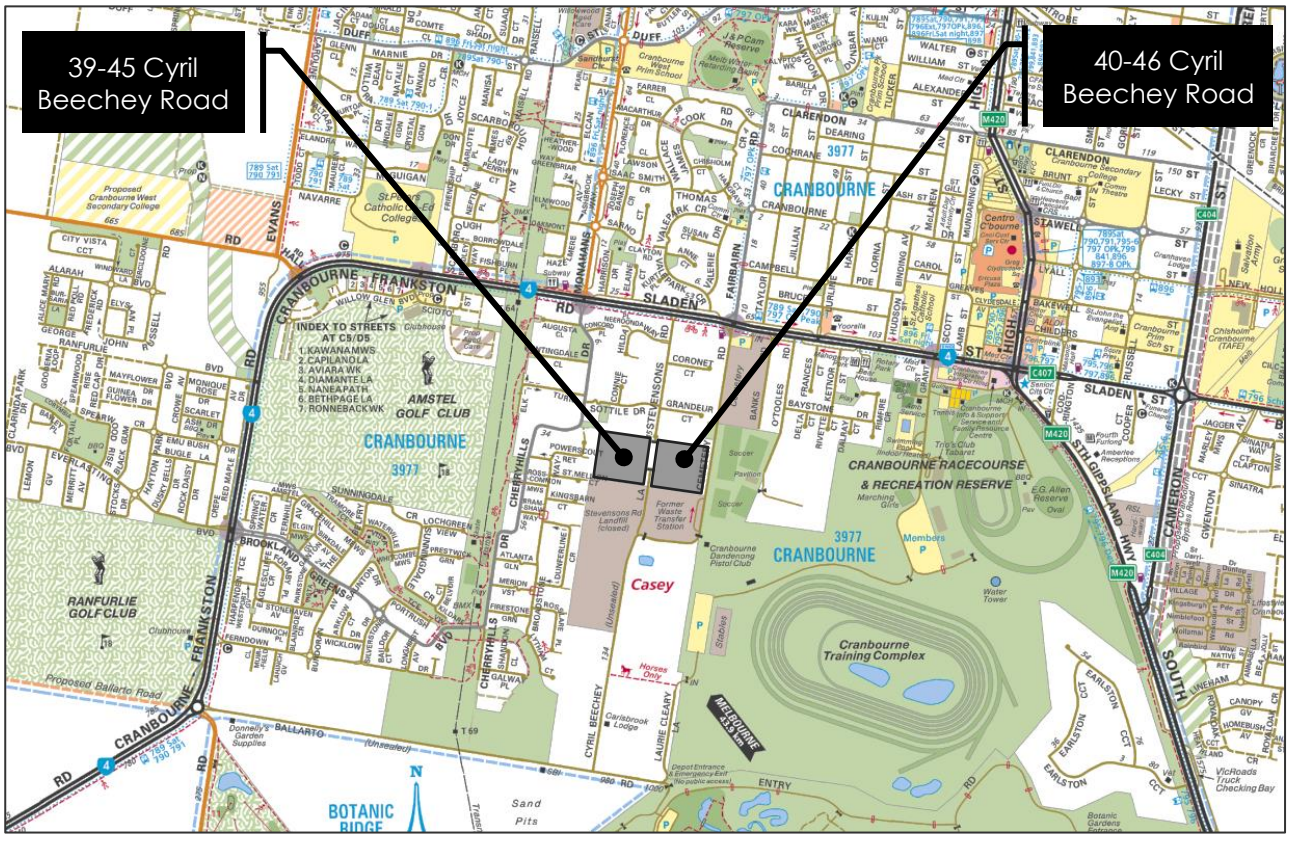
As part of this assessment the subject site has been inspected with due consideration of the development proposal, traffic data has been sourced and relevant background reports have been reviewed.

2 EXISTING CONDITIONS

2.1 Site Location

The subject sites are located on the east and west sides of the northern end of Cyril Beechey Lane. These lots are to the immediate south of the current extension of Stevensons Road which connects to Cranbourne-Frankston Road (Sladen Street) to the north. The locations of the sites are shown in Figure 1.

Figure 1 Site Locations



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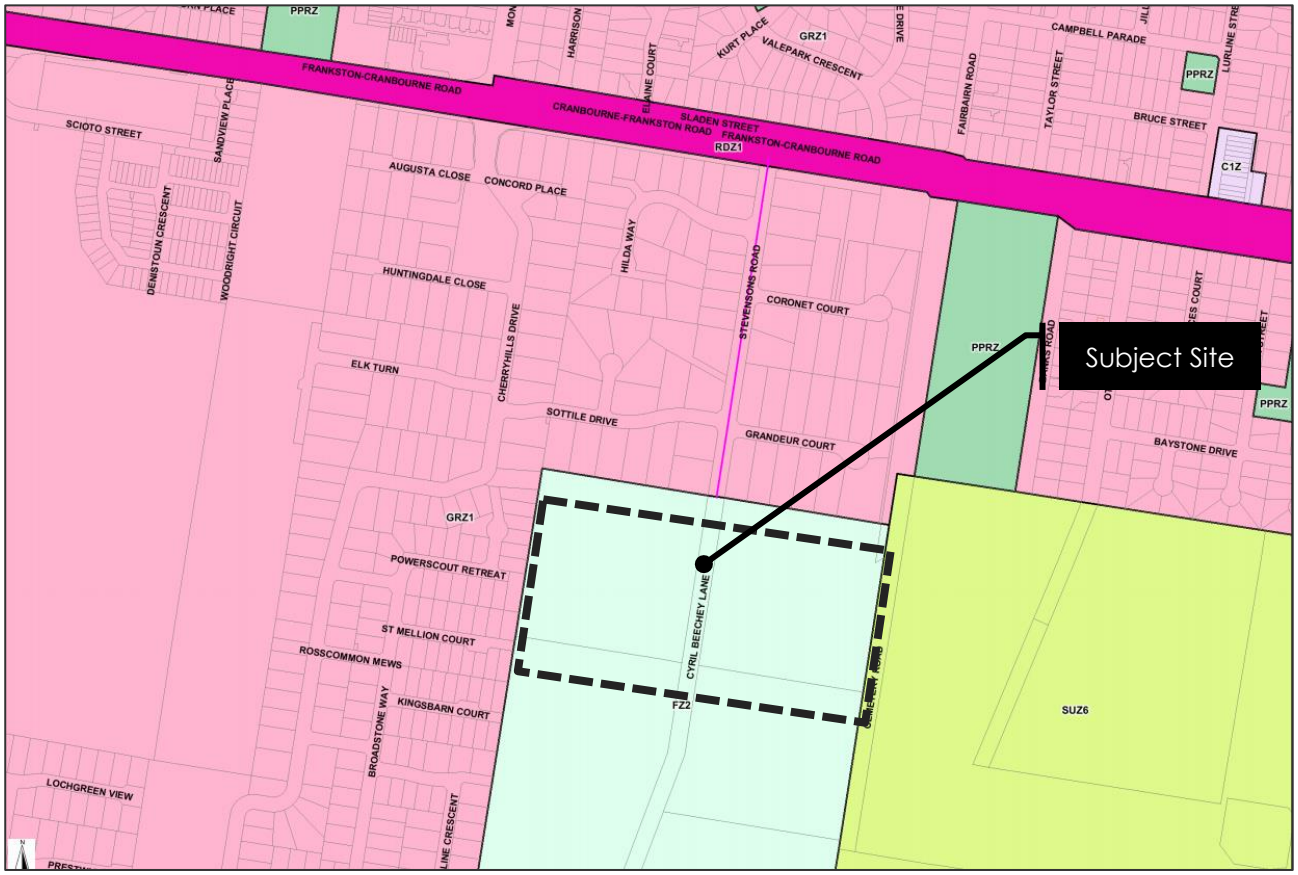
The sites are currently both undeveloped, with one building on the western side of 39-45 Cyril Beechey Lane which is accessed via the southern end of Stevensons Road, and via Cyril Beechey Lane.

Land use to the north and west is generally residential. The land to the south was previously utilised for landfill and a as a waste transfer station.

2.2 Planning Zones

It is shown in Figure 2 that the site is located within a Farming Zone (FZ), for which the permitted uses are listed in Clause 35.07 of the Casey Planning Scheme.

Figure 2 Planning Scheme Zones



2.3 Road Network

2.3.1 Stevensons Road

Stevensons Road is a local road which extends from Cranbourne-Frankston Road in the north to the northern end of the subject sites.

Stevensons Road has a road reserve of approximately 19m and a pavement width of approximately 7m, which allows two-way vehicle movements and intermittent kerbside parking on each side of the road. The southern end of Stevensons Road currently terminates at the northern end of the sites as a court bowl.

The default 50km/h speed limit applies to Stevensons Road.

The intersection between Cranbourne-Frankston Road and Stevensons Road is a left-in/left-out T-intersection. A left turn deceleration lane is provided on the eastern leg of Frankston-Cranbourne Road.

The cross-section of Stevensons Road to the north of the sites is shown in Figure 3.

Figure 3 Stevensons Road, looking south from Cranbourne-Frankston Road



2.3.2 Cyril-Beechey Lane

Cyril-Beechey Lane is a local access road which extends from Ballarto Road in the south to the subject sites in the north.

Cyril Beechey Lane is currently unsealed and provides a varying carriageway width along its length.

The cross-section of Cyril Beechey Lane is shown in Figure 4.

Figure 4 Cyril Beechey Lane, looking north from Ballarto Road



2.3.3 Sottile Drive

Sottile Drive is a local road extending east-west between Cherryhills Drive in the west and Stevensons Road in the east.

Sottile Drive has a pavement width of approximately 7m.

The default 50km/h speed limit applies to Sottile Drive.

The cross-section of Sottile Drive is shown in Figure 5.

Figure 5 Sottile Drive, looking west beyond Stevensons Road



2.3.4 Cherryhills Drive

Cherryhills Drive is a local road extending generally north-south between Cranbourne-Frankston Road in the north and continues to the south as Brookland Greens Boulevard. The northern leg of the signalised intersection between Cranbourne-Frankston Road and Cherryhills Drive continues as Monahans Road.

Cherryhills Drive generally has a pavement width of 8.5m and includes kerbside parking on each side of the road.

The intersection between Cranbourne-Frankston Road and Cherryhills Drive is a fully controlled signalised cross intersection with separate right turn lanes and left turn slip lanes, at each leg of the intersection respectively.

The cross section of Cherryhills Drive is shown in Figure 6.

Figure 6 Cherryhills Drive, looking north toward Cranbourne-Frankston Road



2.3.5 Cranbourne-Frankston Road (Sladen Street)

Cranbourne-Frankston Road, also referred to as Sladen Street, is an arterial road which extends generally south-west to north-east from Frankston in the west to Cranbourne in the east. The road is identified as a Road Zone Category 1 and is under the control of VicRoads.

In the vicinity of the sites, Cranbourne-Frankston Road comprises two traffic lanes and a bicycle lane in each direction, separated by a median of approximately 12m wide. A service lane on the northern side of the road provides for direct property access.

An indented bus stop is situated on the westbound traffic carriage on Cranbourne-Frankston Road, to the east of the intersection with Stevensons Road.

A signed speed limit of 80km/h applies to Cranbourne-Frankston Road in the vicinity of Stevensons Road.

The cross-section of the westbound traffic lanes on Cranbourne-Frankston Road is shown in Figure 7.

Figure 7 Cranbourne-Frankston Road (westbound lanes), looking east beyond Stevensons Road



The Cranbourne Development Plan (adopted by Casey City Council on 18 September 2007) identifies an ultimate layout for Cranbourne-Frankston Road for a 4-6 lane divided regional connection between the Cranbourne and Frankston areas.

2.4 Traffic Volumes

Traffic volume surveys were undertaken by Trans Traffic Survey on behalf of **one**mile**grid** on Wednesday 15th February 2017 (6:30am-9:30am and 3:30pm-7:00pm) at the following intersections:

- Cranbourne-Frankston Road / Cherryhills Drive / Monahans Road; and
- Cranbourne-Frankston Road / Cemetery Road / Fairbairn Road.

Seven-day tube counters were also installed between Thursday 9th February and Wednesday 15th February 2017 at the following locations:

- Stevensons Road (at the northern end of the road near the intersection with Frankston-Cranbourne Road); and
- Sottile Drive (approximately mid-block between Stevensons Road and Cherryhills Drive).

The seven-day tube counters were also utilised to determine the peak hour volumes that correspond with the peak hours adopted as part of the turning movement counts.

The peak hour traffic volumes for the AM peak hour (8:00am-9:00am) are demonstrated in Figure 8 and for the PM peak hour (3:45pm-4:45pm) are demonstrated in Figure 9.

