



An Assessment of Traffic Impacts upon Kensington and Parts of Kingsford

Final Draft Report

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Prepared for



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1 INTRODUCTION

gtk consulting was appointed by Randwick City Council (Council) on 7 November 2008 to undertake a study in the suburbs of Kensington and West Kingsford to assess likely traffic impacts resulting from the following proposals:

- New ramps on Gardeners Road to and from Southern Cross Drive (RTA);
- The Green Square Urban Renewal Area (City of Sydney); and
- The half road closure of Lenthall Street, Kensington (Council).

Council's primary objectives for this study are:

- Identify the impact of the RTA proposal on Council's road network and the amenity of the residents in the study area.
- Recommend treatments to address the adverse traffic impacts identified in the above assessment.
- Provide advice to Council about the RTA proposal, to inform discussion and consultation with the local Randwick community.
- Identify the impact on Council's road network and the amenity of residents in the study area of proposed increased residential density in the Zetland and Victoria Park areas as proposed by the City of Sydney.
- Assess the likely impacts of implementing a 'half-closure' eastbound on Lenthall Street.

To achieve the study objectives **gtk consulting** will:

- Review each proposal;
- Assess the impact of the proposals on the existing road network, access and resident amenity; and
- Recommend treatments to address adverse traffic impacts caused by the proposals.

The study area considered in this report is bordered by Dacey Avenue/Alison Road to the north, Doncaster Avenue/Anzac Parade to the east, Gardeners Road to the south and Southern Cross Drive/Dowling Street/South Dowling Street to the west (see **Figure 2.1**). A wider area which includes parts of the City of Sydney Local Government Area (LGA), as defined in the study brief, has been included in this assessment for its potential to impact on the study area.

2 STUDY AREA

The study area (**Figure 2.1**) lies within the Randwick City Council LGA and takes in the suburbs of Kensington and the western portion of Kingsford. The wider area considered in this study (**Figure 2.2**) includes the entire Green Square Urban Renewal Area because of its potential to impact on the study area.

The study area is predominantly residential with low density detached, semidetached and attached dwellings in its western portion and higher density apartments/flats combined with business and retail uses along Anzac Parade and adjacent streets. A heritage conservation area is located between Southern Cross Drive, Lenthall Street and Todman Avenue with a smaller area around the Catholic Convent between Tunstall Avenue and Kensington Road. The Moore Park 'Supa Centa' is a major retail shopping complex located on Todman Avenue at the intersection of South Dowling Street. The Kingsford Town Centre is situated at the south-eastern corner of the study area on Anzac Parade and Gardeners Road (The Nine Ways) and the Kensington Town Centre is located along Anzac Parade between Carlton Street to the north and Doncaster Avenue to the south.

The study area is surrounded by high traffic volume State Arterial roads such as Southern Cross Drive/Dowling Street/South Dowling Street to the west, Dacey Avenue/Alison Road to the north, Anzac Parade to the east and Gardeners Road to the south. Doncaster Avenue (between Todman Avenue and Alison Road) and Todman Avenue are Sub-Arterial Roads also carrying high traffic volumes.

The study area is significantly impacted by nearby major facilities such as Moore Park to the north, University of NSW (UNSW), Prince of Wales Hospital and Randwick Racecourse to the east and the Australian Golf Course in the south-western corner of the study area. The National Institute of Dramatic Arts (NIDA) is located on the western side of Anzac Parade opposite UNSW.

Parking restrictions are imposed on all roads in the Kensington and Kingsford Town Centres. UNSW generates significant parking demand despite the excellent bus services provided for its students and staff. Council has installed Resident Parking Schemes and timed parking in many areas surrounding the university to manage this demand.

Figure 2.1: Study area



Source: Randwick City Council 2008

Figure 2.2: Wider area considered by study

Source: Randwick City Council 2008

2.1 ROAD NETWORK AND CLASSIFICATION

The purpose of a road network is to provide for the safe and efficient movement of people and goods. The road network provides access to land use activities, through traffic connection and may provide on-street parking. It supports economic development and the social functioning of the community and provides a structure around which a built environment can be formed.

Road users include passenger, freight and commercial vehicles, buses, motorcycles, bicycles and pedestrians. While these users are varied, they share a common desire for safe, efficient and reliable movement through the road network. In order to manage the road network in response to the needs and impacts of these users, road authorities such as Councils classify roads according to their function or purpose. The road classification system recognises the needs of different road users and the transport and non-transport functions of roads. It recognises the wide range and balance between mobility and access on the road network. This is largely driven by the relationship between the road network and the land use it serves. Not all roads can cater effectively for all road user needs nor perform all functions efficiently. It is therefore important that roads are managed according to a functional hierarchy while considering their intended purpose. This approach ensures the achievement of an appropriate balance between movement and access on the road network.

The study area encompasses approximately 70 roads, the vast majority of which are local roads. Todman Avenue and Doncaster Avenue are Sub-Arterial Roads and the roads which border the study area, i.e. Southern Cross Drive, Dowling Street, South Dowling Street, Dacey Avenue, Alison Road, Anzac Parade and Gardeners Road, are Arterial Roads.

2.1.1 Classification Criteria

Roads carrying higher traffic volumes are generally State Arterial Roads whereas those roads with lesser volumes are Collector and Local Roads. The study area encompasses roads of varying classifications. The three methods used to classify roads in NSW are:

- Functional classification
- Funding classification
- Classification by environmental capacity

2.1.2 Functional Classification

The Roads and Traffic Authority, NSW (RTA) has published guidelines for the classification of roads using a functional system (RTA 1991[1], pp.1-2 – 1-11). This system is based on an assessment of traffic volumes, composition and management. The existing characteristics of the road are compared with a number of criteria which are summarised in **Table 2-1**.

The functional classification system should not be used as a rigid guideline. There are many instances where through traffic and local neighbourhood shops attract a higher portion of traffic using the local road system. Examples of such roads in the study area are Borrodale Road (Doncaster Avenue to Anzac Parade), Houston Road and Doncaster Avenue (south of Todman Avenue). It is desirable, however, to minimise traffic using residential streets.

Table 2-1: Functional classification system

	Arterial	Sub-Arterial	Collector	Local
Traffic Volume (AADT)	>15,000	5-20,000	2-10,000	< 2,000
Traffic Composition				
Through Traffic	Yes	Yes	Little	No
Local Traffic	No	No	Yes	Yes
Commercial Vehicles	Yes	Yes	No	No
Local Delivery Vehicles	Yes	Yes	Yes	Yes
Buses	Yes	Yes	Yes	Maybe
Bicycles lanes	No	Maybe	Yes	Yes
Parking				
Peak period	No	Yes	Yes	Yes
Off Peak	No	Yes	Yes	Yes
Period parking	No	Maybe	Yes	Yes
Unrestricted	No	No	Maybe	Yes
Angle parking	No	No	Maybe	Yes
Intersection control	Yes	Yes	Maybe	Maybe
Bus and Transit lanes	Yes	Yes	Maybe	No
Pedestrian crossings	Controlled	Controlled	Controlled	No
Speed Limit	60+	60	50/60	50
Lane & separation lines	Yes	Yes	Maybe	No
Medians	Yes	Maybe	Maybe	No
Road closures	No	No	Maybe	Maybe

Source: Adapted from RTA 1991[2]

2.1.3 Funding Classification

In addition, the RTA has also adopted a classification system related to the funds allocated to roads. This system classifies roads according to the funding provided by the RTA as follows:

- **State Roads** – roads which perform a state function and therefore receive one hundred percent funding from the RTA. Essentially, these are arterial roads.
- **Regional Roads** – roads that perform a regional function for which the RTA and Council each contribute fifty percent towards funding. These are essentially sub-arterial roads.
- **Local Roads** – roads that perform a collector or local function, which are one hundred per cent Council funded.

In general, the RTA is responsible for the state road network and Councils are responsible for the regional and local road systems. The RTA has an input into the management of local and regional road systems through local traffic committees. Councils must comply with the requirements of delegations granted to them by the RTA for the control and management of regional and local road systems.

2.1.4 Environmental Capacity

The RTA has also published guidelines which provide advice for the assessment of environmental capacity for streets with direct access to residential properties (RTA 2002[1], p.4-7). These guidelines were developed following considerable research and have taken into account residents' attitudes to traffic in their streets. The guidelines are summarised in

Table 2-2.

Table 2-2: RTA recommended environmental capacity performance standards for residential streets, i.e. local and collector roads

Road Class	Road Type	Maximum Speed (km/h)	Maximum Peak Hour Volume (veh/h)
Local	Access way	25	100
Local	Street	40	200 environmental goal 300 environmental maximum
Collector	Street	50	300 environmental goal 500 environmental maximum

Source: RTA 2002[2]

Two sets of performance standards have been recommended for the maximum peak hour volume in **Table 2-2**. The first indicates the desirable maximum and the second denotes the absolute maximum. For example, the desirable maximum number of vehicles per hour (vph) for a local street is 200 vph and the absolute maximum is 300 vph. However, it is acknowledged that there are some streets that carry volumes greater than the recommended absolute maximum due to their location and connectivity within the road network.

2.1.5 Classification of Streets in the Study Area

This study will use a combination of the three methods of classifying roads, together with consideration of their physical characteristics, to assign a classification to roads within the study area. This will assist in the assessment of the traffic impacts generated by the proposals referred to in **Section 1**.

Using the above methodology the classification of roads within the study area is shown in **Figure 2.3**. Current traffic volumes for roads in the study area are reported in **Section 2.4** and compared against the functional and environmental classification criteria in **Table 2-3**.

Figure 2.3: Road Hierarchy

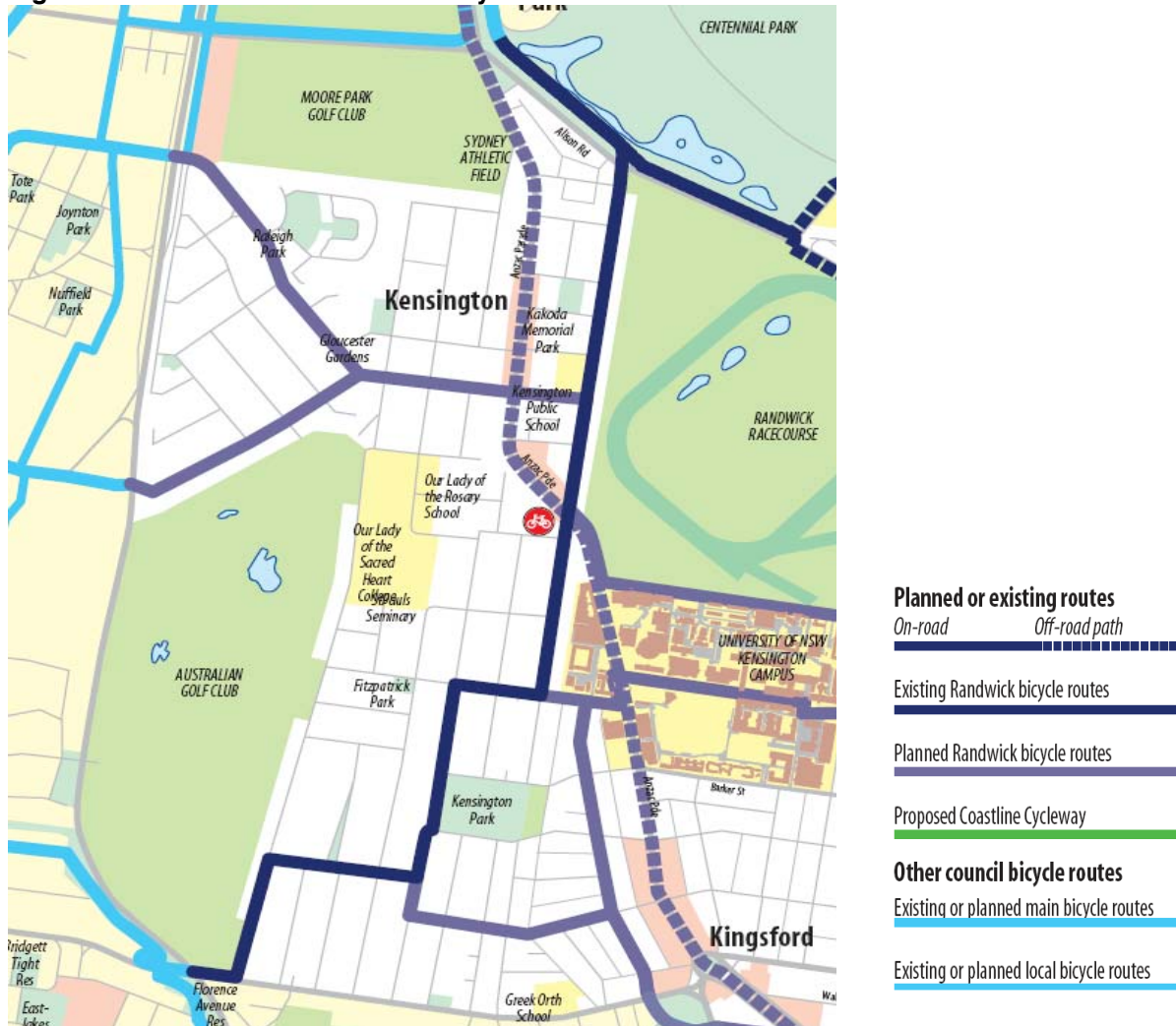


Source: gk consulting 2009

2.2 BICYCLE NETWORK

In 2007 Council updated its 1998 Bicycle Plan. Part of the updated Bicycle Plan relevant to the study area is reproduced in **Figure 2.4**. The complete Randwick City Bicycle Plan can be viewed on Council's website (<http://www.randwick.nsw.gov.au>).

Figure 2.4: Bike Plan relevant to study area



Source: Randwick City Council 2008

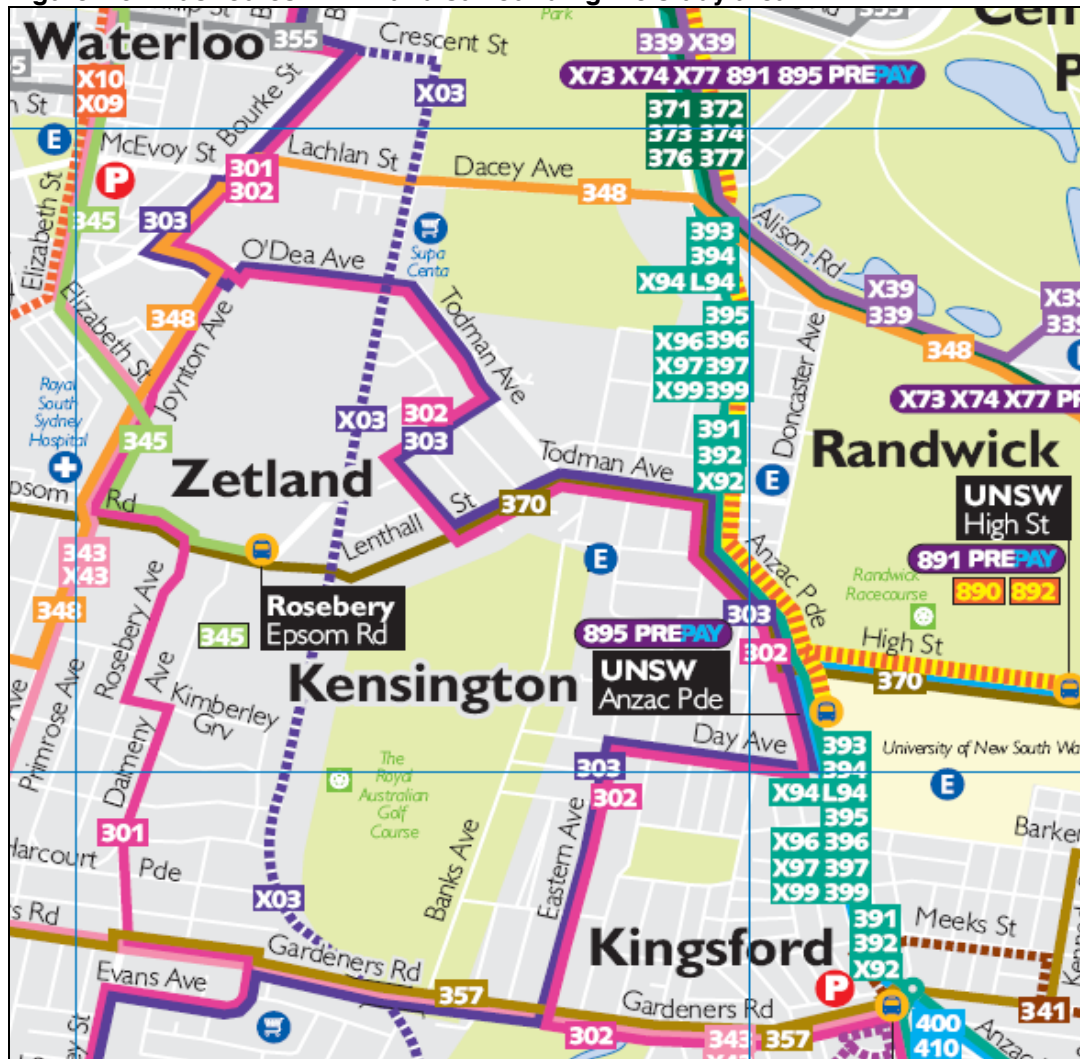
The existing bicycle routes in the study area are well used by cyclists for both commuter and recreational purposes. Observations undertaken during the course of this study also revealed that cycling is a common fitness activity in the study area. The 2006 Census indicated that 756 commuters in the Randwick LGA regularly rode a bicycle to and from work (Australian Bureau of Statistics 2007).

2.3 PUBLIC TRANSPORT NETWORK

2.3.1 Buses

The study area is well serviced by bus transport along the main arterial roads as shown in **Figure 2.5**. Three services travel through the internal roads within the study area via Day Street and Eastern Avenue (routes 302 and 303) and along Lenthall Street (route 370). These routes provide a half to one-hour service for residents living within the study area.

Figure 2.5: Bus routes within and surrounding the study area



Source: Sydney Buses 2008

Twenty six percent of trips to work by Randwick City Council residents are made by bus. This is a significantly higher rate for commuter bus travel compared to the Greater Metropolitan Area rate of 6% (Transport Data Centre 2008).

2.3.2 Rail

There are no rail stations within the study area. The nearest rail station is Green Square Station on the Airport Line. This station is located at the corner of Bourke Street and O’Riordan Street within the City of Sydney LGA and is approximately 1.5 kilometres from Lenthall Street at the Southern Cross drive overpass.

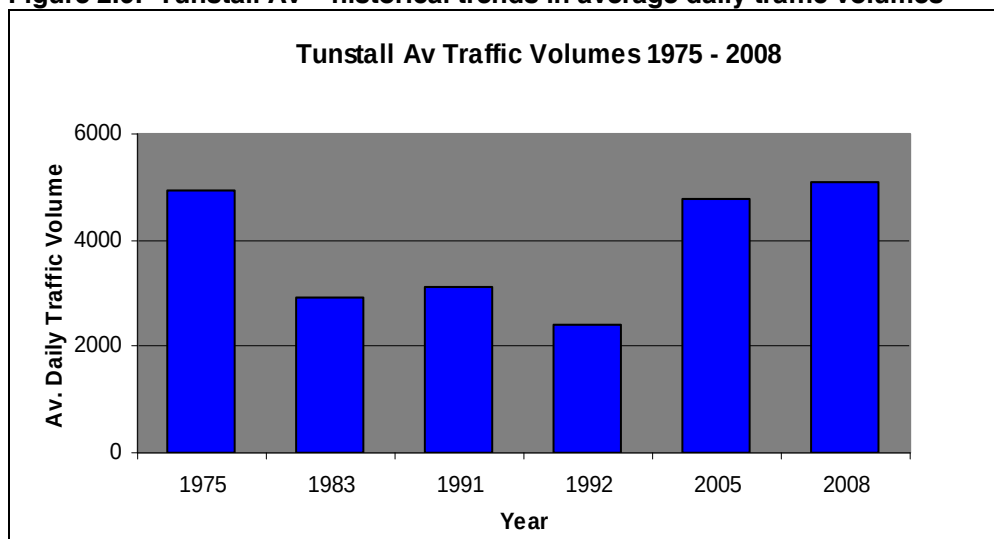
The Airport Line provides a regular rail service to and from Sydney Airport and the Sydney CBD. Since opening, the Airport Line has not been well patronised, this being largely attributed to the high fare structure for the service. For example, the adult return fare from Green Square to Central is \$10.20, compared with the adult return fare from Erskineville to Central (a comparable distance) of \$6.40 (City Rail Fares 2009).

Only 4% of residents in the Randwick LGA travel to work by rail (TDC 2008). It is probable that these residents live in the northern part of the Randwick LGA close to Bondi Junction Station. It is considered unlikely that residents living within the study area travel to work by rail.

2.4 EXISTING TRAFFIC VOLUMES

Randwick City Council has undertaken mid-block traffic surveys on key roads within the study area for many years. This information provides an important record of changes to traffic volumes on these roads and is documented in **Appendix 1**. **Figure 2.6**, for example, shows changes in Tunstall Avenue traffic volumes since 1975.

Figure 2.6: Tunstall Av – historical trends in average daily traffic volumes



Source: gtk consulting 2009

In addition to the mid-block traffic surveys undertaken by Council, intersection surveys (turning movement counts) were undertaken by **gtk consulting** during November 2008 at the following intersections:

- Epsom Road and Link Road
- Todman Avenue and Lenthall Street
- Todman Avenue and Kensington Road
- Doncaster Avenue and Alison Road
- Doncaster Avenue and Todman Avenue
- Doncaster Avenue and Roma Avenue
- Eastern Avenue and Day Avenue
- Gardeners Road and Tunstall Avenue
- Gardeners Road and Eastern Avenue
- Gardeners Road and Cottenham Avenue

The data was collected between 0700 – 0900 and 1600 – 1800 for all vehicles. Complete traffic count data is provided in **Appendices 2-11**.

The intersection surveys undertaken during November 2008 are the most up-to-date traffic information available. It is acknowledged that the surveys were conducted after the conclusion of the UNSW Semester 2 Teaching Period, although it should be noted that examinations were still being conducted. Comparison of the November 2008 surveys with those previously undertaken by Council (with UNSW fully operational) reveals an AM Peak volume reduction of approximately 200 vehicles per hour on arterial and sub-arterial roads. However, traffic volumes were similar for collector and local roads within the study area.

Peak hour traffic flows through the study area are illustrated in **Figure 2.7** (AM peak) and **Figure 2.8** (PM peak).

Figure 2.7: AM peak traffic volumes



Source: gtk consulting 2009

Figure 2.8: PM peak traffic volumes

Source: gtk consulting 2009

Traffic volumes for approach roads to the intersections surveyed by **gtk consulting** were calculated using the data collected for the intersection turning movement counts (see **Appendices 2 – 11**) and are listed in **Table 2-3**¹. These volumes were used to compare each road's performance against functional and environmental capacity criteria. Roads exceeding these criteria are shown in bold and those operating at their upper limits are italicised.