Figure 8 AM Peak Hour Existing Traffic Volumes

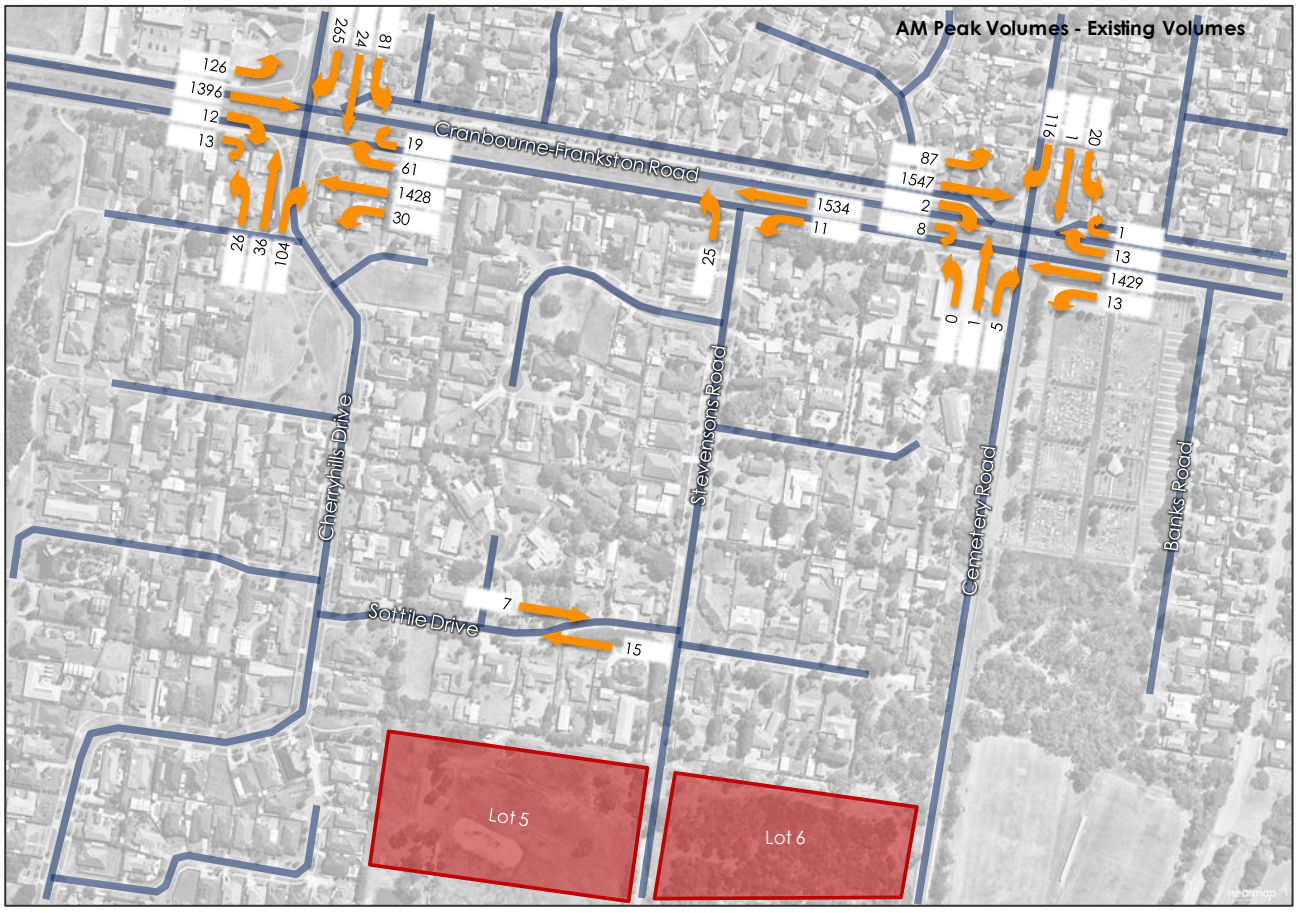
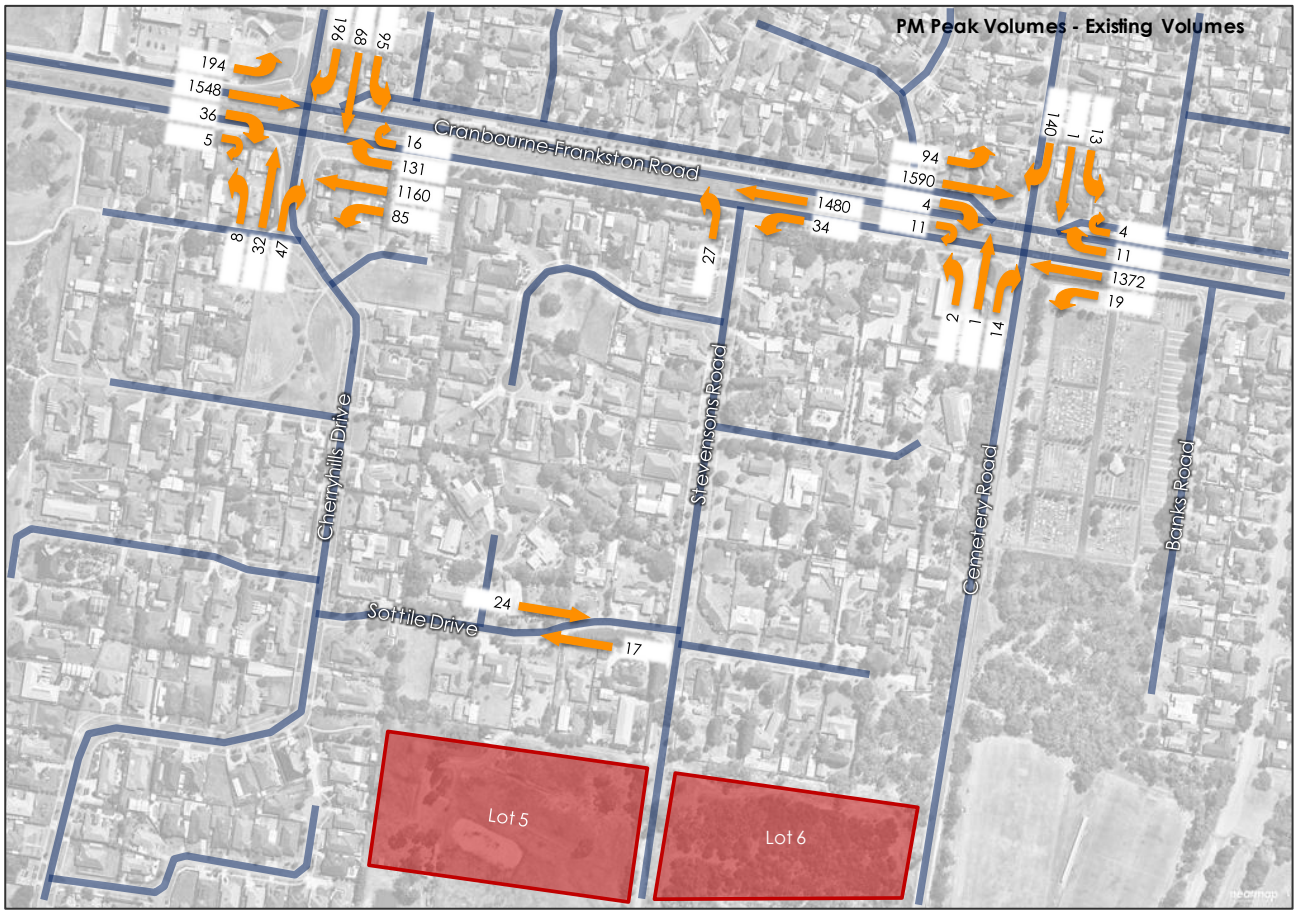


Figure 9 PM Peak Hour Existing Traffic Volumes



The tube counter data for Stevensons Road is summarised in Table 1

Table 1 Stevensons Road Traffic Volume Data

Time Period	Direction	AM Peak Hour - Average (8am-9am)	PM Peak Hour - Average (5pm-6pm)	Traffic Volume (vpd)	Average Speed (km/h)
Weekday Average	Northbound	30	19	264	35.7
	Southbound	15	25	282	33.9
	Both Directions	45	43	546	34.9

Table 2 Sottile Drive Traffic Volume Data

Time Period	Direction	AM Peak Hour - Average (7am-8am)	PM Peak Hour - Average (3pm-4pm)	Traffic Volume (vpd)	Average Speed (km/h)
Weekday Average	Eastbound	7	18	170	42.0
	Westbound	21	17	207	41.5
	Both Directions	28	35	377	41.8

2.5 Intersection Operation

To assess the existing operation of the intersections with Frankston-Cranbourne Road, the 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 below.

Table 3 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. *Degree of Saturation* / *Rating* Up to 0.60 – Excellent 0.61 – 0.70 – Very Good 0.71 – 0.80 – Good 0.81 – 0.90 – Fair 0.91 – 1.00 – Poor Above 1.00 – Very Poor It is noted that whilst the range of 0.91 – 1.00 is rated as 'poor', it is acceptable for critical movements at an intersection to be operating within this range during high peak periods, reflecting actual conditions in a significant number of suburban signalised intersections.
Average Delay (seconds)	Average delay is the time delay that can be expected for all vehicles undertaking a particular movement in seconds.
95th Percentile (95%ile) Queue	95%ile queue represents the maximum queue length in metres that can be expected in 95% of observed queue lengths in the peak hour

The results of the analysis are provided in Table 4, Table 5 and Table 6.

Table 4 Cranbourne-Frankston Road / Cherryhills Drive – Existing Intersection Analysis

Period	*Approach*	*DoS*	*Avg Delay (sec)*	*Queue (m)*
AM Peak Hour	Cherryhills Drive - South	0.291	38	34.4
	Cranbourne-Frankston Road - East	0.78	23.1	235.8
	Monahans Road - North	0.821	44.4	108.7
	Cranbourne-Frankston Road - West	0.813	25.1	263
	Intersection	**0.821**	**26.8**	**263**
PM Peak Hour	Cherryhills Drive - South	0.207	44.6	17.1
	Cranbourne-Frankston Road - East	0.876	18.2	132.9
	Monahans Road - North	0.785	52.6	82.6
	Cranbourne-Frankston Road - West	0.86	27.2	325.4
	Intersection	**0.876**	**26.7**	**325.4**

Table 5 Cranbourne-Frankston Road / Cemetery Road – Existing Intersection Analysis

Period	Approach	DoS	Avg Delay (sec)	Queue (m)
AM Peak Hour	Cemetery Road - South	0.03	44.2	2.1
	Cranbourne-Frankston Road - East	0.623	12.7	172.9
	Fairbairn Road - North	0.658	56.8	55.2
	Cranbourne-Frankston Road - West	0.684	12.8	199.7
	Intersection	**0.684**	**14.7**	**199.7**
PM Peak Hour	Cemetery Road - South	0.071	45.3	5.3
	Cranbourne-Frankston Road - East	0.608	13	166.1
	Fairbairn Road - North	0.698	56.9	62.6
	Cranbourne-Frankston Road - West	0.717	13.9	215.9
	Intersection	**0.717**	**15.7**	**215.9**

Table 6 Cranbourne-Frankston Road / Stevensons Road – Existing Intersection Analysis

Period	Approach	D.o.S.	Avg Delay	Queue (m)
AM Peak Hour	Stevensons Road - South	0.039	9.9	1.1
	Cranbourne-Frankston Road - East	0.427	0.1	0
	Intersection	**0.427**	**0.3**	**1.1**
PM Peak Hour	Stevensons Road - South	0.04	9.6	1.1
	Cranbourne-Frankston Road - East	0.412	0.2	0
	Intersection	**0.412**	**0.3**	**1.1**

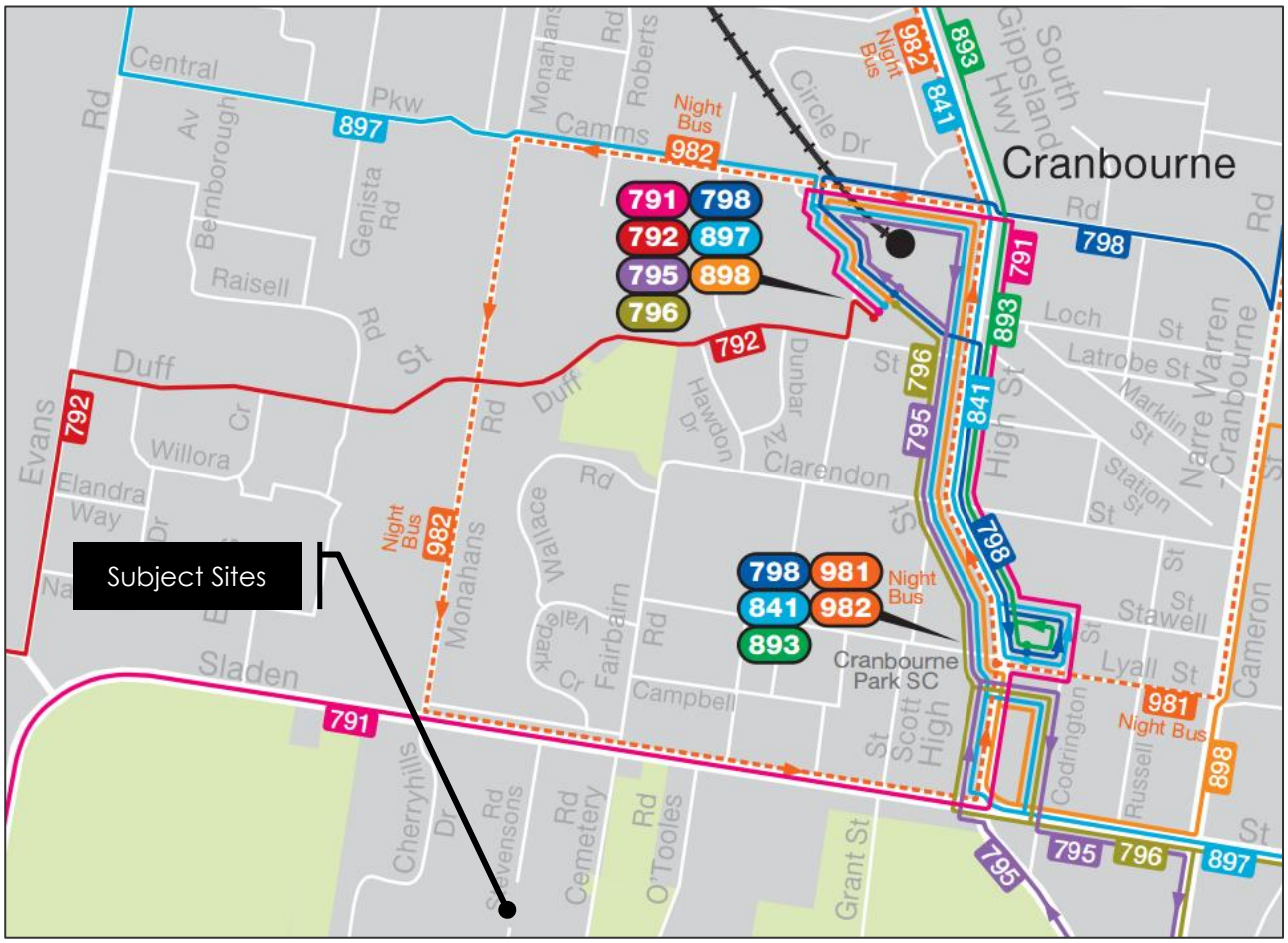
The existing conditions intersection analysis identified that the Cranbourne-Frankston Road / Cherryhills Drive intersection operates with a rating of 'fair'; the Cranbourne-Frankston Road / Cemetery Road intersection operates with a rating of 'good' and the unsignalised intersection between Cranbourne-Frankston Road / Stevensons Road operates with a rating of 'excellent'.

2.6 Public Transport

The 791 Frankston Station – Cranbourne Station bus service operates on Frankston-Cranbourne Road in the vicinity of the sites and connects to other public transport services in the surrounding area.

The full public transport provision in the vicinity of the site is shown in Figure 10.

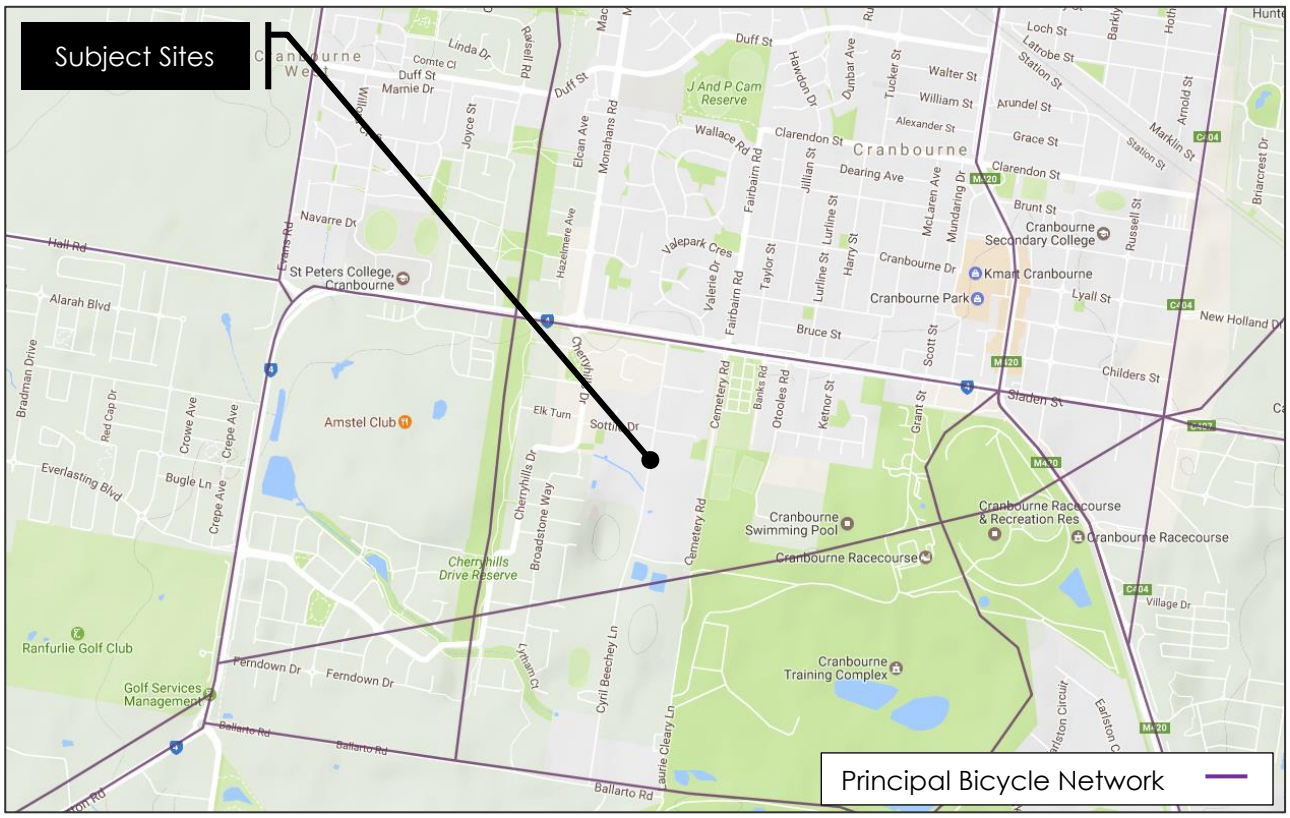
Figure 10 Public Transport Provision



2.7 Bicycle Facilities

As noted previously, Frankston-Cranbourne Road includes on-road bicycle lanes in each direction which provides excellent cycling access to the subject sites. The Principal Bicycle Network in the area is shown in Figure 11.