Table 2-3: Operation of roads within study area in relation to functional classification and environmental capacity

Road	Location	Av. Daily Traffic Volume	Functional Classification	Functional Classification Volumes	Environmental Capacity
Cottenham Av	Btw Gardeners Rd & Borrodale Rd	2150	Collector	2000 - 10000	3000 - 5000
Day Av	Btw Eastern Av & Cottenham Av	6590	Collector	2000 - 10000	3000 - 5000
	West of Eastern Av Intersection	4320	Collector	2000 - 10000	3000 - 5000
Doncaster Av	South of Alison Rd Intersection	14230	Sub - Arterial	5000 - 20000	N/A
	North of Todman Av Intersection	18090	Sub - Arterial	5000 - 20000	N/A
	South of Todman Av Intersection	6760	Collector	2000 - 10000	3000 - 5000
	North of Roma Av Intersection	6670	Collector	2000 - 10000	3000 - 5000
	South of Roma Av Intersection	5470	Collector	2000 - 10000	3000 - 5000
Eastern Av	North of Day Av Intersection	270	Local	<2000	2000 - 3000
	South of Day Av Intersection	3040	Collector	2000 - 10000	3000 - 5000
	<i>Btw Gardeners Rd & Tresidder Av</i>	<i>5080</i>	<i>Collector</i>	2000 - 10000	<i>3000 - 5000</i>
Gardeners Rd	West of Eastern Av Intersection	32870	Arterial	>15000	N/A
	East of Eastern Av Intersection	28960	Arterial	>15000	N/A
Kensington Rd	Btw Addison St & Todman Av	6660	Local	<2000	2000 - 3000
	North of Todman Av Intersection	3010	Local	<2000	2000 - 3000
Lenthall St	South of Todman Av Intersection	16640	Collector	2000 - 10000	3000 - 5000
Roma Av	West of Doncaster Av Intersection	1860	Local	2000 - 10000	3000 - 5000
Todman Av	West of Lenthall St intersection	13330	Sub-Arterial	5000 - 20000	N/A
	East of Lenthall St intersection	28950	Sub-Arterial	5000 - 20000	N/A
	West of Kensington Rd	27010	Sub-Arterial	5000 - 20000	N/A
	Btw Kensington Rd & Villiers St	23700	Sub-Arterial	5000 - 20000	N/A
	East of Anzac Pd	12670	Sub-Arterial	5000 - 20000	N/A
Tunstall Av	<i>Btw Gardeners Rd & Tresidder Av</i>	<i>5090</i>	<i>Collector</i>	2000 - 10000	<i>3000 - 5000</i>

Source: gtk consulting 2009

¹ AM peak hour traffic volumes generally represent 10% of average daily traffic volumes.

2.5 EXISTING ROAD NETWORK PERFORMANCE

In order to determine the existing performance of key roads within the study area, intersection modelling was undertaken using the SIDRA traffic modelling program. The SIDRA program determines the average delay of vehicles, the degree of saturation and the level of service of approach roads to the intersections. The degree of saturation is the ratio of the arrival rate of vehicles to the capacity of the approach road. For roundabouts and sign controlled intersections, e.g. stop and give-way signs, the delay examined is the delay for the worst performing movement at the intersection. For signalised intersections the delay examined is the average of all movements at the intersection. Average delay is expressed in seconds per vehicle.

The SIDRA modelling program determines the operation and level of service of each intersection utilising performance criteria set out in **Table 2-4**.

Table 2-4: SIDRA level of service criteria

Level of Service (LOS)	Av. Delay per Vehicle (secs/veh)	Signals & Roundabouts	Give Way & Stop Signs
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity: At <i>signals</i> , incidents will cause excessive delays <i>Roundabouts</i> require other control mode	At capacity, requires other control mode
F	>70	Extra capacity required	Extreme delay, traffic signals or other major treatment required

Source: RTA 2002[3]

A SIDRA analysis was performed on the data collected for 6 of the 10 intersections² surveyed by **gtk consulting** in November 2008, as follows:

- Gardeners Road and Cottenham Avenue
- Gardeners Road and Eastern Avenue
- Gardeners Road and Tunstall Avenue
- Day Avenue and Eastern Avenue
- Todman Avenue and Kensington Road
- Todman Avenue and Lenthall Street

Table 2-5 summarises the results of SIDRA modelling for the existing AM Peak and **Table 2-6**, the existing PM peak:

Table 2-5: SIDRA results existing AM peak

Intersection	Dem. Flow (veh/h)	Deg. of Saturation (v/c)	Av. Delay (sec)	Level of Service (LOS)	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Av. Speed (km/h)
Gardeners & Cottenham (Give-Way)	3254	0.350	1.0	LOS A	11	0.02	0.05	58.2
Gardeners & Eastern (Signalised)	3534	0.708	18.8	LOS B	107	0.89	0.82	39.1
Gardeners & Tunstall (Give-Way)	3951	0.393	1.6	LOS A	11	0.01	0.09	57.5
Day & Eastern (Stop Sign)	749	0.291	6.6	LOS A	13	0.58	0.23	48.8
Todman & Kensington (Roundabout)	3177	0.847	11.4	LOS A	60	0.66	0.78	45.0
Todman & Lenthall (Signalised)	3102	0.981	55.0	LOS D	500	0.89	0.95	23.9

Source: gtk consulting 2009

² These six intersections represent key locations within the study area.

Table 2-6: SIDRA results existing PM peak

Intersection	Dem. Flow (veh/h)	Deg. of Saturation (v/c)	Av. Delay (sec)	Level of Service (LOS)	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Av. Speed (km/h)
Gardeners & Cottenham (Give-Way)	3130	0.544	1.2	LOS A	16	0.02	0.03	58.0
Gardeners & Eastern (Signalised)	3450	0.800	19.7	LOS B	127	0.89	0.84	38.3
Gardeners & Tunstall (Give-Way)	3691	0.340	0.9	LOS A	9	0.01	0.05	58.5
Day & Eastern (Stop Sign)	512	0.151	6.7	LOS A	9	0.49	0.30	48.9
Todman & Kensington (Roundabout)	2912	0.612	9.0	LOS A	42	0.53	0.67	47.0
Todman & Lenthall (Signalised)	2741	0.895	32.4	LOS C	194	0.88	0.89	31.7

Source: gtk consulting 2009

These results indicate that the majority of intersections surveyed in the study area are operating at a good level of service. However, it should be noted that the signalised intersection at Lenthall Street and Todman Avenue has a number of approaches (Lenthall Street right turn into Todman Avenue; Todman Avenue left turn into Lenthall Street) with a level of service 'F'³.

Detailed SIDRA modelling results for each intersection can be found in **Appendix 12**.

³ SIDRA uses the average of all movements at signalised intersections.

2.6 CRASHES WITHIN STUDY AREA

Randwick City Council supplied raw crash data for the years 1996 to June 2007 for the study area and surrounding streets. For the purposes of this study the most recent data for the 3 year period 1 July 2004 - 30 June 2007 was examined as it is essential that up-to-date information is used when undertaking a crash analysis.

A total of 391 crashes occurred within the study area over the three year period considered. These included 4 fatal crashes (including 3 pedestrian fatalities), 153 injury crashes and 234 crashes involving one or more vehicles being towed (see **Appendix 13**).

2.6.1 Pedestrian Crashes

There were 26 crashes involving pedestrians (including 3 fatalities) during the period examined. The location, number and severity of pedestrian crashes are shown in **Table 2-7**.

Table 2-7: Study area pedestrian crashes 1/7/2004 – 30/6/2007

Crash Location	No. Crashes	Severity
Alison Rd at Doncaster Av	1	Fatal
Anzac Pd at ped. signals near Bowral St	1	Injury
Anzac Pd north of Todman Av	1	Injury
Anzac Pd at Todman Av	4	Injury
Anzac Pd at ped signals near Addison St	1	Injury
Anzac Pd at ped signals outside UNSW	3	Fatal (1) Injury (2)
Anzac Pd north of Carlton St	1	Injury
Anzac Pd and Barker St	4	Injury
Anzac Pd and Middle St	1	Injury
Anzac Pd / Gardeners Rd / Rainbow St	3	Injury
Gardeners Rd at Houston Rd	4	Injury
Gardeners La near Houston Rd	1	Injury
Tresidder Av near Maitland Av	1	Fatal

Source: gtk consulting 2009

The number of pedestrian crashes within the study area is considered high for the period reviewed. There are a number of locations listed in **Table 2-7** and plotted on the Crash Map (**Figure 2.9**) which experienced multiple pedestrian crashes. These locations warrant further investigation to determine if the number of pedestrian accidents can be reduced, or eliminated, with the implementation of suitable countermeasure treatments. It should be noted, that with the exception of the fatality on Tresidder Avenue and injury crash on Gardeners Lane, there were no pedestrian crashes on the internal local/regional roads within the study area.

2.6.2 Study Area Crash Rates

There are a number of methods for calculating road crash rates. These include:

- Rating by severity of crashes
- Cost of crashes
- Total number of crashes at any given location
- Number of crashes within a given area
- Number of crashes per unit length of road in a given period

The RTA has developed a method based on the number of crashes per million vehicle kilometres travelled for various road classifications in the Sydney Region (RTA 2002[1], pp.4-10 & 4-11). This method of classification is shown in **Table 2-8**.

Table 2-8: Crash rates by road classification (per million veh.km travelled)

Road Classification	Fatal Injury	Serious Injury	Other Injury	Property Damage	Total
Local/sub arterial	0.015	0.015	0.551	1.152	1.87
Arterial	0.016	0.012	0.429	0.989	1.55
Freeway	0.003	0.0037	0.091	0.230	0.36

Source: RTA 2002[4]

gtk consulting considers the ranking of crashes in accordance with exposure (number of vehicles) over a unit length of road (road length) for a three year period is a practical method of comparing and ranking the performance of streets within the study area.

Table 2-9 lists crash rates for streets within the study area compared against the Sydney Region crash rate.

**Table 2-9: Crash rates for streets within study area
(per million vehicle km travelled)**

Street	Crash Rate	Sydney Region Crash Rates
Anzac Pd	2.46	1.55
Borrodale Rd	1.36	1.87
Cottenham Av	1.62	1.87
Doncaster Av – North of Todman Av	0.78	1.55
Doncaster Av – South of Anzac Pd	0.48	1.87
Day Av	1.56	1.87
Eastern Av	0.73	1.87
Gardeners Rd	0.30	1.55
Houston Rd	0.94	1.87
Kensington Rd – South of Todman Av	2.17	1.87
Lenthall St	0.27	1.87
Todman Av – West of Lenthall St	1.13	1.55
Todman Av – East of Lenthall St	1.00	1.87
Tunstall Av – South of Day Av	0.67	1.87
Tunstall Av – North of Day Av	0	1.87

Source: gtk consulting 2009

There are two sections of road within the study area which experience crash rates above the Sydney Region crash rate, i.e. Anzac Parade and Kensington Road south of Todman Avenue. Anzac Parade is a State Road under the care, control and responsibility of the RTA, however, Kensington Road is a local road and the responsibility of Council.

Other locations where a concerning number of crashes has occurred are:

- Tresidder Avenue⁴ 1 fatality, 2 injury and 1 tow away
- Kensington Road /Duke Street intersection 2 injury and 3 tow away crashes
- Kensington Road/Todman Avenue intersection 2 injury and 10 tow away crashes

Further investigation of these locations is recommended to determine if these crash numbers can be reduced, or eliminated, with the implementation of suitable countermeasure treatments. A plan of road crashes July 2004 - June 2007 for the study area is shown in **Figure 2.9**.

⁴ No traffic volumes were available for Tresidder Av, therefore, a crash rate could not be determined.

Figure 2.9: Study area road crashes July 2004 – June 2007



Source: gtk consulting 2009

3 GREEN SQUARE

3.1 BACKGROUND

The Green Square Urban Renewal Area is situated within the City of Sydney LGA, on the western side of Southern Cross Drive/Dowling Street/South Dowling Street, directly opposite the heritage conservation area of West Kensington. It is generally bordered to the north by Phillip and Crescent Streets, Epsom Road to the south and Bourke Street to the west (**Figure 3.1**).

Figure 3.1: Green Square Urban Renewal Area



Source: City of Sydney 2008

The Green Square urban strategy aims to “develop neighbourhoods that provide living, working and recreational environments”. The area (280 hectares) is divided into defined neighbourhoods as follows (City of South Sydney 1997):

- “Zetland and Beaconsfield Residential Neighbourhoods – residential comprising existing conserved terraces and compatible new development.
- Green Square Town Centre – commercial, retail and cultural development.
- Victoria Park – mixed use development comprising medium to high rise residential, commercial and retail at lower and ground levels.
- Northern Neighbourhoods – mixed use development incorporating office and retail showrooms and café/restaurant activities.
- Southern Neighbourhoods – mixed use commercial and residential”.

City of Sydney anticipates that the Green Square Urban Renewal Area will accommodate approximately 33,150 residents and 28,400 employees when fully developed by the year 2021. In order to support the new residents and employees the following development is forecast:

- | | |
|--------------------------|--------------------------|
| • Dwellings | 13,076 |
| • Residential floorspace | 1,310,000 m ² |
| • Commercial floorspace | 854,000 m ² |
| • Retail floorspace | 46,000 m ² |

City of Sydney estimates that approximately 20% of this development has been completed to date (City of Sydney 2008).

The recently released *Green Square Urban Renewal Area Transport Management and Accessibility Plan (TMAP)* has introduced 2031 as the new date for full development (Parsons Brinckerhoff Australia Pty Ltd 2008). The TMAP also states that the expected number of new employees will rise from an existing 20,000 to only 22,000 by 2031. At the time of writing this report there is no explanation for the anomaly between this employee number (i.e. 22,000) and the commercial floorspace quoted by City of Sydney of 854,000m² which, on industry standards, will accommodate between 34,000–43,000 employees (i.e. 1 employee/20-25m² of floorspace). It is noted that the *Zetland Area Traffic Study* also quotes an anticipated employee population of 41,578 (Maunsell Australia 2004).

3.2 PREVIOUS TRAFFIC STUDIES

There have been a number of traffic studies and reports completed for various projects in the Green Square area. Studies referred to in the preparation of this report include:

- *Eastern Distributor Local Area Improvement Program – West Kensington and Zetland* (PPK Environment & Infrastructure Pty Ltd 1999)
- *Green Square Town Centre Master Plan, Supporting Studies – Transport Report* (Masson Wilson Twiney Traffic and Transport Consultants 2003)
- *Zetland Area Traffic Study* (Maunsell Australia 2004)

The *Green Square Town Centre Master Plan, Supporting Studies – Transport Report* and *Zetland Area Traffic Study* undertook traffic modelling to predict the traffic volumes which will be generated by the Green Square Redevelopment Area for 2016. The *Eastern Distributor Local Area Improvement Program – West Kensington and Zetland* report modelled traffic flows for 2011.

The *Zetland Area Traffic Study* estimated that by 2016 approximately 90% of development within the Green Square Urban Renewal Area will be completed (Maunsell Australia 2004, p.45).

From the information provided by City of Sydney on the ultimate development for Green Square (**Section 3.1**), traffic volumes can be estimated for 2016 from the following floorspace and number of dwellings⁵:

- | | |
|--------------------------|--------------------------|
| • Dwellings | 11,768 |
| • Residential floorspace | 1,179,000 m ² |
| • Commercial floorspace | 768,600 m ² |
| • Retail floorspace | 41,400 m ² |

⁵ i.e. 90% of the dwelling numbers and residential, commercial, retail floorspace quoted in Section 3.1

3.3 PREDICTED TRAFFIC GENERATION

The RTA provides average traffic generation rates for a range of different land uses in the publication *Guide to Traffic Generating Developments* (2002[1], pp.3-22 & 3-23). The rates are based on extensive surveys undertaken throughout the Sydney Metropolitan Area.

Residential Developments

The Masson Wilson Twiney (MWT) study (2003, p.6) notes different travel mode ratios for residential developments located close to public transport and those further away from public transport. In keeping with this, Maunsell Australia (2004, pp.45-46) used the following trip generation rates:

- 0.30 vehicle trips/ peak hour/dwelling for areas near public transport; and
- 0.44 vehicle trips/ peak hour/dwelling for areas further away from public transport.

In contrast, the RTA (2002[1], p.3-22.) quotes trip generation rates for high and medium density developments as follows:

- 0.24 vehicle trips/peak hour/ high density residential flat dwelling in urban areas; and
- 0.40 – 0.65 vehicle trips/peak hour/ per medium density dwelling in urban areas.

This study will use the trip generation rate of 0.30 vehicle trips/peak hour/dwelling for the reasons that:

- The majority of proposed dwellings in the Green Square area are high density.
- Proposed dwellings in the Green Square area will comprise a mix of studio through to three bedroom and larger type apartments.
- A rate of 0.30 trips/peak hour/dwelling will compensate for the mix of apartment type.
- 0.30 trips/peak hour/dwelling is consistent with previous studies undertaken for the Green Square Urban Renewal Area.

Commercial and Retail Developments

The use of RTA trip generation rates for commercial (2 vehicle trips per 100m²) and retail (7.6 vehicle trips per 100m²) activities will provide an indication of the potential traffic volumes that could be generated by the Green Square Urban Renewal Area (RTA 2002[1], pp.3-6 & 3-22.).

Based on the above residential, commercial and retail trip generation rates, the Green Square Urban Renewal Area could potentially generate the traffic volumes shown in **Table 3-1**, by the year 2016, if policies and transport alternatives are not in place to constrain private vehicle traffic growth and the provision of car parking.

Table 3-1: Trip generation - Green Square Urban Renewal Area (2016)

Land Use	No. Dwellings/ Floorspace	Trip Rate	Peak Hour Trip Generation (veh/h)
Dwellings	11,768	0.30	3,530
Commercial	768,000m ²	2.0 per 100m ²	15,360
Retail	41,400 m ²	7.6 per 100m ²	3,146
Total Potential Peak Hour Trip Generation (2016)			22,036

Source: gtk consulting 2009

As noted in **Section 3.1**, approximately 20% of Green Square development has been completed. Taking this into account, the potential additional peak hour traffic generation is, therefore, **17,629 vehicles/hour** for the year 2016.

Clearly, traffic volumes of this magnitude could not be accommodated on the existing road network, even taking into account the proposed infrastructure improvements outlined in **Section 3.5**. For this reason the Ministry of Transport together with City of Sydney and Landcom have developed the *Green Square Urban Renewal Area Transport Management and Accessibility Plan (TMAP)* (Parsons Brinckerhoff Australia Pty Ltd 2008) in order to examine the options available to reduce the use of private motor vehicles for trips to and from Green Square.

3.4 TRANSPORT MANAGEMENT AND ACCESSIBILITY PLAN (TMAP)

In January 2009 Randwick City Council was advised that the *Green Square Urban Renewal Area Transport Management and Accessibility Plan (TMAP)* was available for perusal. City of Sydney's Senior Transport Planner and Transport Manager met with Randwick City Council's Manager Integrated Transport and the Director of **gtk consulting** on 23 January 2009. This meeting discussed the objectives of the TMAP and the proposed transport corridors on Lenthall Street and Todman Avenue in the Randwick LGA.

The TMAP Report was undertaken by Parsons Brinckerhoff Australia Pty Ltd on behalf of the Ministry of Transport, City of Sydney and Landcom. Key findings of the TMAP (2008, p.1) are:

- “A “*Business as Usual*” scenario of future growth would be incompatible with a vision of Green Square as a sustainable and liveable Global Village
- the vision of Green Square would be best supported in transport terms by a “*No Car Growth*” scenario, which requires a whole-of-government strategy implemented by the City of Sydney in collaboration with State Government
- to be successful, this strategy includes a package of comprehensive transport and integrating planning measures that support a “*No Car Growth*” scenario, in particular:
 - managing car parking supply, location and regulation and delivering responsive public transport provision
 - facilitating key transport corridors that can accommodate higher forms of transit and the needs of all transport users over time
 - prioritising walking and cycling mobility for local trips with increased connections to surrounding key destinations, including the CBD
 - promoting travel demand management directly to new residents and businesses over the growth period to directly achieve increased transit use and reduced dependence on private vehicles”.

It is not the purpose of this study to critique the TMAP report. However, as illustrated in **Table 3-1**, the potential traffic generation from proposed development in the Green Square Urban Renewal Area requires a guaranteed commitment to the provision of improved public transport as outlined in the TMAP report. The transport infrastructure improvements necessary to achieve the ‘*No Car Growth*’ objective of the TMAP are vulnerable to changes in budgets, economic conditions, government priorities and governments themselves. While the transport proposals put forward to achieve the objectives of the TMAP are vulnerable to change, new

developments have been constructed, and others are in the process of being approved, within the Green Square Urban Renewal Area. Furthermore, the management of car parking supply and its regulation may result in a shift of long stay (employee) parking to the West Kensington precinct.

3.5 PROPOSED ROAD INFRASTRUCTURE IMPROVEMENTS

There are a number of considerations being given to road infrastructure improvements in the Green Square Urban Renewal Area. However, many of these are undergoing a process of continual review for a variety of reasons.

The three major road infrastructure improvements within the Green Square Urban Renewal Area which will directly impact on Kensington and West Kingsford are:

- The proposed half road closure of Epsom Road/Lenthall Street.
- The provision of additional right turn lanes from O'Dea Avenue into South Dowling Street.
- The provision of additional right turn lanes from Lachlan Street into South Dowling Street.

There are many other road infrastructure proposals recommended for the Green Square Urban Renewal Area which will have lesser impacts on the Kensington and West Kingsford study area. However, as previously mentioned, these proposals are under constant review as development increases. They include (Maunsell Australia 2004, p.63):

- "Signalisation of the intersection of Danks and Bourke Streets with full pedestrian crossings;
- Realignment of the Lachlan Street – McEvoy Street connection to a single intersection with Bourke Street and widening this east west route to three lanes in each direction;
- Major changes to the Green Square arterial interchange (the junction of Bourke Road, Bourke Street, O'Riordan Street, Botany Road and Wyndham Street) with the extent of works dependent on whether the one-way pairs option is adopted;
- A new four-lane east west cross street between the Green Square Town Centre and Bourke Road, with new four-way signalised intersections with Botany Road, O'Riordan Street and possibly Bourke Road at Bowden Street;
- Signalisation of the intersection of Lachlan and Bruce Streets with full pedestrian crossings;

- Signalisation of the intersection of Hunter and McEvoy Streets with full pedestrian crossings;
- Signalisation of the intersection of Gadigal and O'Dea Avenues with full pedestrian crossings;
- Left-out restrictions at Hansard Street at Botany Road;
- Left-in, left-out restrictions at: Portman Street, Dunning Avenue, Hawksley Street, Powell Street, King Wee (future) Street and Sydney Gate's approaches to Bourke Street; at Tilford Street and Wolseley Grove's approaches to Joynton Avenue; at Storm Avenue, Grandstand Parade and Victoria Park Parade's approaches to O'Dea Avenue; at Storm Avenue's approach to Lachlan Street; and at Hunter, Morehead and Young Street's approaches to McEvoy Street.
- Increased capacity at the intersection of South Dowling Street and O'Dea Avenue;
- Increased capacity at the intersection of South Dowling Street and Lachlan Street; and
- Consistent four-lane geometry with peak period clearways on Epsom Road between Joynton Avenue and Dalmeny Avenue, Joynton Avenue south of Elizabeth Street, Bourke Street between O'Dea Avenue and Crescent Street, O'Dea Avenue between Joynton Avenue and Defries Avenue".