Figure 11 Principal Bicycle Network



3 DEVELOPMENT PROPOSAL

It is proposed to rezone the land at 39-45 Cyril Beechey Lane and 40-46 Cyril Beechey Lane for residential use. Preliminary development plans suggest a total of approximately 187 residential lots may be accommodated on-site, though the number of residential lots within the two sites is subject to change following further development assessment of the site.

The preliminary plans prepared by KLM Spatial include 93 dwellings at 39-45 Cyril Beechey Lane and 94 dwellings at 40-46 Cyril Beechey Lane. The dwellings are expected to generally comprise three bedrooms, through a mixture of single storey detached, two storey detached and two storey attached dwellings. At this stage, the preliminary plans are indicative only for the purposes of assessing the traffic movements to be generated through the proposed rezoning.

Vehicle access is proposed via an extension of Stevensons Road to the south through the site. The extension of Stevensons Road will include two roundabouts, the northern roundabout is proposed with four legs and the southern roundabout is proposed with three legs and a potential future fourth leg to the south. At this stage, there have been no detailed designs undertaken for the proposed roundabouts, however, they will need to be designed and constructed to meet Australian Standards.

The preliminary layout for the sites, including the internal road network, is demonstrated in Figure 12.

Figure 12 Preliminary Residential Layout



4 TRAFFIC CONSIDERATIONS

4.1 Traffic Generation

Surveys undertaken by other traffic engineering firms at residential dwellings have shown that the daily traffic generation rates vary depending on the size, location and type of the dwelling, the parking provision and proximity to local facilities and public transport.

It is generally accepted that single dwellings on a lot in outer suburban areas may generate traffic at up to 10 vehicles per day, whilst in areas with good public transport, and for higher density dwellings, lower traffic generation rates are often recorded.

It is expected that each of the dwellings will be provided with on-site car parking in accordance with Clause 52.06 of the Planning Scheme, with two parking spaces for dwellings with three or more bedrooms.

Considering the location of the sites and the scale of development, it is anticipated that each of the dwellings may generate up to 9 vehicle movements per day, with 10% of these vehicle movements occurring during the peak hour periods.

Application of these rates to the proposed 187 dwellings equates to 1,683 daily vehicle movements and up to 169 vehicle movements during the peak hour periods.

Furthermore, during the morning peak, it is estimated that 80% of the residential traffic will be outbound, while during the afternoon peak, 60% of the residential traffic will be inbound.

The anticipated peak hour traffic generation is summarised in Table 7.

Table 7 Anticipated Peak Hour Traffic Generation

Period	*Inbound*	*Outbound*	*Total*
AM Peak	34	135	169
PM Peak	102	67	169

4.2 Traffic Distribution

The proposed development of the site includes sole access via Stevensons Road, which provides further vehicle access to the external road network. Consequently, all vehicle movements will be made via Stevensons Road and then to Cranbourne-Frankston Road via Stevensons Road or Sottile Drive and Cherryhills Drive.

Based on the existing road layout and the surveyed traffic movements, it is anticipated that the development traffic will be distributed to the following areas:

- Cranbourne-Frankston Road (East) – 50%
- Cranbourne-Frankston Road (West) – 30%
- Monahans Road (North) – 15%
- Fairbairn Road (North) – 5%

The generated traffic movements are also distributed to Cranbourne-Frankston Road via Stevensons Road or Cherryhills Drive.

The anticipated peak hour vehicle movements to be generated by the proposed residential dwellings are shown in Figure 13 for the AM peak hour and in Figure 14 for the PM peak hour.

Figure 13 AM Peak Hour Traffic Generation

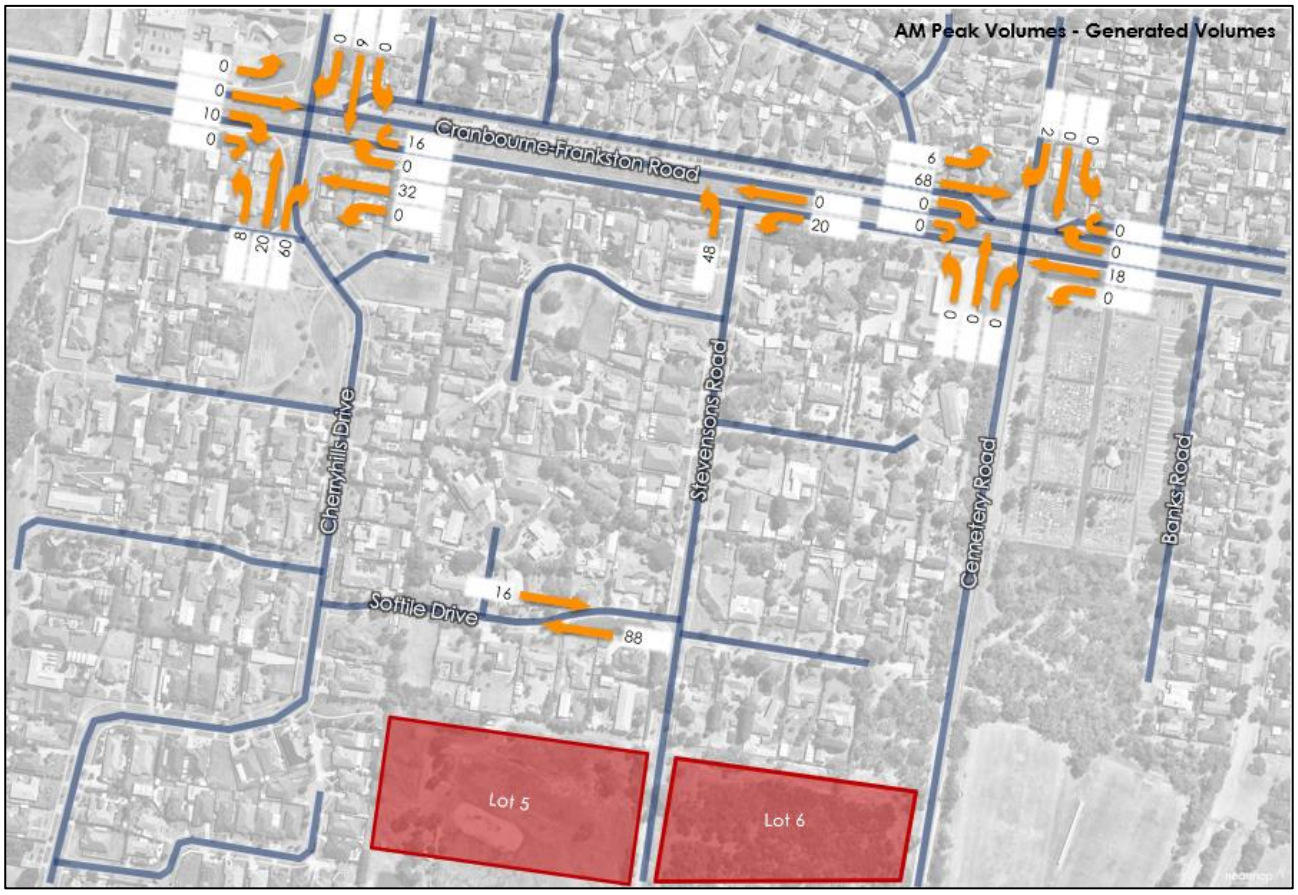
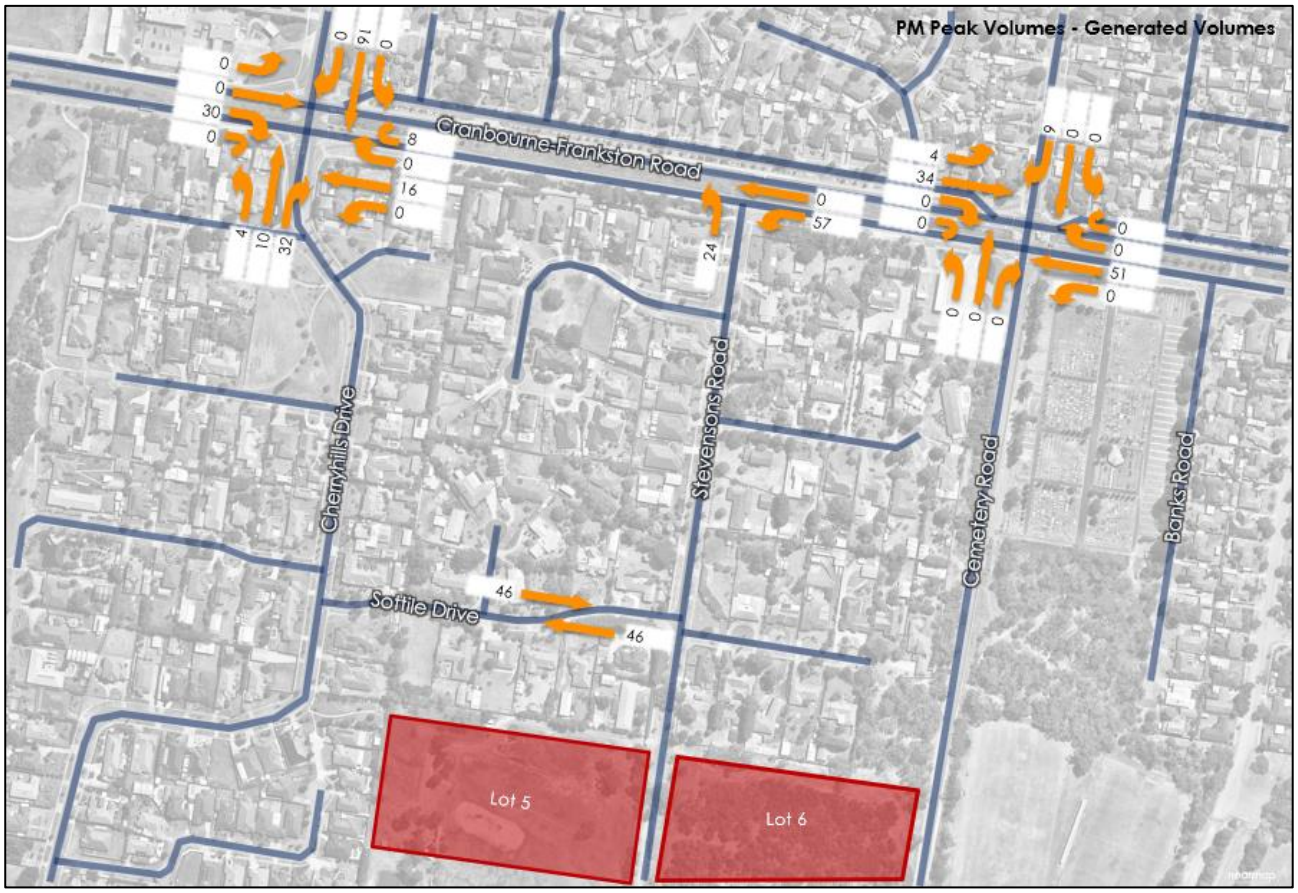


Figure 14 PM Peak Hour Traffic Generation

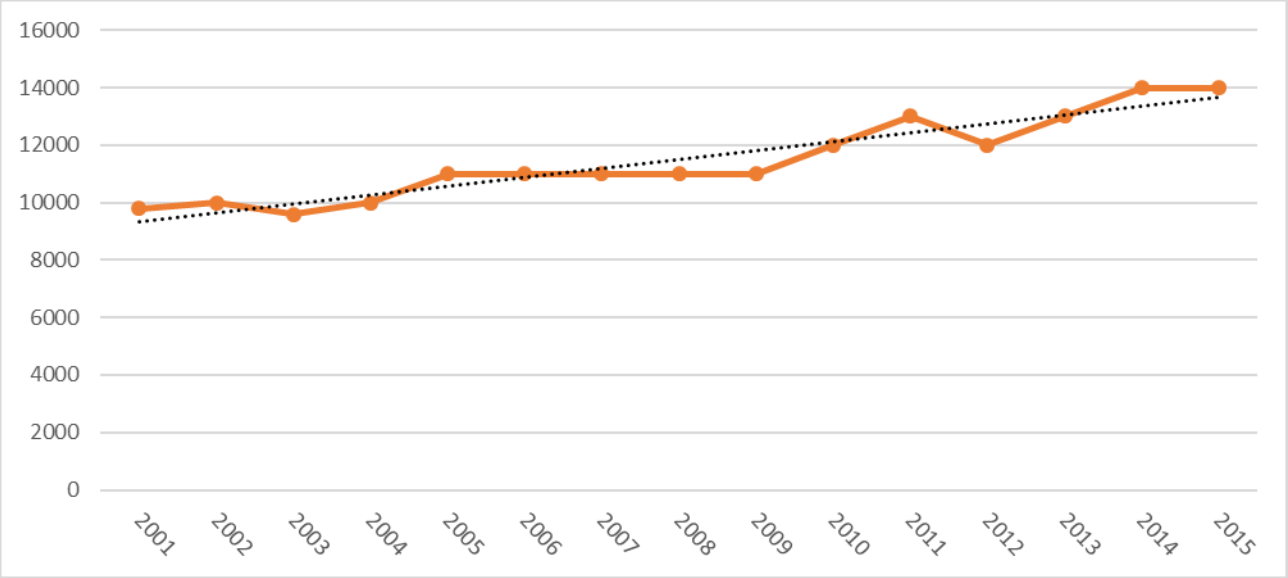


4.3 Traffic Growth

It is expected that there will be growth on the arterial road network in the area between the time of the traffic surveys and the occupation of dwellings on the sites. The growth of traffic movements on Cranbourne-Frankston Road has been reviewed over the past 15 years, which equated to a rate of approximately a 3% increase each year.

The traffic volume growth on Cranbourne-Frankston Road over the past 15 years (as collected from VicRoads Traffic Profile Viewer) is shown in Figure 15. The traffic volumes shown in Figure 15 are the average daily two-way traffic volumes on Cranbourne-Frankston Road.

Figure 15 Average Daily Two Way Traffic – Cranbourne-Frankston Road (VicRoads Traffic Profile Viewer)



To allow for growth the existing through movements on Cranbourne-Frankston Road have been increased by 3% each year, over a three-year period (provision for construction and occupation of the dwellings by the end of 2020).