3.6 POTENTIAL TRAFFIC FLOW EFFECTS UPON KENSINGTON AND WEST KINGSFORD

In determining the volume of traffic that may potentially travel through the Kensington and West Kingsford study area it was necessary to consider the following:

- The variety of different land use activities within the Green Square Urban Renewal Area.
- The proposed land uses in the Green Square Urban Renewal Area (mixed use commercial, retail and residential) generate trips in both directions. In the AM peak, commercial and retail trips are mostly inward, while residential trips are mostly outward. The reverse applies for the PM peak.
- As congestion increases drivers will seek alternative routes to and from their origins and destinations.
- It has been assumed that traffic generated in the Green Square Urban Renewal Area will travel on the existing road network in a similar distribution as currently occurs.

- Approximately 20% of the Green Square Urban Renewal Area has already been developed and traffic generated by these developments is included in existing traffic volumes.

In **Section 3.3** it was estimated that by 2016, or at 90% of full development, the Green Square Urban Renewal Area could potentially generate an additional 17,629 vehicles per hour, if policies and transport alternatives are not in place to constrain private vehicle traffic growth and the provision of car parking. Of these additional 17,629 vehicles per hour, taking into account existing traffic patterns to and from Green Square and the considerations listed on the previous page, it is estimated that 3,526 vehicles per hour may enter and leave the Kensington and West Kingsford areas (**Table 3-2**).

Table 3-2: Green Square – estimate of traffic entering and leaving study area (2016)

	Traffic Generation (veh/h)	Land Use	Enter/ Exit Green Square	Total Traffic Generation (veh/h)
AM Peak	565	residential	exit	3,526
	2,961	commercial & retail	enter	
PM Peak	565	residential	enter	3,526
	2,961	commercial & retail	exit	

Source: gtk consulting 2009

In contrast, the recently released TMAP report promotes a '*No Car Growth*' scenario for the Green Square Urban Renewal Area and maintains that this will be achieved by the implementation of a package of comprehensive transport and integrated planning measures (Parsons Brinckerhoff Australia Pty Ltd 2008, p.1).

4 PROPOSED RAMPS ON GARDENERS ROAD AT SOUTHERN CROSS DRIVE

4.1 BACKGROUND

On 24 September 2004 the then Minister for Roads, Carl Scully MP, issued a media release advising that the State Government had released plans to build south facing ramps on Gardeners Road at Eastlakes, providing direct access to and from Southern Cross Drive (Scully 2004).

The proposed ramps were part of an \$80 million road package for the South Sydney Area announced by the State Government in 2003. The media release advised that tenders would be called in the first half of 2005, with construction planned to commence in the second half of that year and completion expected in late 2006.

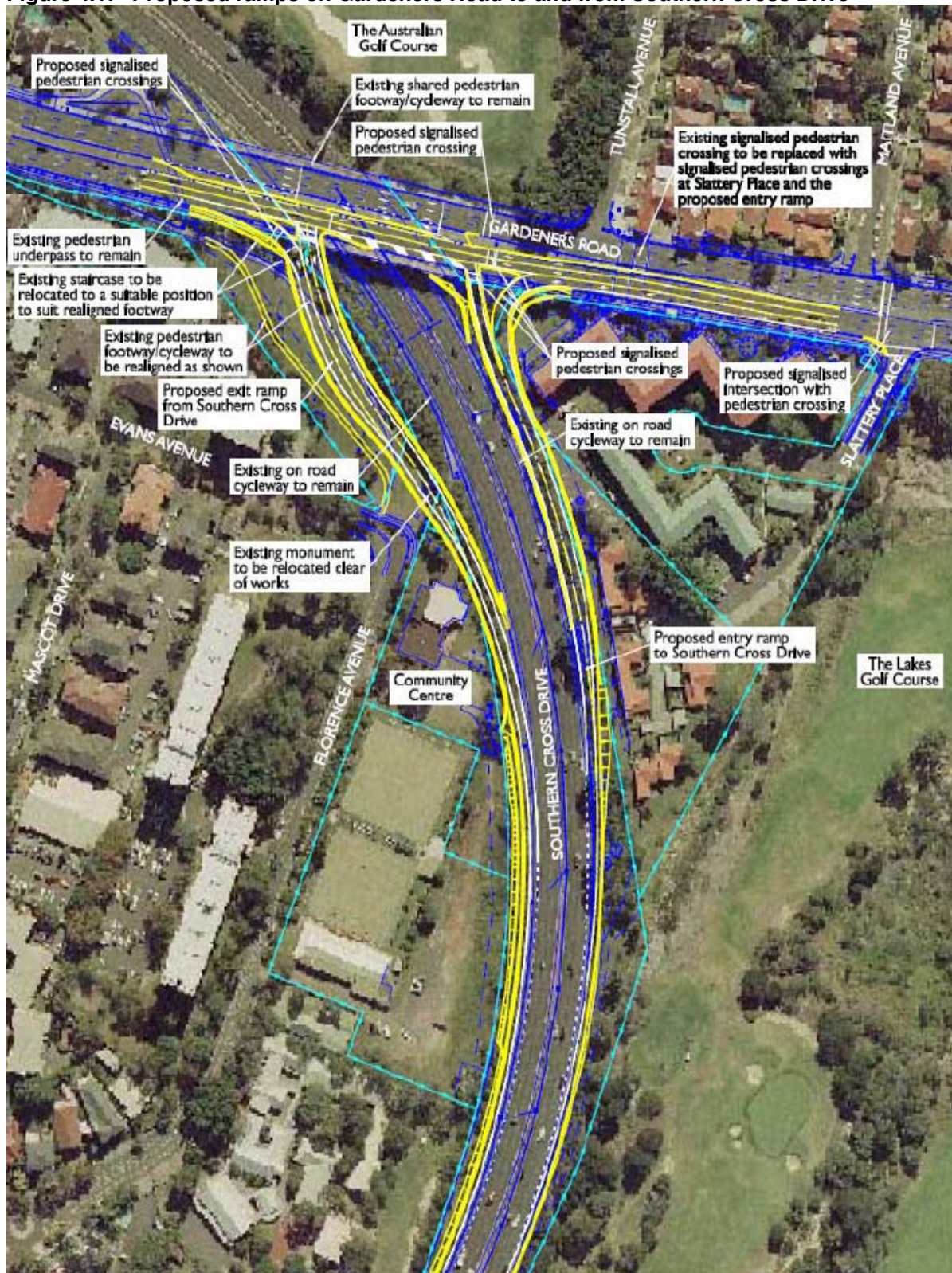
The objectives of the proposed ramps were to (RTA 2004a):

- “Improve traffic flow, reduce travel times, delays and road user costs
- Improve the arterial road network and encourage greater use of Gardeners Road
- Improve road safety for all users
- Improve access to the road network
- Provide for future public transport that may use the proposed facilities”

An aerial image showing an overlay of the proposed ramps is provided in **Figure 4.1**.

In 2005 Council, the community and the RTA considered a variety of local traffic measures to offset any negative impacts the proposed ramps might have on the local streets of the Randwick LGA to the north of Gardeners Road. Following deliberations of a working party set up to liaise with the RTA to determine local area mitigation measures Council resolved, on 22 February 2005, to suspend its in-principle support for the concept of the Gardeners Road access ramps to and from Southern Cross Drive (Randwick City Council 2005). Since this time there has been little if any progress on the implementation of the ramp proposal.

The current status of the proposed Gardeners Road ramps is detailed on the RTA website, where it is reported that construction of the project is to be deferred for at least four years due to reduced Federal Government AusLink funding levels (RTA 2008).

Figure 4.1: Proposed ramps on Gardeners Road to and from Southern Cross Drive

Source: RTA 2005

4.2 PREDICTED TRAFFIC GENERATION

In September 2004, the RTA advised Randwick City Council that the proposed ramps on Gardeners Road at Southern Cross Drive had been modelled using the RTA's EMME/2 network analysis model. Traffic predictions for the AM peak for 2016 were (RTA 2004a):

- 717 vehicles per hour entering the southbound ramp from Gardeners Road
- 1162 vehicles per hour exiting the northbound ramp from Southern Cross Drive

4.3 PROPOSED ROAD INFRASTRUCTURE IMPROVEMENTS

Works proposed for the provision of the new ramps included (RTA 2004a):

- “The construction of south facing ramps between Gardeners Road and Southern Cross Drive (one lane for southbound traffic to Southern Cross Drive and two lanes for northbound traffic approaching Gardeners Road.
- Removal of existing pedestrian signals on Gardeners Road east of Tunstall Avenue.
- The provision of new traffic signals (including pedestrian signals) 50 metres west of Tunstall Avenue on Gardeners Road. All movements permitted to ramp for southbound traffic.
- The provision of new traffic signals 130 metres west of Tunstall Avenue on Gardeners Road. All movements permitted between ramp and Gardeners Road.
- Reduce Gardeners Road to two lanes for west-bound traffic at the site”.

4.4 POTENTIAL TRAFFIC FLOW EFFECTS UPON KENSINGTON AND WEST KINGSFORD

As noted in **Section 4.2**, RTA traffic modelling estimates that 1162 vehicles per hour will exit Southern Cross Drive onto Gardeners Road and 717 vehicles per hour will enter Southern Cross Drive from Gardeners Road. Having regard to existing traffic patterns and the locations of places of employment, educational facilities, etc., it is assumed that approximately 70% – 80% of traffic exiting Southern Cross Drive via the northbound ramp onto Gardeners Road will travel in an easterly direction towards the Kensington and West Kingsford areas. For the purpose of this report a figure of 75% will be used to calculate the volume of this additional eastbound Gardeners Road traffic in the AM peak. The same percentage (i.e. 75%) will also be used to calculate additional westbound traffic on Gardeners Road accessing the southbound ramp onto Southern Cross Drive in the AM peak from the Kensington and West Kingsford areas.

The RTA has not provided estimates for the PM peak period. However, traffic surveys undertaken by Council and **gtk consulting** within the study area indicate that the AM and PM peaks are generally similar. It is assumed, therefore, that this arrangement will also apply to additional traffic travelling to and from Southern Cross Drive via the new ramps in the AM and PM peak periods.

Estimates of additional traffic entering and leaving the Kensington and West Kingsford areas (2016) as a result of the proposed Gardeners Road/Southern Cross Drive ramps are summarised in **Table 4-1**.

Table 4-1: Gardeners Rd ramps – estimate of traffic entering and leaving study area (2016)

	Additional Traffic Generation (veh/h)	Direction of Travel on Gardeners Rd	Two-Way Additional Traffic (veh/h)
AM Peak	870	eastbound	1,410
	540	westbound	
PM Peak	540	eastbound	1,410
	870	westbound	

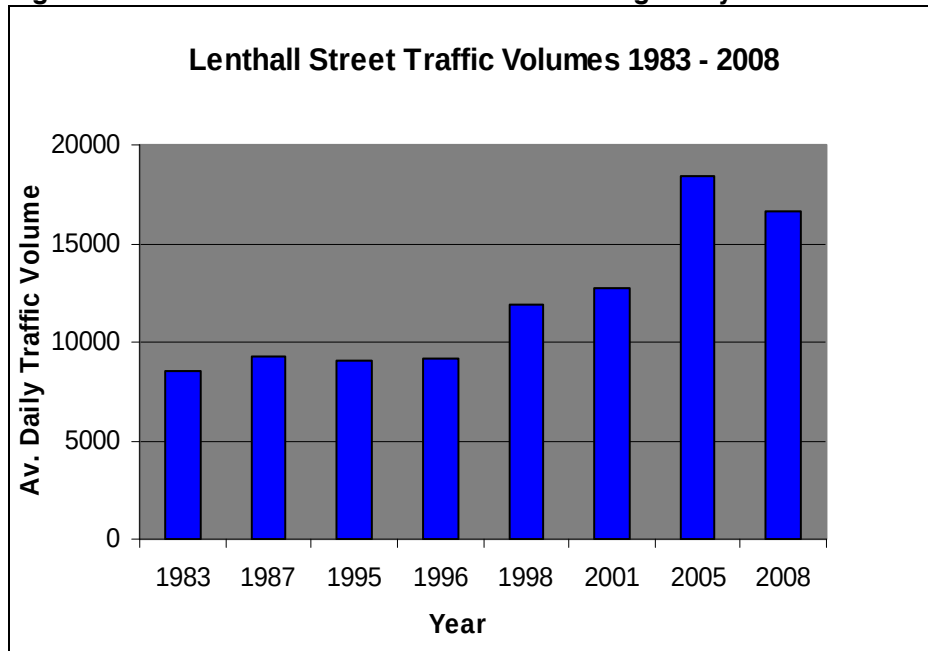
Source: gtk consulting 2009

5 PROPOSED LENTHALL STREET HALF ROAD CLOSURE

5.1 BACKGROUND

Lenthall Street is a collector road which runs in a north-east /south-west direction between Southern Cross Drive and Todman Avenue. Lenthall Street joins Epsom Road under the Southern Cross Drive overpass. Lenthall Street and Epsom Road form a well used traffic route between the areas to the south and west of Green Square and the Eastern Suburbs, and provide local access. It has long experienced high traffic volumes (see **Figure 5.1**) and prior to Randwick City Council implementing traffic calming measures in 1998/99, Lenthall Street also experienced high vehicle speeds.

Figure 5.1: Lenthall St - historical trends in average daily traffic volumes



Source: gtk consulting 2009

Between 1983 – 1996 traffic volumes on Lenthall Street were in the order of 9,000 vehicles per day. Lenthall Street, therefore, has been functioning as a sub-arterial road since at least 1983. Traffic volumes have now risen to 1664 vehicles per hour in the AM peak period, i.e. approximately 16,500 vehicles per day. It is considered inappropriate for such high traffic volumes on a local road bisecting a residential heritage conservation area.

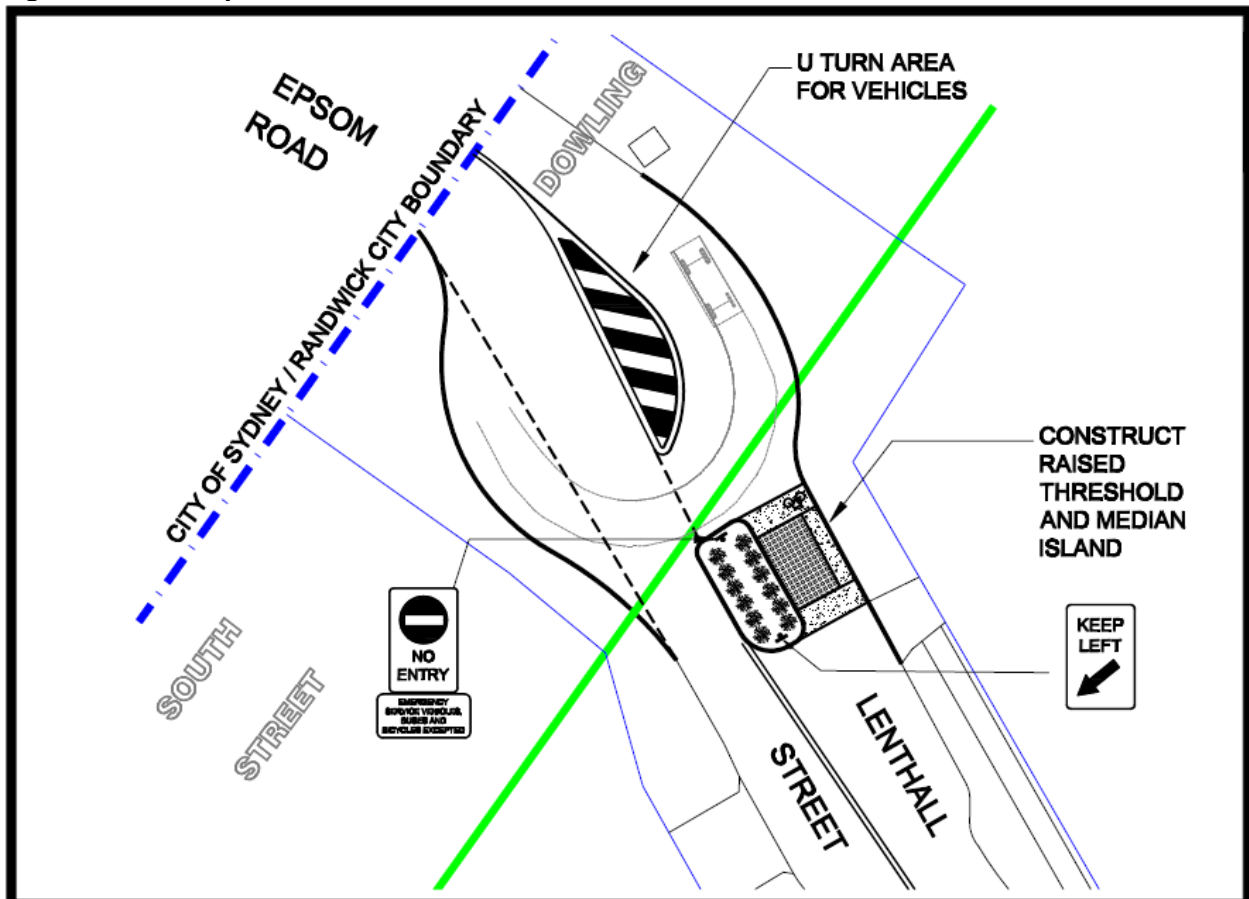
5.2 COUNCIL'S PROPOSAL FOR LENTHALL STREET HALF ROAD CLOSURE

In 1999, PPK Environment and Infrastructure Pty Ltd prepared the *Eastern Distributor Local Area Improvement Program West Kensington and Zetland* traffic study for the RTA. The purpose of this study was to establish recommended local area improvement works to offset any traffic infiltration into local residential areas caused by the construction of the Eastern Distributor.

The PPK study (1999, p.12) considered a number of traffic management options, including a half road closure of Lenthall Street at Epsom Road under the Southern Cross Drive overpass. The proposal involved prohibiting vehicles (buses and cyclists excepted) travelling in an eastbound direction on Epsom Road from Zetland to Kensington.

At the time of the PPK study, the proposed half road closure (as illustrated in **Figure 5.2**) was supported by some Randwick City Council residents and Council. However, following reviews by a Technical Advisory Committee and a Community Consultative Committee the proposed half road closure of Lenthall Street was substituted for a range of traffic calming measures, including roundabouts and defined parking, cycleway and traffic lanes. These facilities were subsequently installed.

Figure 5.2: Concept Plan Lenthall Street Half Road Closure

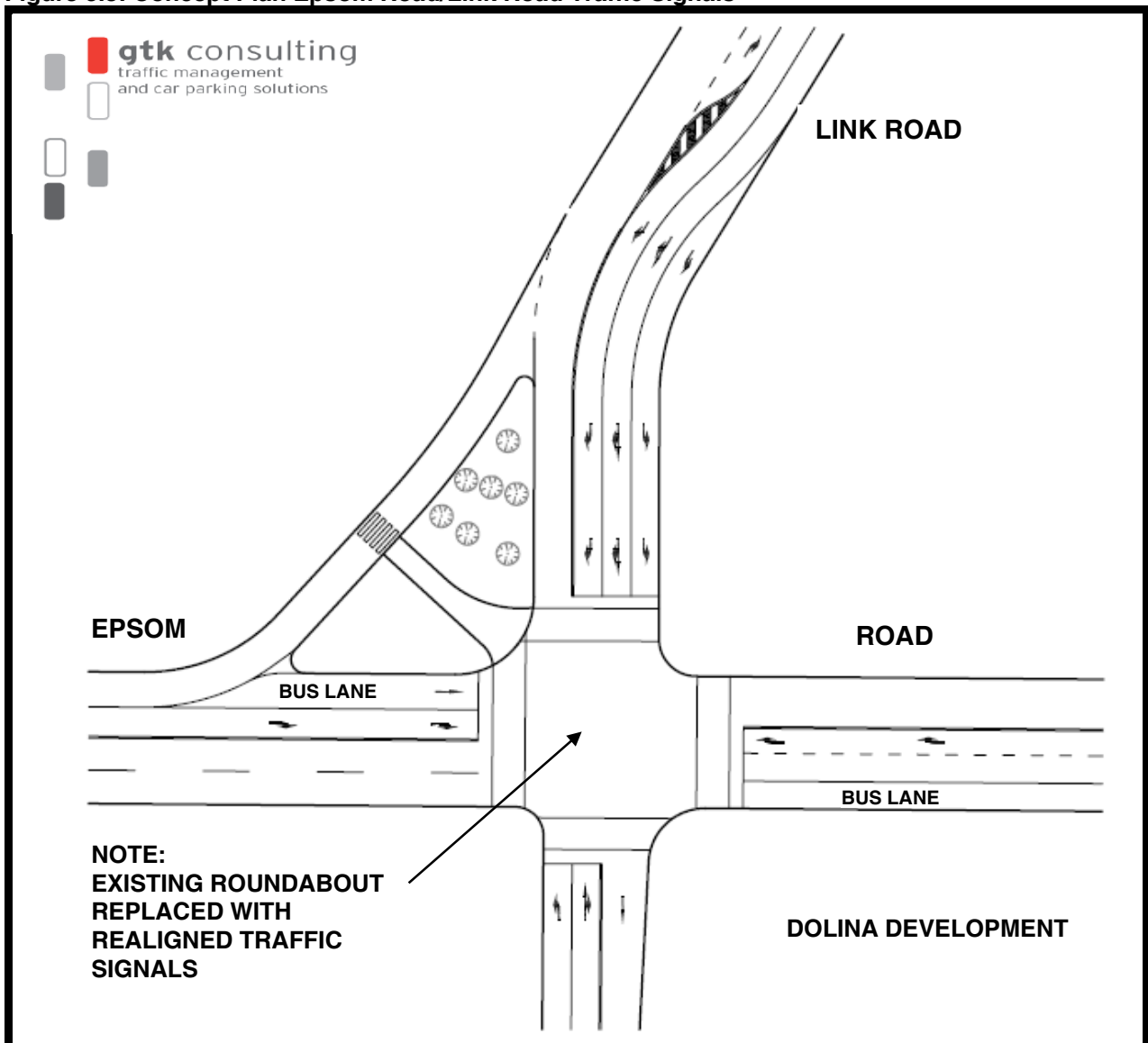


Source: Randwick City Council 2009

5.3 PROPOSED SIGNALISATION OF EPSOM ROAD AND LINK ROAD INTERSECTION

In 2004, City of Sydney considered a development application for a Master Plan comprising a mixed use residential and retail development at 87-103 Epsom Road and land bordered by Link Road and Southern Cross Drive at Rosebery (i.e. the Dolina development). City of Sydney referred the development application to the RTA in accordance with State Environment Planning Policy No.11. The RTA advised City of Sydney of its concerns regarding increased traffic flows onto Lenthall Street which would result if the proposed Master Plan was approved. The RTA recommended that City of Sydney and the developer contact Randwick City Council to discuss and implement suitable measures to mitigate further traffic increases along Lenthall Street as a result of the proposed development (RTA 2004b).