4.4 Traffic Volumes

The future traffic volumes at the subject intersections on Cranbourne-Frankston Road are determined as the existing volumes surveyed plus the additional growth for the through movements on Cranbourne-Frankston Road and the additional traffic movements generated by the residential development of the subject sites.

The future traffic volumes in the AM peak hour are shown in Figure 16 and in the PM peak hour are shown in Figure 17.

Figure 16 Future Traffic Volumes – AM Peak Hour

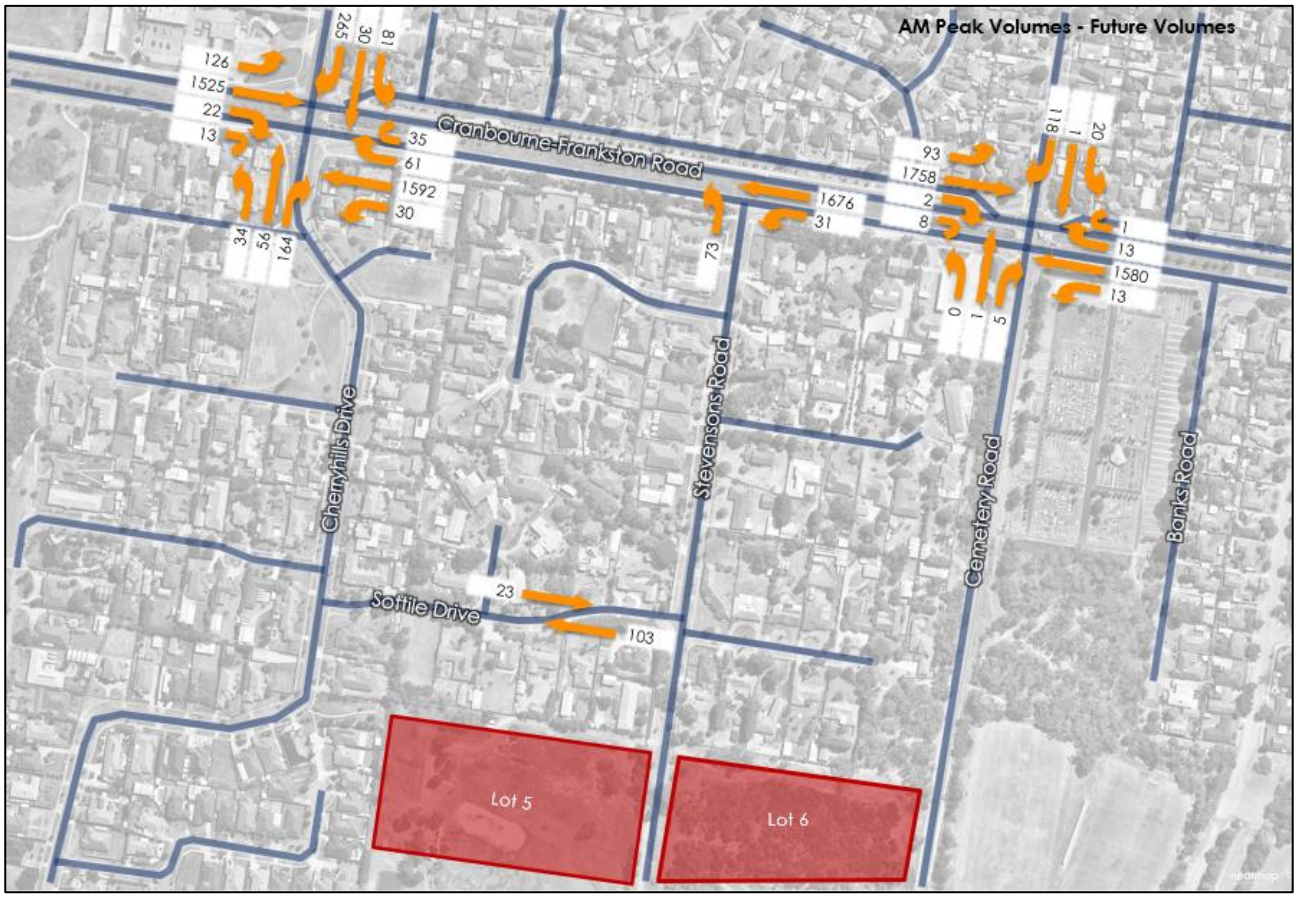
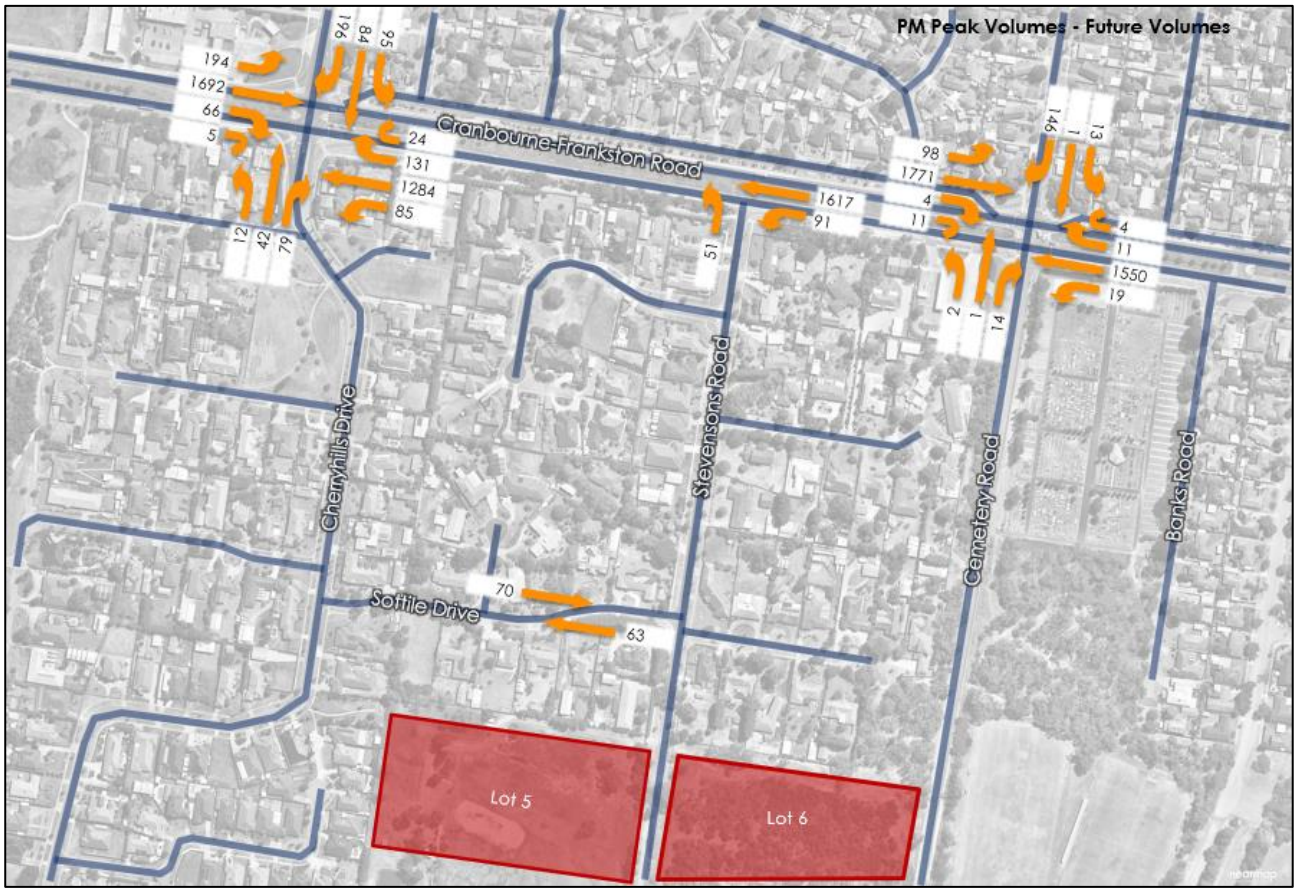


Figure 17 Future Traffic Volumes – PM Peak Hour



4.5 Traffic Impact

4.5.1 Midblock Capacity Assessment

The proposed developments are projected to generate traffic movements to the surrounding road network via Stevensons Road and to a lesser extent Sottile Drive and then Cherryhills Drive. As noted previously, the development of the two lots is projected to generate in the order of 1,683 daily vehicle movements.

Stevensons Road currently caters for an average weekday daily traffic volume of 546 vehicles. It is noted that the volumes on Stevensons Road were collected at the northern end of this road, near the intersection with Cranbourne-Frankston Road, which is expected to be the peak traffic section of this road.

As identified previously, Stevensons Road has a road reserve of approximately 19m, a pavement width of approximately 7m and allows for intermittent kerbside parking on each side of the road. These existing road dimensions are consistent with an 'Access Street – Level 2' as listed within Clause 56 of the Planning Scheme, which is listed as having an indicative daily traffic volume of between 2,000 and 3,000 vehicles per day.

The existing average daily traffic volume of 546 vehicles is well within the indicative capacity for up to 3,000 vehicles per day. The addition of up to 1,684 vehicle movements generated by the proposed dwellings (conservatively adopting that all of the traffic could be generated to the northern end of Stevensons Road) equates to a total traffic volume of up to 2,230 vehicle movements, which is still well within the indicative capacity for an Access Street – Level 2.

The existing and proposed extended layout of Stevensons Road is considered to have available capacity to accommodate the additional daily vehicle movements generated by the proposed dwellings on the two sites.

Sottile Drive has a road reserve width of approximately 16m and a pavement width of approximately 7m, these dimensions are also approximately consistent with an 'Access Street – Level 2' which was previously listed as having an indicative daily traffic volume for between 2,000 and 3,000 vehicles per day.

The tube counter on Sottile Drive counted an average daily traffic volume of 377 vehicles. The layout of Sottile Drive, and the existing daily traffic volumes, are considered to also have capacity to accommodate the daily traffic movements to be generated by the proposed residential developments.

Cherryhills Drive has a road reserve width of approximately 18m and two traffic lanes of approximately 4m each which are indicative of a 'Connector Street – Level 2' as listed within Clause 56 of the Planning Scheme with an advised traffic volume for up to 7,000 vehicles per day. Based on the connections to Cherryhills Drive and observations of the road, it is expected that there is capacity to accommodate additional vehicle movements to be generated by residential dwellings on the two lots.

Based on the preceding, it is considered that there is existing environmental capacity within the immediate roads to accommodate additional vehicle movements to be generated by dwellings at the proposed lots.

4.5.2 Intersection Capacity Assessment

To assess the operation of the intersections on Cranbourne-Frankston Road the future traffic volumes have been input into SIDRA Intersection.

The results of the future conditions analysis are provided in Table 8, Table 9 and Table 10.

Table 8 Cranbourne-Frankston Road / Cherryhills Drive – Future Conditions Analysis

Period	*Approach*	*D.o.S.*	*Avg Delay (sec)*	*Queue (m)*
AM Peak Hour	Cherryhills Drive - South	0.514	45.6	58.2
	Cranbourne-Frankston Road - East	0.851	27.3	295.7
	Monahans Road - North	0.849	49.2	115
	Cranbourne-Frankston Road - West	0.869	31.3	329.1
	Intersection	***0.869***	***32.2***	***329.1***
PM Peak Hour	Cherryhills Drive - South	0.38	49.2	30
	Cranbourne-Frankston Road - East	0.937	20.1	168.4
	Monahans Road - North	0.81	57.2	84.4
	Cranbourne-Frankston Road - West	0.938	46	472.7
	Intersection	***0.938***	***37.2***	***472.7***

Table 9 Cranbourne-Frankston Road / Cemetery Road – Future Conditions Analysis

Period	Approach	D.o.S.	Avg Delay (sec)	Queue (m)
AM Peak Hour	Cemetery Road - South	0.035	46.2	2.2
	Cranbourne-Frankston Road - East	0.67	12.2	194.6
	Fairbairn Road - North	0.758	61.3	59
	Cranbourne-Frankston Road - West	0.759	12.9	243.7
	Intersection	***0.759***	***14.5***	***243.7***
PM Peak Hour	Cemetery Road - South	0.076	46.4	5.4
	Cranbourne-Frankston Road - East	0.678	13.4	198.3
	Fairbairn Road - North	0.767	60.1	67.6
	Cranbourne-Frankston Road - West	0.791	14.4	261.4
	Intersection	***0.791***	***16.1***	***261.4***

Table 10 Cranbourne-Frankston Road / Stevensons Road – Future Conditions Analysis

Period	Approach	D.o.S.	Avg Delay (sec)	Queue (m)
AM Peak Hour	Stevensons Road - South	0.127	11	3.5
	Cranbourne-Frankston Road - East	0.467	0.2	0
	Cranbourne Frankston Road - West	0	0	0
	Intersection	***0.467***	***0.6***	***3.5***
PM Peak Hour	Stevensons Road - South	0.084	10.5	2.3
	Cranbourne-Frankston Road - East	0.451	0.4	0
	Cranbourne Frankston Road - West	0	0	0
	Intersection	***0.451***	***0.7***	***2.3***

The future conditions intersection analysis identified that the intersection of Cranbourne-Frankston Road / Stevensons Road will continue to operate with a rating of 'excellent' and that the intersection of Cranbourne-Frankston Road / Cemetery Road will operate with a rating of 'fair'.

The intersection between Cranbourne-Frankston Road / Cherryhills Drive is demonstrated to operate with a rating of 'poor' however still operates with a degree of saturation less than 1.0. The SIDRA results demonstrate that the 95th percentile queues do not extend to the nearby intersections on the main road.

The rise in degree of saturation is generally created through the increase of through movements on Cranbourne-Frankston Drive, due to the growth applied to this road. To determine the impact of the additional movements generated by the proposed dwellings, an additional assessment has been undertaken of this intersection with just the through volume growth applied. The intersection analysis results shown in Table 11 compare the SIDRA results for the growth volumes at the intersection and the growth volumes plus the development traffic.

Table 11 Cranbourne-Frankston Road / Cherryhills Drive – Future Conditions Comparison

Period	*Approach*	*Growth Volumes*			*Future Volumes*		
		D.o.S.	Avg Delay (sec)	Queue (m)	D.o.S.	Avg Delay (sec)	Queue (m)
AM Peak Hour	Cherryhills Drive - South	0.304	40	34.9	0.514	45.6	58.2
	Cranbourne-Frankston Road - East	0.847	28.3	295.7	0.851	27.3	295.7
	Monahans Road - North	0.845	47	112.3	0.849	49.2	115
	Cranbourne-Frankston Road - West	0.866	30.5	325.1	0.869	31.3	329.1
	Intersection	***0.866***	***31.6***	***325.1***	***0.869***	***32.2***	***329.1***
PM Peak Hour	Cherryhills Drive - South	0.225	46.3	17.3	0.38	49.2	30
	Cranbourne-Frankston Road - East	0.876	17.7	151	0.937	20.1	168.4
	Monahans Road - North	0.823	56	85.1	0.81	57.2	84.4
	Cranbourne-Frankston Road - West	0.915	37.6	425.6	0.938	46	472.7
	Intersection	***0.915***	***31.8***	***425.6***	***0.938***	***37.2***	***472.7***

The comparison between the growth volumes and future volumes (plus growth) identifies an increase of degree of saturation of 0.003 in the AM peak hour and 0.023 in the PM peak hour.

It is noted that the Cranbourne Development Plan (adopted by Casey City Council on 18 September 2007) identifies an ultimate layout for Cranbourne-Frankston Road for a 4-6 lane divided regional connection between the Cranbourne and Frankston areas. The potential additional lanes would provide additional capacity for the through movements on Cranbourne-Frankston Road.