The Development Application for the Master Plan was appealed by the developer to the NSW Land and Environment Court in February 2007 for deemed refusal by City of Sydney. The appeal was successful in obtaining the approval of the Court subject to conditions, one of which was to signalise the intersection of Link Road/Epsom Road and the new road access to the proposed development (Warehouse v Sydney City Council 2007). The Land and Environment Court further conditioned that the signalised intersection be designed to the requirements of the RTA. The RTA has proposed (RTA 2009) that the intersection of Link Road/Epsom Road and the new road access to the development be constructed to prevent through traffic, with the exception of buses and cyclists, travelling east past the intersection. However, it should be noted that the RTA proposal still permits left turns from Link Road into Epsom Road and ultimately, Lenthall Street. **Figure 5.3** illustrates a concept plan of the RTA proposal.

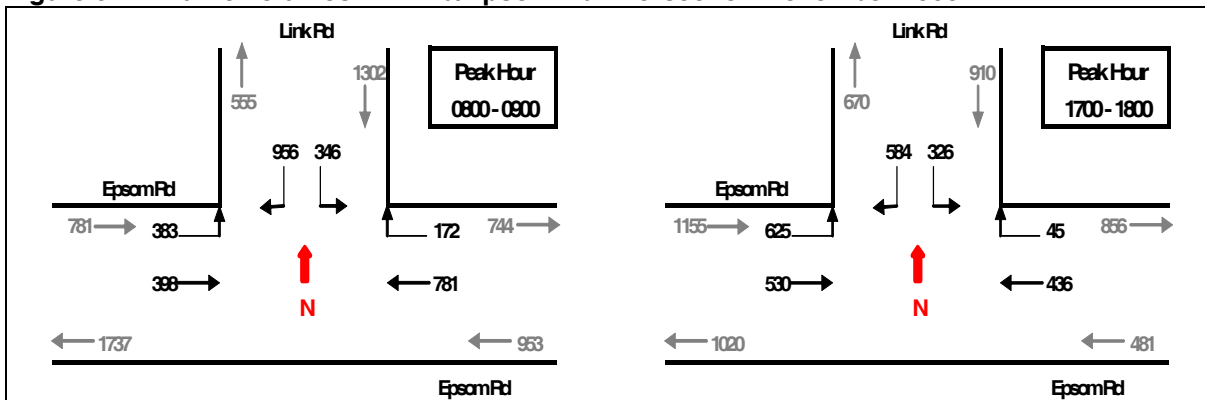
Figure 5.3: Concept Plan Epsom Road/Link Road Traffic Signals

Source: gtk consulting 2009

5.4 PREDICTED REDUCTION IN LENTHALL STREET TRAFFIC VOLUMES

Both the Council and RTA proposals result in significant traffic volume reductions in Lenthall Street. In order to estimate this reduction, surveys were undertaken at the intersection of Epsom Road and Link Road in November 2008. **Figure 5.4** shows existing eastbound traffic volumes on Epsom Road east of Link Road of 744 vehicles/hour in the AM peak and 856 vehicles/hour in the PM peak.

Figure 5.4: Traffic volumes Link Rd/Epsom Rd intersection November 2008



Source: gtk consulting 2009

Under Council's proposal for the half road closure of Lenthall Street all eastbound traffic will be redirected (with the exception of buses and cyclists), resulting in traffic volume reductions on Lenthall Street of approximately 44% (744 vehicles) in the AM peak and 64% (856 vehicles) in the PM peak.

In contrast, the RTA's requirement for the signalisation of the Epsom Road/Link Road intersection retains the left turn movement from Link Road into Epsom Road. Reduction in traffic volumes in Lenthall Street under this proposal are approximately 23% (398 vehicles) in the AM peak and 40% (530 vehicles) in the PM peak.

To achieve an equivalent outcome to Council's half road closure proposal on Lenthall Street it will be necessary to prohibit the left turn movement from Link Road into Epsom Road which is still permitted under the RTA proposal. Council should request that the RTA ban the left turn from Link Road and proposed right turn from the Dolina site into Epsom Road. Alternatively, Council can install the half road closure on Lenthall Street as shown in **Figure 5.2**.

While vehicles will be redirected to Todman Avenue, Dacey Street and Gardeners Road (discussed in **Section 6.2**), the proposed half road closure results in a significant reduction to traffic flow on Lenthall Street. However, it is acknowledged that some residents living in the West Kensington precinct will experience an increase in travel times when travelling from areas west of Lenthall Street.

6 TRAFFIC IMPACT OF PROPOSALS ON KENSINGTON AND WEST KINGSFORD

The potential impact of the proposals on traffic volumes is summarised as follows:

- The proposed ramps on Southern Cross Drive to and from Gardeners Road – additional 1410 vehicles for AM and PM peaks.
- The Green Square Urban Renewal Area '*Full Car Growth*'⁶ – additional 3526 vehicles for AM and PM peaks.
- The Green Square Urban Renewal Area '*No Car Growth*'⁷ – no additional vehicles for AM and PM peaks.
- The half closure of Lenthall Street, Kensington – reduces existing traffic volumes in Lenthall Street by approximately 744 vehicles in the AM peak and 856 vehicles in the PM peak.

6.1 IMPACT ON TRAFFIC VOLUMES

The potential impact of each proposal on AM peak traffic volumes is summarised in **Table 6-1**⁸.

Table 6-1: Estimated potential changes to AM peak traffic volumes

Road	Location	Existing AM Peak Volume (veh/h)	Green Square		Ramps	Lenthall Half Closure
			'Full Car Growth'	TMAP 'No Car Growth'		
Cottenham Av	Btw Gardeners Rd & Borrodale Rd	215	5	0	69	10
Day Av	Btw Eastern Av & Cottenham Av	659	71	0	250	21
	West of Eastern Av Intersection	432	7	0	108	17
Eastern Av	South of Day Av Intersection	304	64	0	142	4
	North of Gardeners Rd Intersection	508	64	0	142	4
Gardeners Rd	West of Eastern Av Intersection	3287	339	0	1194	98
	East of Eastern Av Intersection	2896	275	0	1052	94
Lenthall St	South of Todman Av Intersection	1664	1058	0	0	-744
Todman Av	West of Lenthall St Intersection	1333	1058	0	0	446
	East of Lenthall St Intersection	2895	2116	0	0	-298
	West of Kensington Rd Intersection	2701	2116	0	0	-298
	Btw Kensington Rd & Villiers St	2370	2116	0	0	-298
Tunstall Av	Btw Gardeners Rd & Tresidder Av	509	14	0	216	33

Source: gtk consulting 2009

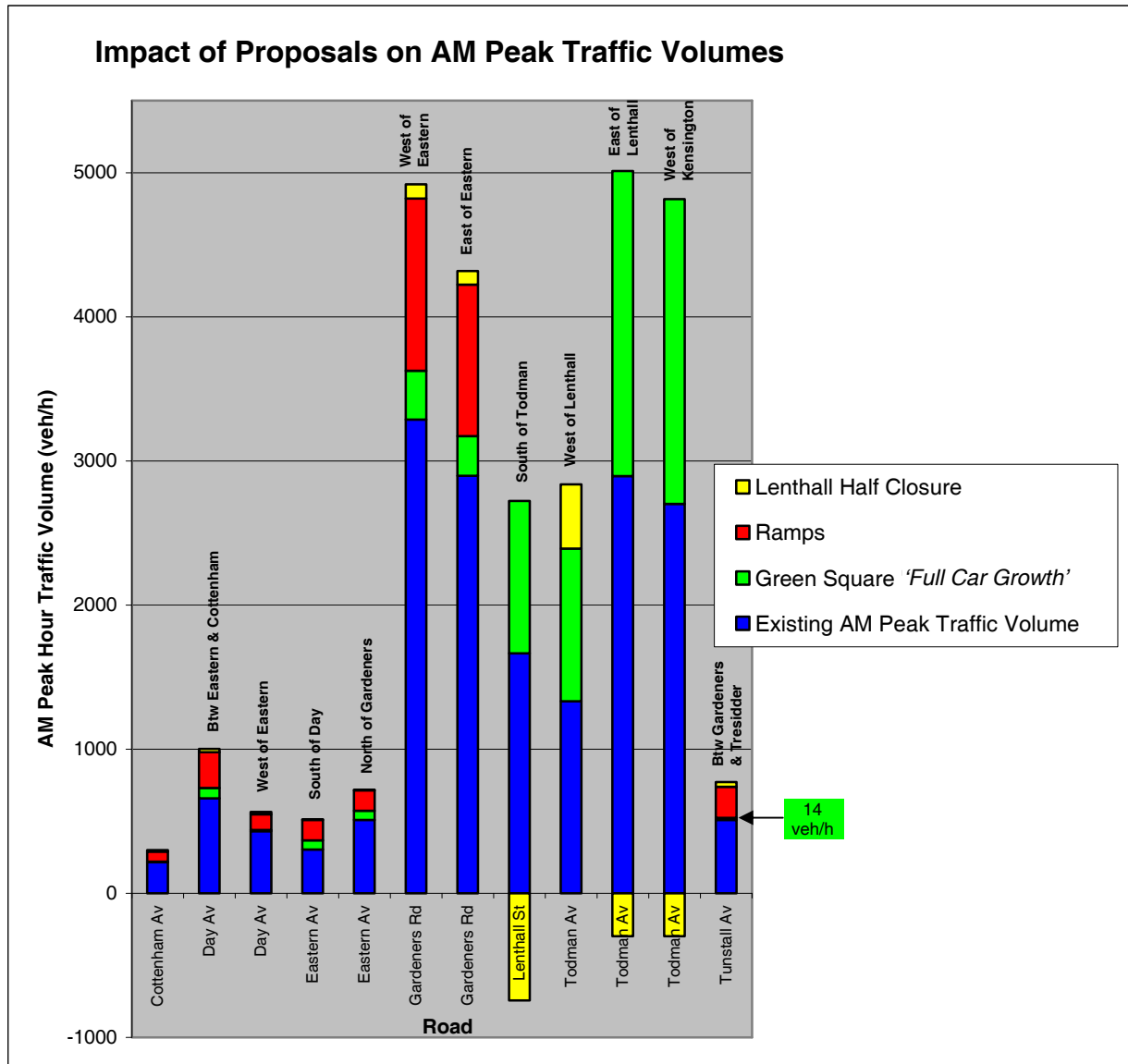
⁶ Vehicle growth generated by Green Square development without alternative transport initiatives.

⁷ Green Square TMAP objective.

⁸ The traffic impact of each proposal is considered independently.

Figure 6.1 provides a graphical representation of changes to traffic volumes for each proposal recorded in **Table 6-1**.