Based on the preceding, the subject intersections on Cranbourne-Frankston Road are considered to have capacity to accommodate the additional traffic to be generated by 187 dwellings at the subject sites.

The detailed SIDRA outputs are provided in Appendix A.

5 CONCLUSIONS

It is proposed to rezone the land at 39-45 Cyril Beechey Lane and 40-46 Cyril Beechey Lane from Farming Zone to Residential and then develop the two sites to provide in the order of 187 residential dwellings.

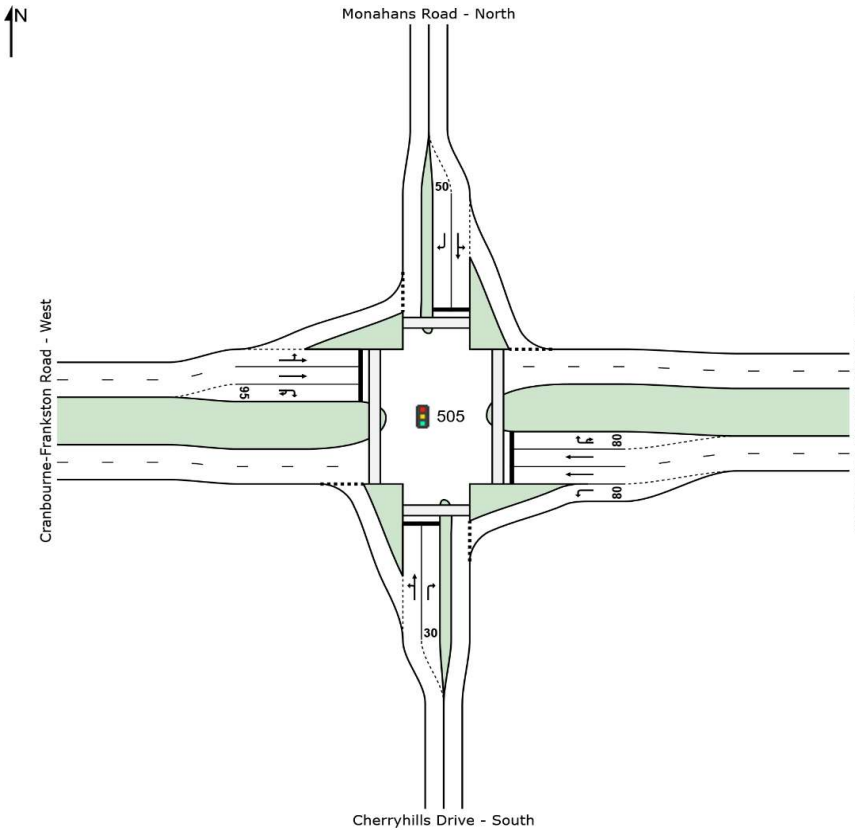
Vehicle access to the sites is proposed via an extension of Stevensons Road.

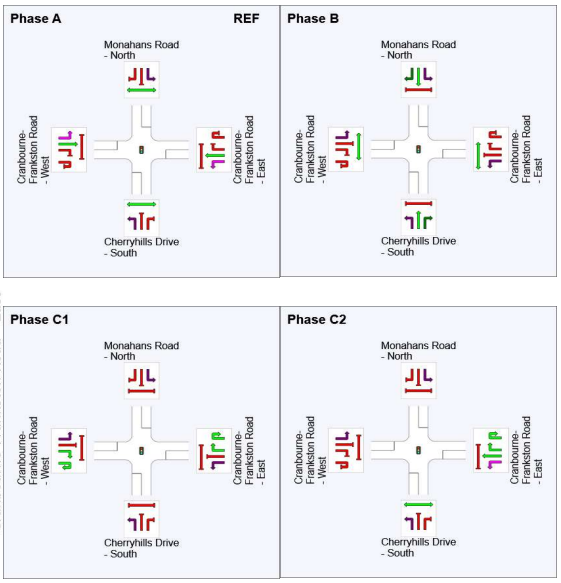
Based on the preceding assessments, the following is concluded:

- The potential residential development of 187 dwellings is projected to generate 1,684 daily vehicle movements and 169 vehicle movements during the peak hour periods;
- The layout of Stevensons Road is determined to have indicative daily capacity for the future development of the sites;
- The layout of Sottile Drive and Cherryhills Drive are considered to have indicative daily capacity for the future development of the sites; and
- The intersection analysis identified that post-development the intersections of Cranbourne-Frankston Road / Stevensons Road, Cranbourne-Frankston Road / Cemetery Road and Cranbourne-Frankston Road are operating within capacity.

Appendix A Detailed SIDRA Output

Signals *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranCherAMExE]*





Phase	Grn	Yel	Red	Total	%
A	60	4	2	66	60
B	25	4	2	31	28.18
C1	6	4	2	12	10.91
C2	0	4	2	1	0.909

Monahans Road - North

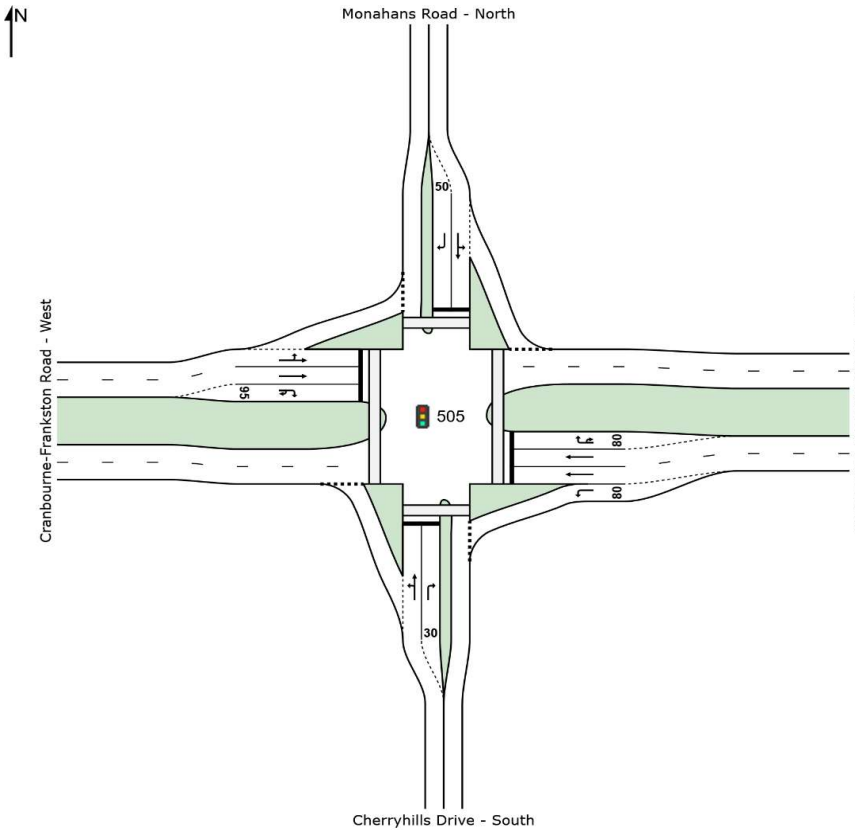
						App	**R**	**T**	**L**					**110**
						44.6	53.6	17.4	23					
						107.9	107.9	20.9	20.9					
						0.791	0.791	0.281	0.281					
						389	279	25	85					
Cranbourne-Frankston Road - West						8	6	1	2					**Cranbourne-Frankston Road - East**
						381	273	24	83					
L	26.7	246.1	0.786	133	3	130				1541	78	1619	0.78	224.3	21.6	**App**
T	21	246.1	0.786	1469	73	1396				63	1	64	0.78	35.4	67.3	**R**
R	63.8	10.5	0.309	13	0	13				1428	75	1503	0.757	224.3	19.3	**T**
App	22.1	246.1	0.786	1628	77	1551				31	1	32	0.02	0.8	6	**L**
					3648		26	37	107	171						**LV***
					164		1	1	2	4						**HV***
					3812		27	38	109	175						**Total Vol***
					0.791		0.32	0.32	0.313	0.32						**D.o.S.**
					246.1		14.3	14.3	35.4	35.4						**95th %ile Back of Queue (m)**
					25		34.2	28.5	44.3	39.3						**Average Delay (sec)**
					Intersection		**L**	**T**	**R**	**App**						

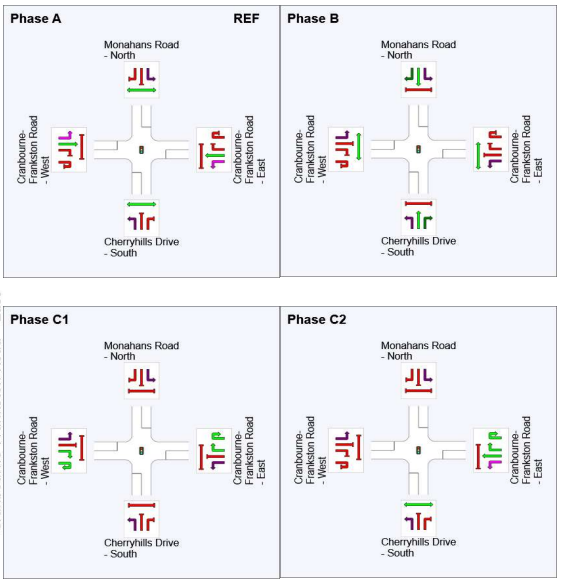
*Output Volumes

Cherryhills Drive - South

Cranbourne-Frankston Road / Cherryhills Drive / Monahans Road
PM, Existing Geometry, Existing Volumes

Signals *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranCherPMExE]*





Phase	Grn	Yel	Red	Total	%
A	63	4	2	69	62.73
B	18	4	2	24	21.82
C1	6	4	2	12	10.91
C2	0	4	2	5	4.545

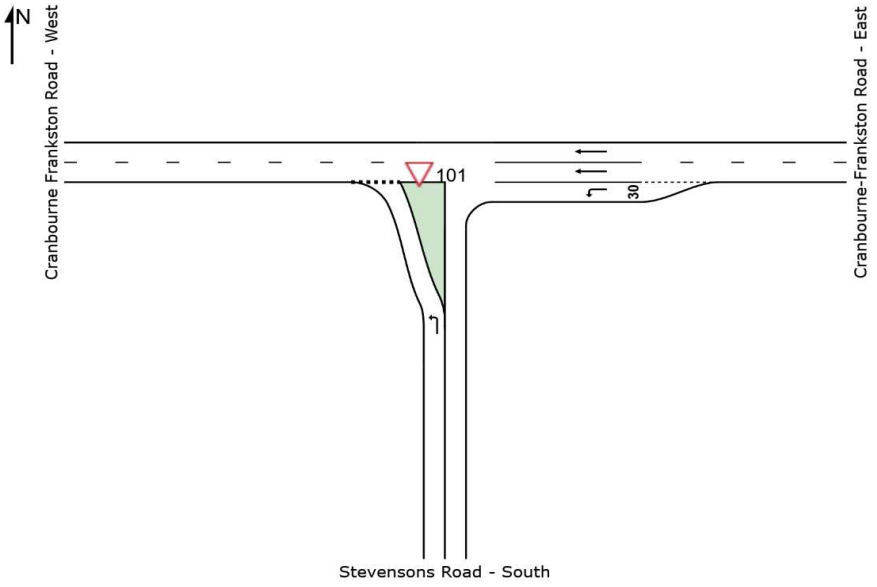
Monahans Road - North

						App	**R**	**T**	**L**					**110**
						53	59.7	41.6	47.2					
						83.5	83.5	49	49					
						0.797	0.797	0.704	0.704					
						378	206	72	100					
						8	4	1	2					
Cranbourne-Frankston Road - West						370	202	71	98					**Cranbourne-Frankston Road - East**
L	31.5	325.4	0.86	204	4	200				1399	66	1465	0.876	132.9	18.2	**App**
T	25.7	325.4	0.86	1629	81	1548				135	3	138	0.876	67.4	69.2	**R**
R	64.1	17.2	0.45	38	1	37				1160	61	1221	0.523	132.9	12.6	**T**
App	27.2	325.4	0.86	1877	86	1791				87	2	89	0.058	3.6	6.4	**L**
					3652		8	33	48	90						**LV***
					160		0	1	1	2						**HV***
					3812		8	34	49	92						**Total Vol***
					0.876		0.217	0.217	0.213	0.217						**D.o.S.**
					325.4		12	12	17.1	17.1						**95th %ile Back of Queue (m)**
					26.7		42.2	36.5	51.4	45.1						**Average Delay (sec)**
					Intersection		**L**	**T**	**R**	**App**						

*Output Volumes

Cherryhills Drive - South

Give-Way/Yield *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranStevAMExE]*



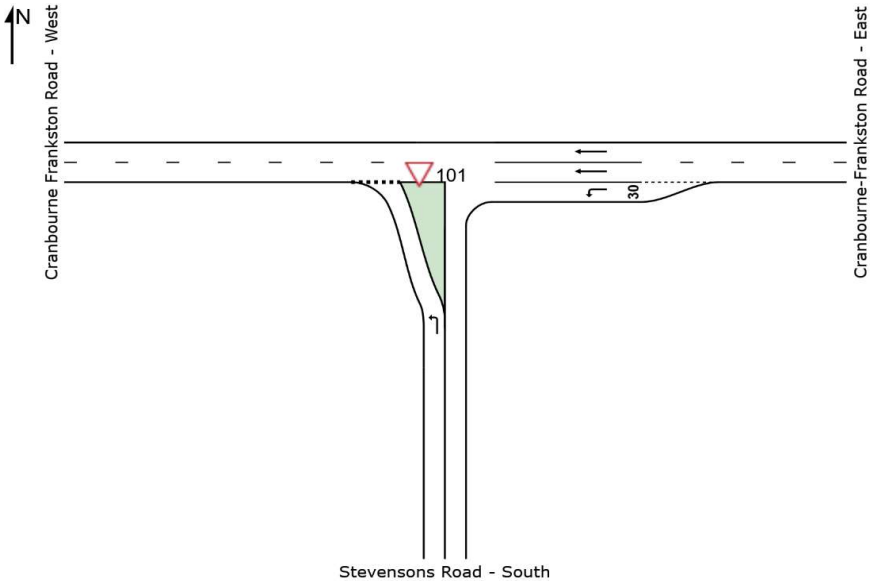


	App	R	T	L							
Cranbourne Frankston Road - West										**Cranbourne-Frankston Road - East**	
L					1545	81	1626	0.427	0	0.1	**App**
T											**R**
R					1534	81	1615	0.427	0	0.1	**T**
App	0	0	0	0	0	0	12	0	12	0.006	0	5.6	**L**
					1572	25		25		**LV***	
					81	1		1		**HV***	
					1653	26		26		**Total Vol***	
					0.427	0.039		0.039		**D.o.S.**	
					1.1	1.1		1.1		**95th %ile Back of Queue (m)**	
					0.3	9.9		9.9		**Average Delay (sec)**	
					Intersection	**L**	**T**	**R**	**App**		

*Output Volumes

Stevensons Road - South

Give-Way/Yield *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranStevPMExE]*





	App	R	T	L
Cranbourne Frankston Road - West				
L			1516	78
T				
R			1480	78
App	0	0	35	1
	0	0	0	0
	1543	27		27
	79	1		1
	1622	28		28
	0.412	0.04		0.04
	1.1	1.1		1.1
	0.3	9.6		9.6
Intersection		**L**	**T**	**R**

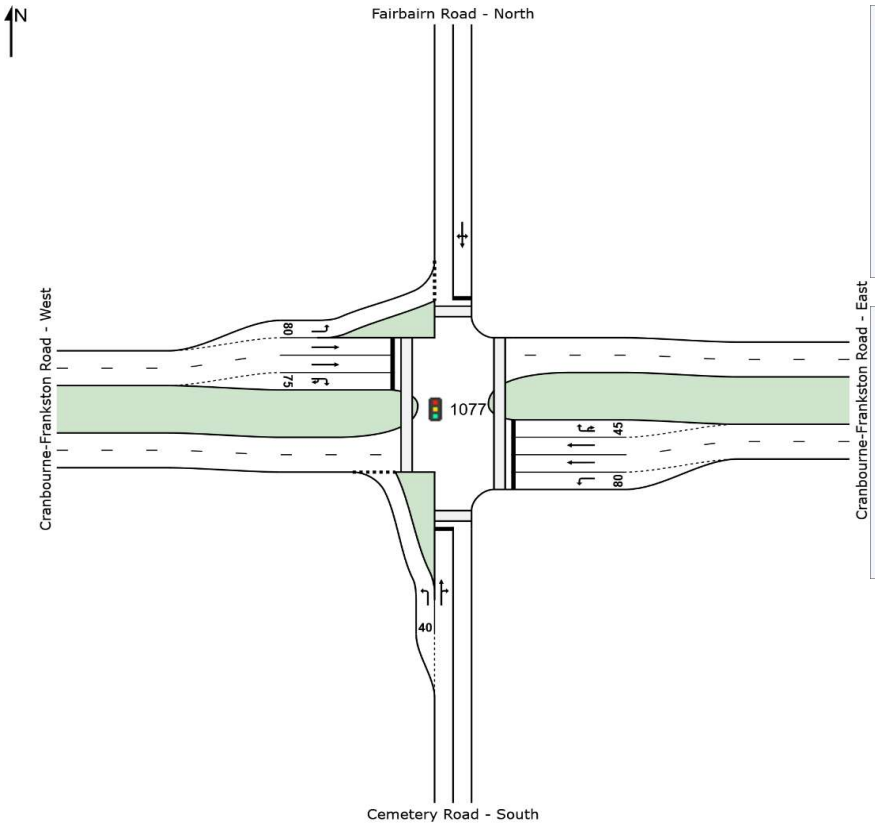
1594	0.412	0	0.2
1558	0.412	0	0.1
36	0.02	0	5.6

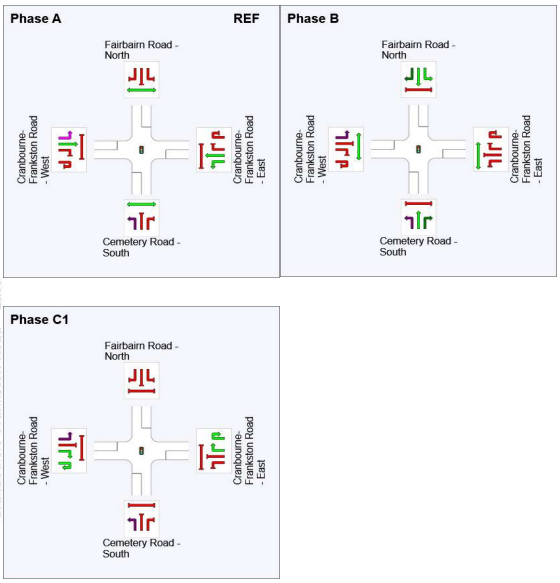
LV*	**Cranbourne-Frankston Road - East**
HV*	
Total Vol*	
D.o.S.	
95th %ile Back of Queue (m)	
Average Delay (sec)	
App	
R	
T	
L	

*Output Volumes

Stevensons Road - South

Signals *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranCemeAMExE]*





Phase	Grn	Yel	Red	Total	%
A	71	4	2	77	70
B	15	4	2	21	19.09
C1	6	4	2	12	10.91

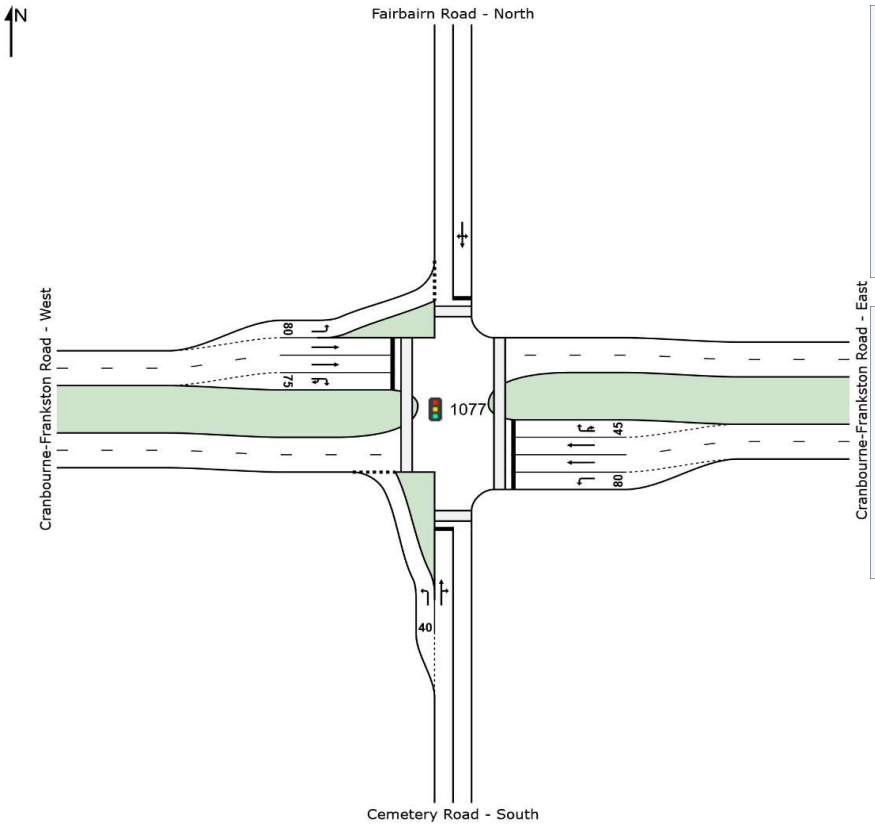
Fairbairn Road - North

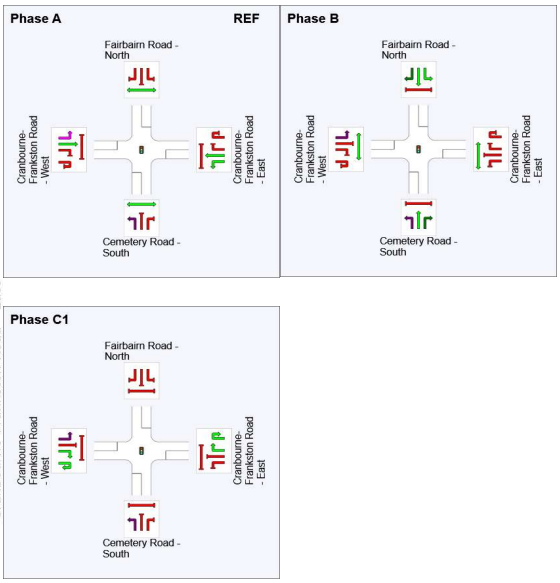
					App	**R**	**T**	**L**						**110**
					56.8	56.9	51.3	56.8						
					55.2	55.2	55.2	55.2						
					0.658	0.658	0.658	0.658						
					144	122	1	21						
Cranbourne-Frankston Road - West					3	2	0	0						**Cranbourne-Frankston Road - East**
					141	120	1	21						
L	6	2	0.058	92	2	90			1458	75	1533	0.623	172.9	12.7	**App**
T	12.9	199.7	0.684	1628	81	1547			14	0	14	0.151	5.7	62.2	**R**
R	62.9	4.1	0.133	2	0	2			1429	75	1504	0.623	172.9	12.2	**T**
App	12.8	199.7	0.684	1731	83	1648			14	0	14	0.012	1.8	12.8	**L**
					3251	1	1	5	7	**LV***					
					164	0	0	0	0	**HV***					
					3415	1	1	5	7	**Total Vol***					
					0.684	0.002	0.03	0.03	0.03	**D.o.S.**					
					199.7	0.1	2.1	2.1	2.1	**95th %ile Back of Queue (m)**					
					14.7	11.5	45	50.6	44.2	**Average Delay (sec)**					
					Intersection	**L**	**T**	**R**	**App**						

*Output Volumes

Cemetery Road - South

Signals *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranCemePMExE]*





Phase	Grn	Yel	Red	Total	%
A	70	4	2	76	69.09
B	16	4	2	22	20
C1	6	4	2	12	10.91

Fairbairn Road - North

						App	**R**	**T**	**L**					**110**
						56.9	57	51.4	56.9					
						62.6	62.6	62.6	62.6					
						0.698	0.698	0.698	0.698					
						162	147	1	14					
Cranbourne-Frankston Road - West						3	3	0	0					**Cranbourne-Frankston Road - East**
						159	144	1	14					
L	6	2.2	0.062	99	2	97				1407	73	1480	0.608	166.1	13	**App**
T	13.9	215.9	0.717	1674	84	1590				12	0	12	0.172	6.2	62.6	**R**
R	63.3	6.2	0.197	4	0	4				1372	72	1444	0.608	166.1	12.5	**T**
App	13.9	215.9	0.717	1788	86	1702				20	0	20	0.017	2.7	13.2	**L**
					3286		2	1	15	18						
					162		0	0	0	0						
					3448		2	1	15	18						
					0.717		0.005	0.071	0.071	0.071						
					215.9		0.2	5.3	5.3	5.3						
					15.7		11.5	44.5	50.1	45.3						
					Intersection		**L**	**T**	**R**	**App**						

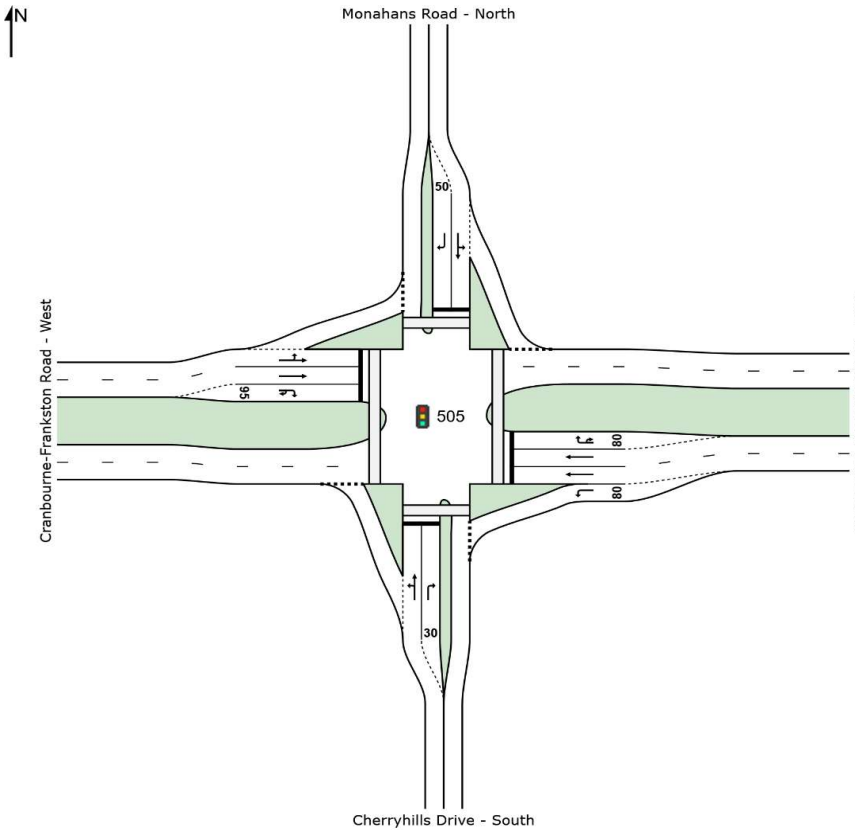
LV*
HV*
Total Vol*
D.o.S.
95th %ile Back of Queue (m)
Average Delay (sec)

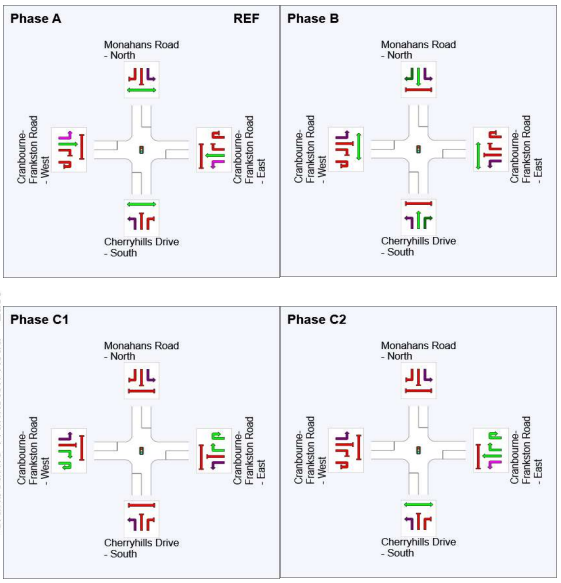
*Output Volumes

Cemetery Road - South

Cranbourne-Frankston Road / Cherryhills Drive / Monahans Road
AM, Existing Geometry, Growth Volumes

Signals *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranCherAMExGr]*





Phase	Grn	Yel	Red	Total	%
A	61	4	2	67	60.91
B	24	4	2	30	27.27
C1	6	4	2	12	10.91
C2	0	4	2	1	0.909

Monahans Road - North

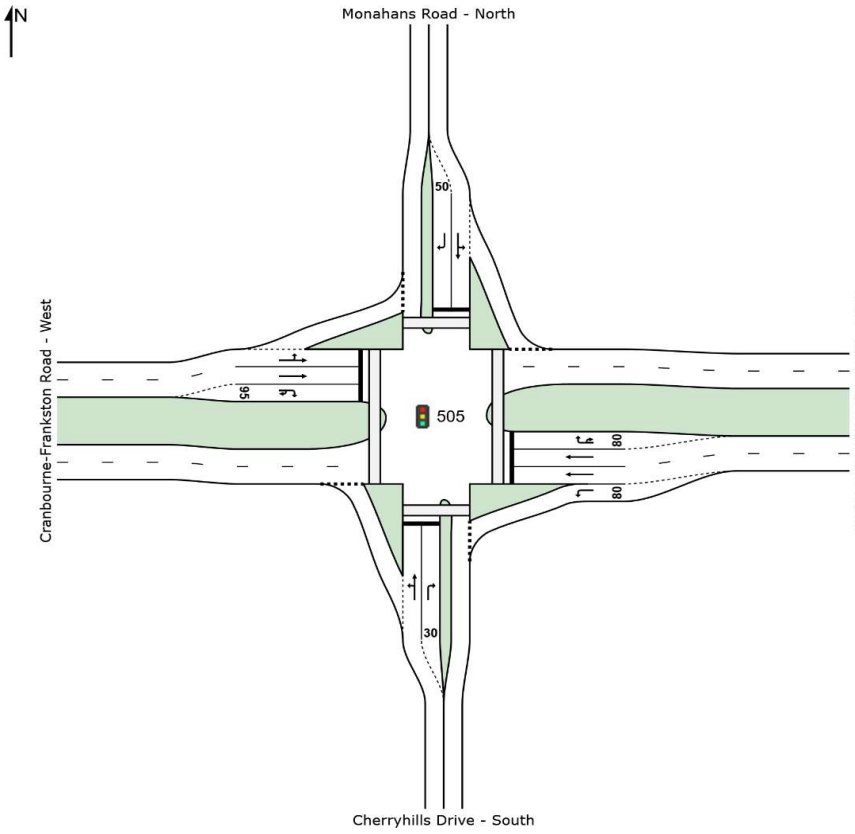
						App	**R**	**T**	**L**					**110**
						47.3	56.6	19.4	25					
						111.7	111.7	23.2	23.2					
						0.824	0.824	0.3	0.3					
						389	279	25	85					
Cranbourne-Frankston Road - West						8	6	1	2					**Cranbourne-Frankston Road - East**
						381	273	24	83					
L	30.2	295.7	0.838	133	3	130				1674	84	1758	0.81	259.7	22.7	**App**
T	24.4	295.7	0.838	1605	80	1525				63	1	64	0.78	35.4	67.3	**R**
R	63.8	10.5	0.309	13	0	13				1560	82	1642	0.81	259.7	20.7	**T**
App	25.5	295.7	0.838	1764	83	1681				31	1	32	0.02	0.8	6	**L**
					3906		26	37	107	171						**LV***
					180		1	1	2	4						**HV***
					4086		27	38	109	175						**Total Vol***
					0.838		0.344	0.344	0.32	0.344						**D.o.S.**
					295.7		14.7	14.7	35.8	35.8						**95th %ile Back of Queue (m)**
					27		37.4	31.8	45.2	41.1						**Average Delay (sec)**
					Intersection		**L**	**T**	**R**	**App**						

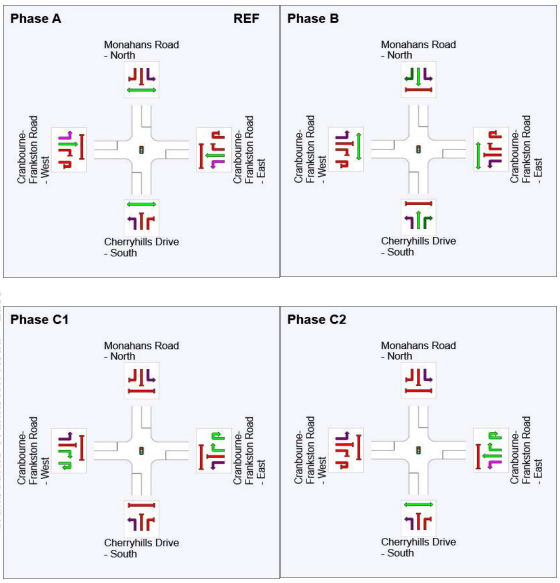
*Output Volumes

Cherryhills Drive - South

Cranbourne-Frankston Road / Cherryhills Drive / Monahans Road
PM, Existing Geometry, Growth Volumes

Signals *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranCherPMExGr]*





Phase	Grn	Yel	Red	Total	%
A	64	4	2	70	63.64
B	17	4	2	23	20.91
C1	6	4	2	12	10.91
C2	0	4	2	5	4.545

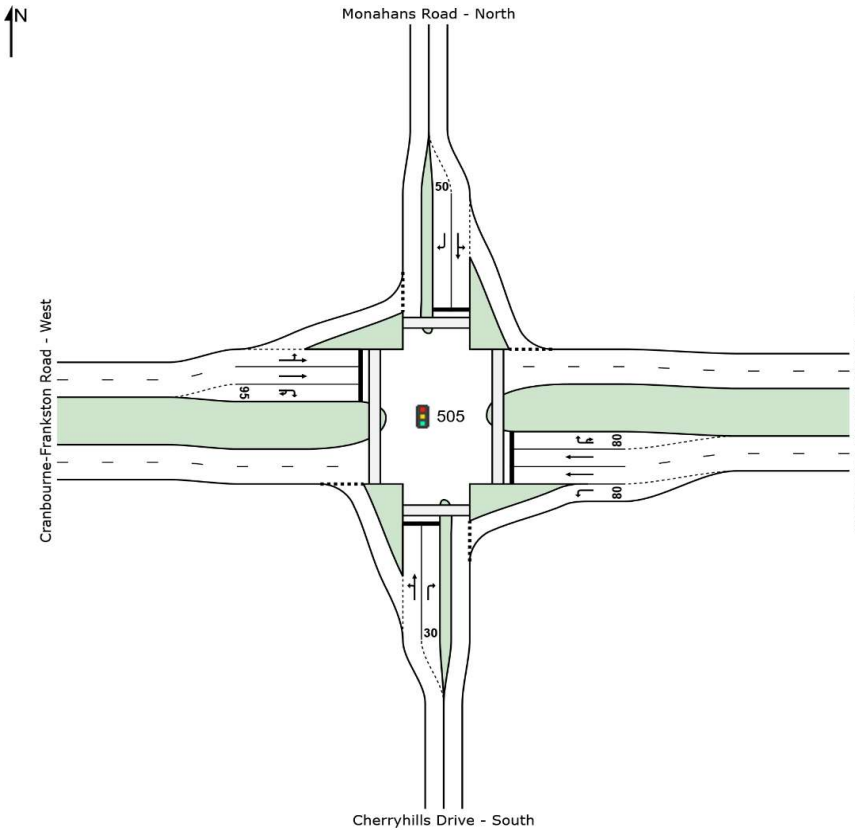
Monahans Road - North

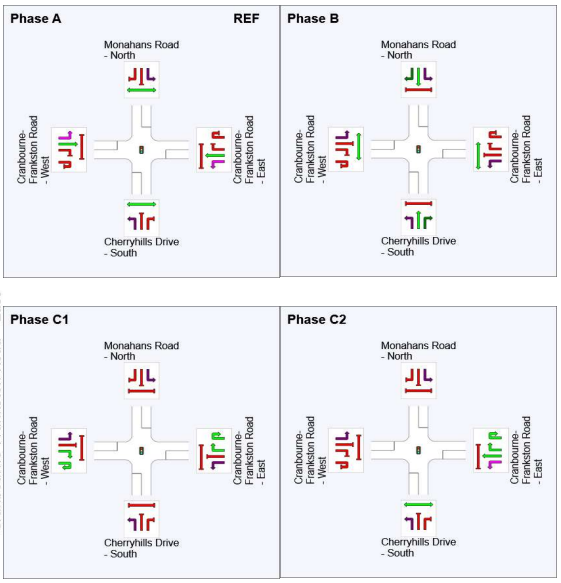
						App	**R**	**T**	**L**					**110**
						56.5	62.9	45.6	51.3					
						86.2	86.2	50.9	50.9					
						0.836	0.836	0.751	0.751					
						378	206	72	100					
Cranbourne-Frankston Road - West						8	4	1	2					**Cranbourne-Frankston Road - East**
						370	202	71	98					
L	42.4	425.6	0.915	204	4	200				1508	71	1579	0.876	154.8	17.8	**App**
T	36.4	425.6	0.915	1781	89	1692				135	3	138	0.876	67.4	69.2	**R**
R	64.1	17.2	0.45	38	1	37				1268	67	1335	0.632	154.8	12.5	**T**
App	37.6	425.6	0.915	2028	93	1935				87	2	89	0.058	3.6	6.4	**L**
					3902	8	33	48	90	**LV***						
					175	0	1	1	2	**HV***						
					4077	8	34	49	92	**Total Vol***						
					0.915	0.225	0.225	0.225	0.225	**D.o.S.**						
					425.6	12.1	12.1	17.4	17.4	**95th %ile Back of Queue (m)**						
					31.9	43.3	37.7	52.5	46.2	**Average Delay (sec)**						
					Intersection	**L**	**T**	**R**	**App**							

*Output Volumes

Cherryhills Drive - South

Signals *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranCherAMExF]*





Phase	Grn	Yel	Red	Total	%
A	59	4	2	65	59.09
B	25	4	2	31	28.18
C1	6	4	2	12	10.91
C2	0	4	2	2	1.818

Monahans Road - North

	App	R	T	L	
	49.2	59	21.7	27.4	
	115	115	26.2	26.2	
	0.849	0.849	0.366	0.366	
	396	279	32	85	
	8	6	1	2	
	388	273	31	83	

110

Cranbourne-Frankston Road - West

L	36	329.1	0.869	133	3	130	1721	87	1808	0.851	295.7	27.3	**App**
T	30.1	329.1	0.869	1605	80	1525	63	1	64	0.851	43.8	69.8	**R**
R	64.2	14.8	0.414	23	0	23	1592	84	1676	0.846	295.7	25.1	**T**
App	31.3	329.1	0.869	1775	83	1692	31	1	32	0.02	0.8	6	**L**

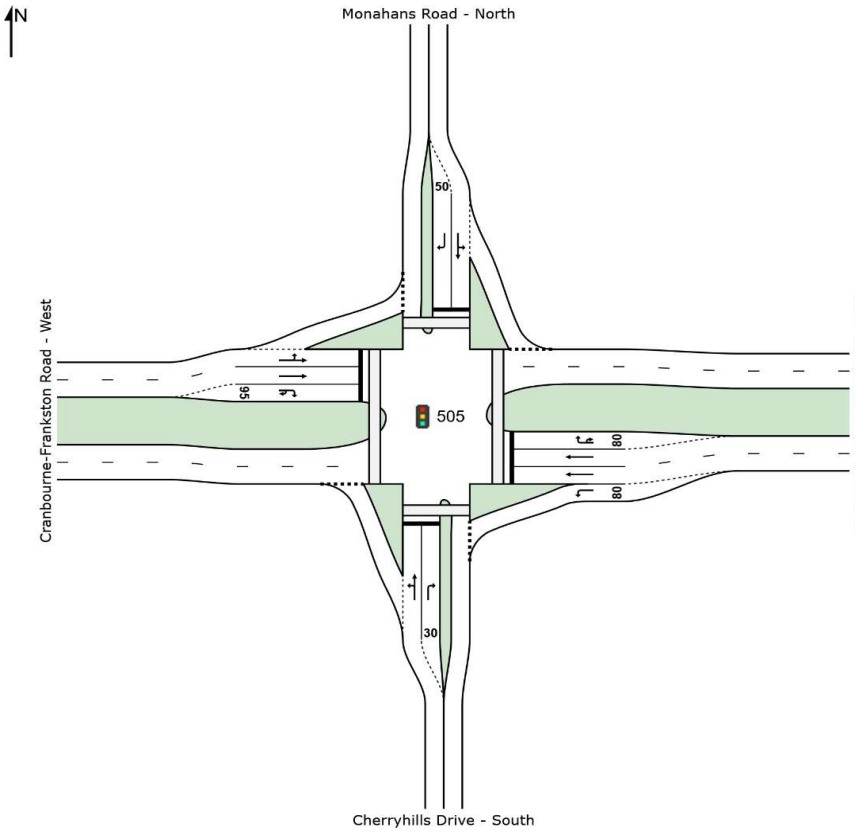
Cranbourne-Frankston Road - East

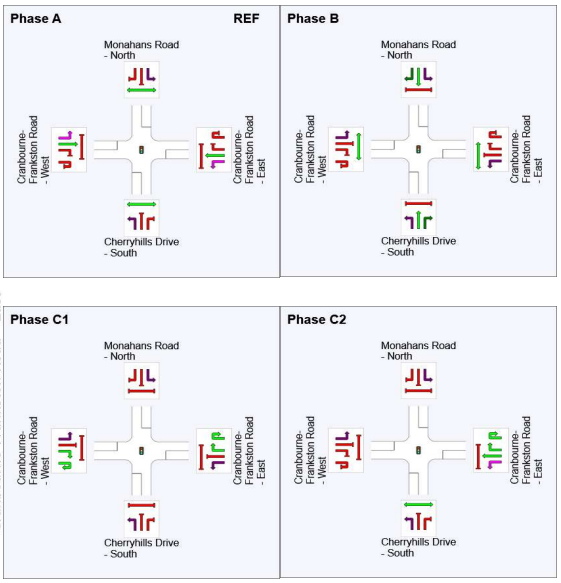
4063	35	58	170	262	**LV***
183	1	1	3	5	**HV***
4246	36	59	173	267	**Total Vol***
0.869	0.473	0.473	0.514	0.514	**D.o.S.**
329.1	27.4	27.4	58.2	58.2	**95th %ile Back of Queue (m)**
32.2	48.5	42.9	46	45.6	**Average Delay (sec)**
Intersection	**L**	**T**	**R**	**App**	

*Output Volumes

Cherryhills Drive - South

Signals *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranCherPMExF]*





Phase	Grn	Yel	Red	Total	%
A	63	4	2	69	62.73
B	18	4	2	24	21.82
C1	7	4	2	13	11.82
C2	0	4	2	4	3.636

Monahans Road - North

	App	R	T	L	
	57.2	60.6	50.5	56.2	
	84.4	84.4	62.2	62.2	
	0.81	0.81	0.786	0.786	
	395	206	88	100	
	8	4	2	2	
	387	202	86	98	

110

Cranbourne-Frankston Road - West

L	50.7	472.7	0.938	204	4	200	1532	72	1604	0.937	168.4	20.1	**App**
T	44.6	472.7	0.938	1781	89	1692	135	3	138	0.937	77.2	78.6	**R**
R	64.5	30.3	0.656	69	1	68	1284	68	1352	0.663	168.4	13.9	**T**
App	46	472.7	0.938	2060	95	1965	87	2	89	0.06	4.6	6.8	**L**

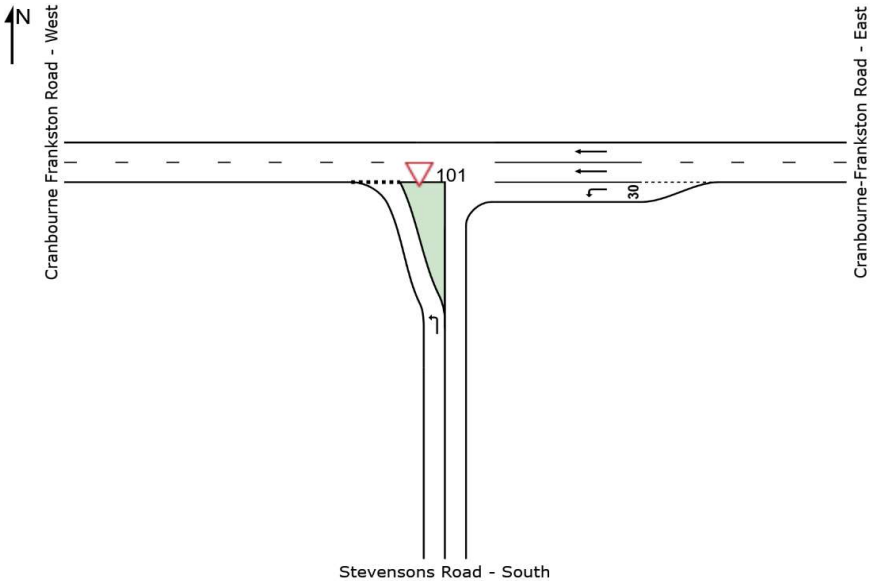
Cranbourne-Frankston Road - East

4023	13	43	81	137	**LV***
176	0	1	2	3	**HV***
4199	13	44	83	140	**Total Vol***
0.938	0.307	0.307	0.38	0.38	**D.o.S.**
472.7	17.2	17.2	30	30	**95th %ile Back of Queue (m)**
37.2	46.7	41	53.9	49.2	**Average Delay (sec)**
Intersection	**L**	**T**	**R**	**App**	

*Output Volumes

Cherryhills Drive - South

Give-Way/Yield *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranStevAMExF]*



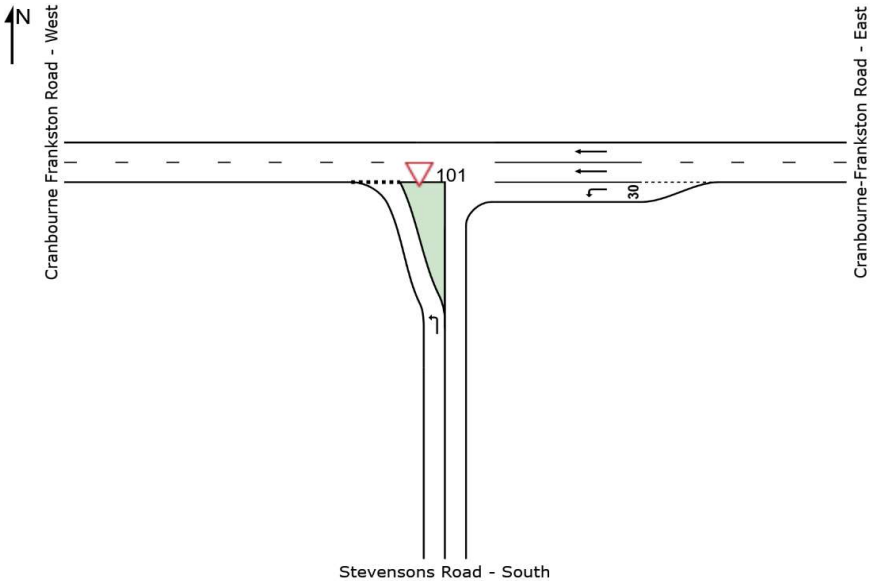


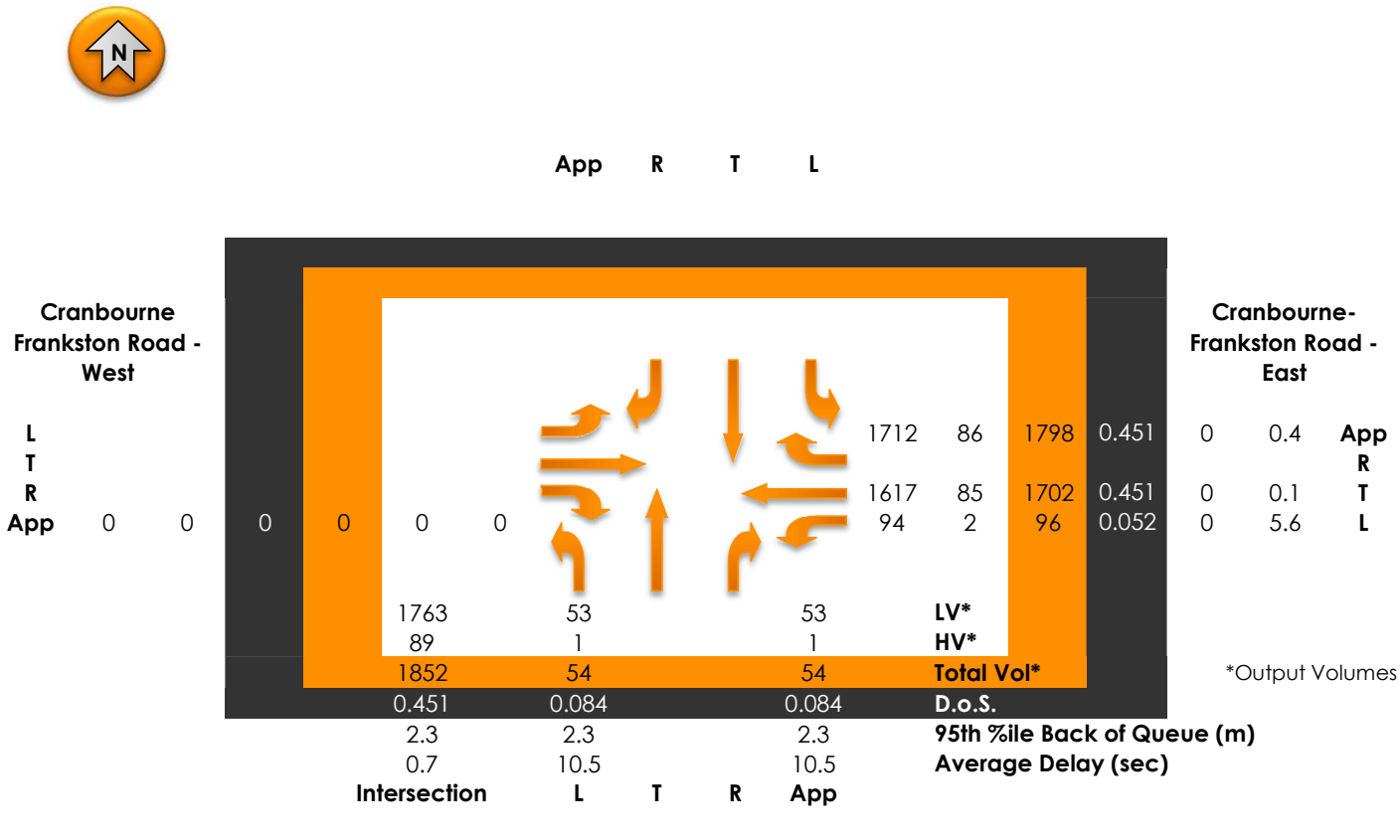
	App	R	T	L								
Cranbourne Frankston Road - West											**Cranbourne-Frankston Road - East**	
L							1709	88	1797	0.467	0	0.2	**App**
T													**R**
R							1676	88	1764	0.467	0	0.1	**T**
App	0	0	0	0	0	0	32	1	33	0.018	0	5.6	**L**
					1784	75		75			**LV***		
					90	2		2			**HV***		
					1874	77		77			**Total Vol***		
					0.467	0.127		0.127			**D.o.S.**		
					3.5	3.5		3.5			**95th %ile Back of Queue (m)**		
					0.6	11		11			**Average Delay (sec)**		
					Intersection	**L**	**T**	**R**	**App**				

*Output Volumes

Stevensons Road - South

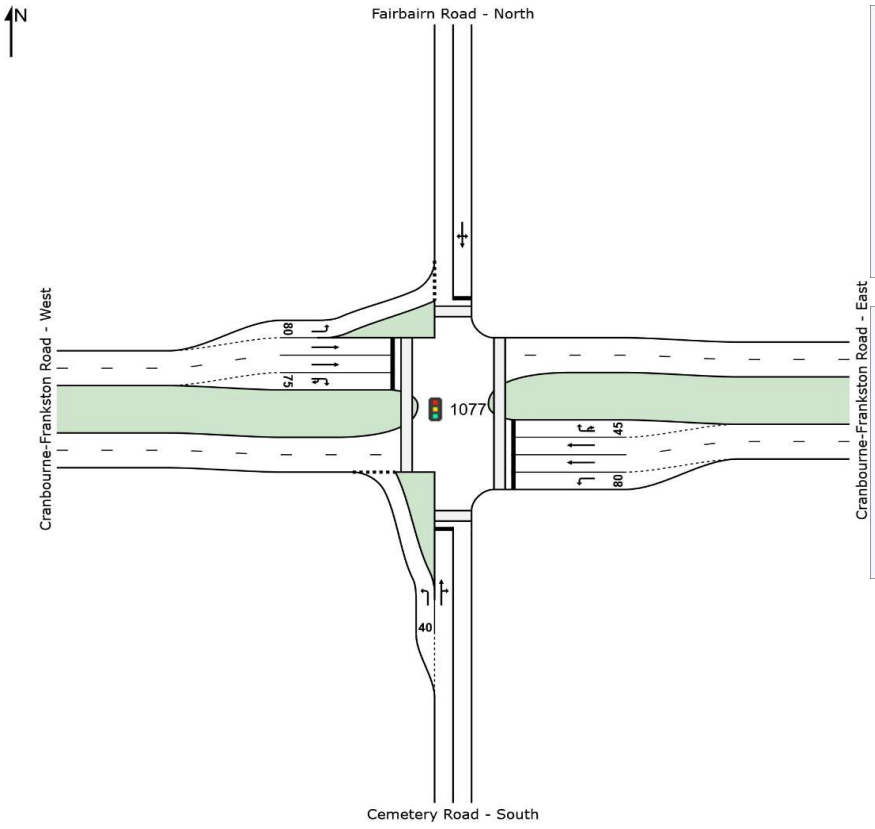
Give-Way/Yield *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranStevPMExF]*

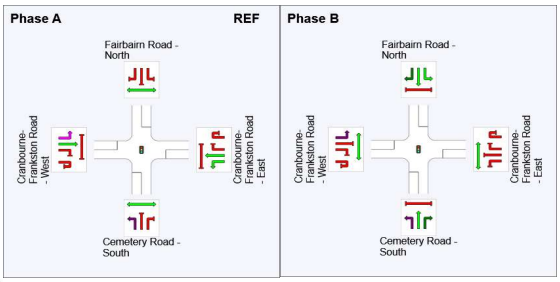


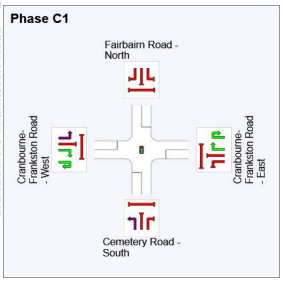


*Output Volumes

Signals *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranCemeAMExF]*







Phase	Grn	Yel	Red	Total	%
A	73	4	2	79	71.82
B	13	4	2	19	17.27
C1	6	4	2	12	10.91

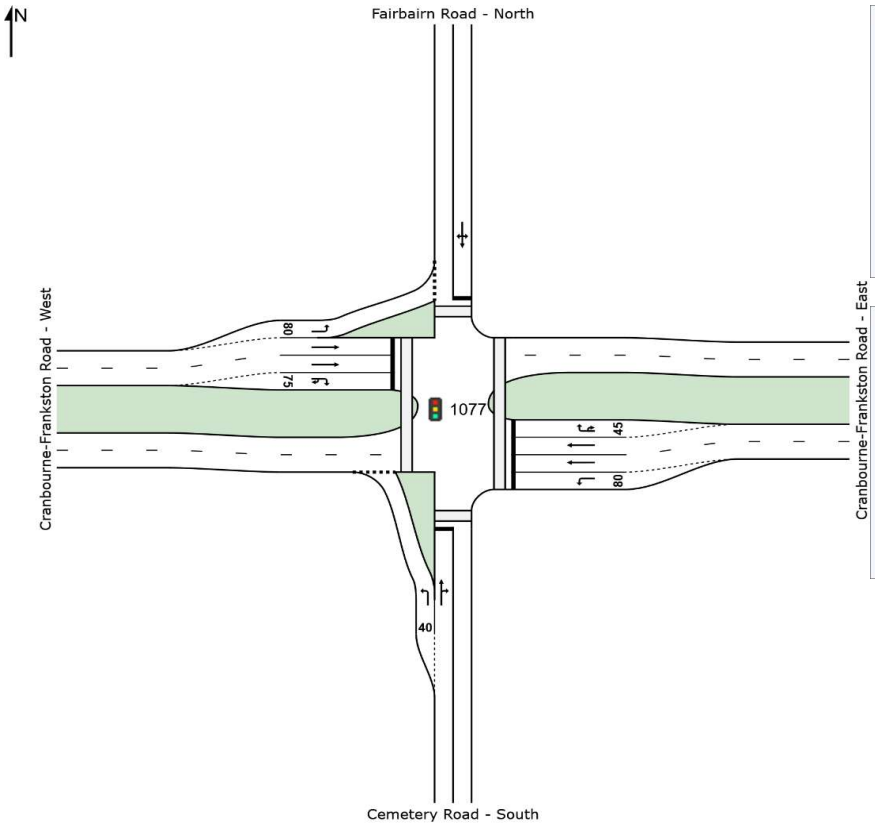
Fairbairn Road - North

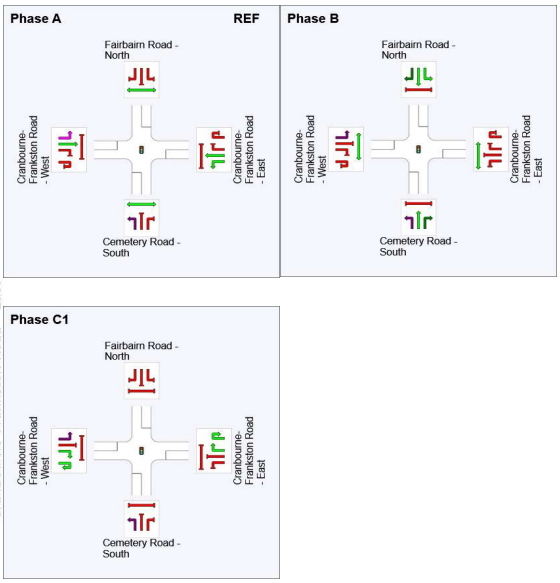
					App	**R**	**T**	**L**						**110**
					61.3	61.3	55.7	61.3						
					59	59	59	59						
					0.758	0.758	0.758	0.758						
					146	124	1	21						
					3	2	0	0						
					143	122	1	21						
Cranbourne-Frankston Road - West														**Cranbourne-Frankston Road - East**
L	6	2.2	0.061	98	2	96			1609	83	1692	0.67	194.6	12.2	**App**
T	12.9	243.7	0.759	1851	93	1758			14	0	14	0.151	5.7	62.2	**R**
R	62.9	4.1	0.133	2	0	2			1580	83	1663	0.67	194.6	11.8	**T**
App	12.9	243.7	0.759	1959	94	1865			14	0	14	0.011	1.7	12.1	**L**
					3621	1	1	5	7		**LV***				
					183	0	0	0	0		**HV***				
					3804	1	1	5	7		**Total Vol***				
					0.759	0.003	0.035	0.035	0.035		**D.o.S.**				
					243.7	0.1	2.2	2.2	2.2		**95th %ile Back of Queue (m)**				
					14.5	12.6	47.2	52.8	46.2		**Average Delay (sec)**				
					Intersection	**L**	**T**	**R**	**App**						

*Output Volumes

Cemetery Road - South

Signals *N:\Projects\2017\170073\Sidra\170073SID002.sip7[CranCemePMExF]*





Phase	Grn	Yel	Red	Total	%
A	71	4	2	77	70
B	15	4	2	21	19.09
C1	6	4	2	12	10.91

Fairbairn Road - North

						App	**R**	**T**	**L**					**110**
						60.1	60.1	54.5	60.1					
						67.6	67.6	67.6	67.6					
						0.767	0.767	0.767	0.767					
						168	154	1	14					
						3	3	0	0					
						165	151	1	14					
Cranbourne-Frankston Road - West														**Cranbourne-Frankston Road - East**
L	6	2.3	0.065	103	2	101				1585	82	1667	0.678	198.3	13.4	**App**
T	14.5	261.4	0.791	1864	93	1771				12	0	12	0.172	6.2	62.6	**R**
R	63.3	6.2	0.197	4	0	4				1550	82	1632	0.678	198.3	12.9	**T**
App	14.4	261.4	0.791	1983	95	1888				20	0	20	0.017	2.7	12.9	**L**
					3657		2	1	15	18						**LV***
					180		0	0	0	0						**HV***
					3837		2	1	15	18						**Total Vol***
					0.791		0.005	0.076	0.076	0.076						**D.o.S.**
					261.4		0.3	5.4	5.4	5.4						**95th %ile Back of Queue (m)**
					16.1		12.9	45.6	51.2	46.4						**Average Delay (sec)**
					Intersection		**L**	**T**	**R**	**App**						

*Output Volumes

Cemetery Road - South