Figure 6.1: Graph showing estimated potential changes to AM peak traffic volumes



Source: gtk consulting 2009

The graph (**Figure 6.1**) reveals the following impacts on AM peak traffic volumes:

- A 30% - 40% increase on Lenthall Street and Todman Avenue from Green Square 'Full Car Growth'.
- A 35% - 40% increase on Gardeners Road and 30% increase on internal roads such as Tunstall, Eastern and Day Avenues, from the ramp proposal.
- The Lenthall Street half road closure increases volumes on Todman Avenue west of Lenthall Street and reduces volumes on Lenthall Street and Todman Avenue east of Lenthall Street.

The potential impact of each proposal on PM peak traffic volumes is summarised in **Table 6-2**.

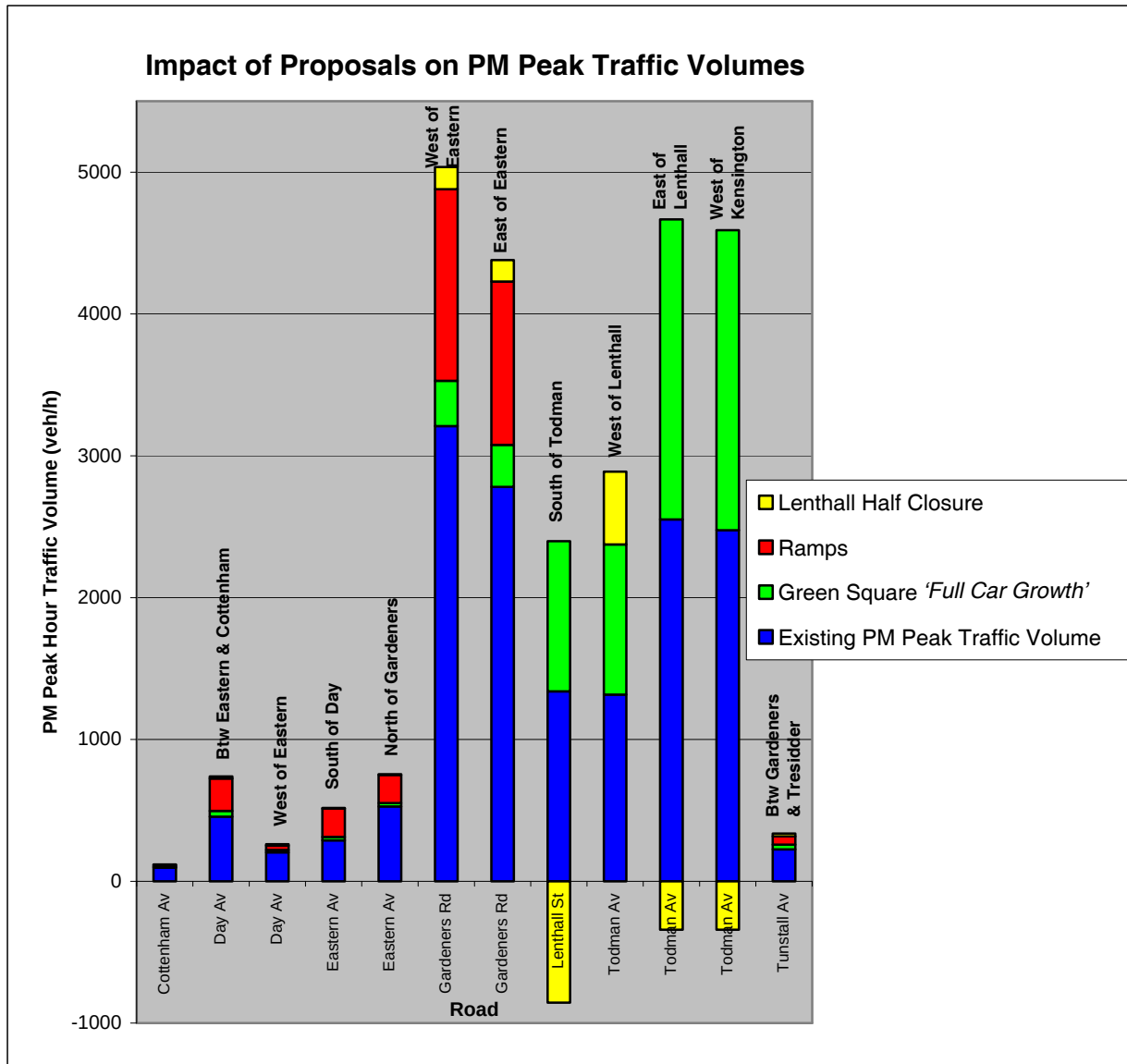
Table 6-2: Estimated potential changes to PM peak traffic volumes

Road	Location	Existing PM Peak Volume (veh/h)	Green Square		Ramps	Lenthall Half Closure
			'Full Car Growth'	TMAP 'No Car Growth'		
Cottenham Av	Btw Gardeners Rd & Borrodale Rd	96	7	0	12	4
Day Av	Btw Eastern Av & Cottenham Av	455	41	0	229	15
	West of Eastern Av Intersection	204	17	0	30	10
Eastern Av	South of Day Av Intersection	289	24	0	199	5
	North of Gardeners Rd Intersection	527	24	0	199	5
Gardeners Rd	West of Eastern Av Intersection	3209	320	0	1351	156
	East of Eastern Av Intersection	2781	296	0	1152	151
Lenthall St	South of Todman Av Intersection	1340	1058	0	0	-856
Todman Av	West of Lenthall St Intersection	1317	1058	0	0	514
	East of Lenthall St Intersection	2551	2116	0	0	-342
	West of Kensington Rd Intersection	2475	2116	0	0	-342
	Btw Kensington Rd & Villiers St	2195	2116	0	0	-342
Tunstall Av	Btw Gardeners Rd & Tresidder Av	225	33	0	59	19

Source: gtk consulting 2009

Figure 6.2 provides a graphical representation of changes to traffic volumes for each proposal recorded in **Table 6-2**.

Figure 6.2: Graph showing estimated potential changes to PM peak traffic volumes



Source: gtk consulting 2009

The graph (**Figure 6.2**) indicates similar impacts on PM peak traffic volumes for Todman Avenue, Lenthall Street and Gardeners Road as for the AM peak. However, there are some variations between AM and PM peak flows for roads such as Tunstall and Day Avenues.

6.2 IMPACT ON ROAD NETWORK PERFORMANCE, ACCESSIBILITY AND AMENITY

SIDRA traffic modelling was undertaken to determine the impact of the proposals on road network performance. **Table 6-3** shows the SIDRA level of service (LOS) results for key intersections within the study area where:

- **EXISTING** is the existing traffic conditions (SIDRA results previously detailed in **Tables 2-5 & 2-6** and **Appendix 12**)
- **SCENARIO 1** is existing traffic conditions plus additional traffic generated by:
 - ramps to and from Gardeners Road
 - Green Square Urban Renewal Area '*Full Car Growth*'
 - half closure of Lenthall Street
- **SCENARIO 2** is existing traffic conditions plus additional traffic generated by:
 - ramps to and from Gardeners Road
 - Green Square Urban Renewal Area '*No Car Growth*'
 - half closure of Lenthall Street

Table 6-3: Comparison of intersection level of service (LOS) for existing and future scenarios

Intersection	Existing LOS		Scenario 1 LOS		Scenario 2 LOS	
	AM	PM	AM	PM	AM	PM
Gardeners Rd/Cottenham Av (Give-Way)	A	A	A	A	A	A
Gardeners Rd/ Eastern Av (Signalised)	B	B	D	F	C	E
Gardeners Rd/Tunstall Av (Give-Way)	A	A	A	A	A	A
Day Av/ Eastern Av (Stop Sign)	A	A	A	A	A	A
Todman Av/Kensington Rd (Roundabout)	A	A	F	F	B	A
Todman Av/Lenthall St (Signalised)	D	C	F	F	A	A

Source: gtk consulting 2009

Detailed SIDRA modelling results for Scenario 1 can be found in **Appendix 14** and for Scenario 2 in **Appendix 15**.

SIDRA Scenarios 1 and 2

The most notable impact of traffic generated by the proposals under Scenario 1 is experienced at the intersections of Todman Avenue/Lenthall Street and Todman Avenue/Kensington Road. This impact can be attributed entirely to '*Full Car Growth*' from Green Square. The additional traffic under this scenario reduces the level of service of these intersections to 'F', i.e. extreme delays experienced if additional capacities (intersection improvements) are not provided. Under Scenario 2 the Green Square '*No Car Growth*' objective improves the level of service for the intersections on Todman Avenue and Lenthall Street to 'A' or 'B', i.e. good operation with acceptable delays and spare capacity.

In the southern portion of the study area the intersection of Gardeners Road/Eastern Avenue is affected by additional traffic travelling to and from the proposed ramps on Gardeners Road at Southern Cross Drive. Under Scenario 1 the level of service at this intersection is reduced to 'D' in the AM peak and 'F' in the PM peak. Under Scenario 2, which includes the Green Square TMAP '*No Car Growth*' objective, there is a slight improvement in the performance of this intersection to level of service 'C' in the AM peak and 'E' in the PM peak. The two-way traffic volumes to and from the proposed ramps at Southern Cross Drive remain unchanged under Scenario 2.

The SIDRA modelling shows Tunstall and Cottenham Avenues, which are restricted to left-in/left-out at Gardeners Road, maintaining a level of service 'A' under both Scenarios 1 and 2. This level of service is attributed to free flow conditions for left turns from Gardeners Road and to uninterrupted flows on the westbound carriageway (due to the central median on Gardeners Road). However, the traffic modelling demonstrates that there will be substantial increases in delays for vehicles turning left from these, and other roads, onto Gardeners Road in both the AM and PM peak periods.

Green Square Urban Renewal Area - Traffic Impact

The potential traffic generated by the Green Square Urban Renewal Area will have a major impact on roads in the northern part of the study area under Scenario 1 '*Full Car Growth*'. This scenario predicts that Todman Avenue and intersecting side-roads will experience severe congestion in both the AM and PM peak periods. The consequence of this congestion will flow to areas outside the Kensington and West Kingsford study area.

The '*No Car Growth*' objective of the Green Square TMAP will result in no additional traffic travelling through the Kensington and West Kingsford areas. Combined with the half closure of Lenthall Street, the '*No Car Growth*' objective will result in traffic volume reductions on Lenthall Street and Todman Avenue. However, to achieve the '*No Car Growth*' objective it is essential that policies and transport alternatives are in place, together with guaranteed implementation dates, to constrain private vehicle traffic growth from the Green Square Urban Renewal Area.

Proposed Ramps on Gardeners Road at Southern Cross Drive – Traffic Impact

The proposed ramps on Gardeners Road at Southern Cross Drive will have a major impact on roads intersecting Gardeners Road and internal roads within the study area. **Table 6-1** indicates that traffic volumes on Tunstall, Day and Eastern Avenues could increase by up to 250 vehicles per hour in the AM peak. Such increases will further reduce the residential amenity on these roads and increase the risk to pedestrians and cyclists.

Traffic from the proposed ramps will increase delays for access to and from properties within the study area. SIDRA modelling reveals that delays from roads intersecting Gardeners Road can increase from 50 seconds to 480 seconds. Such delays will result in residents seeking alternative routes through internal roads to avoid congested intersections, adding to travel times and increasing traffic volumes on roads within the study area.

Lenthall Street Half Road Closure – Traffic Impact

The proposed half road closure of Lenthall Street will result in a reduction of 744 vehicles per hour in the AM peak and 856 vehicles in the PM peak. This represents a substantial reduction in traffic volume and will improve amenity for residents on this road. Under Scenario 1 with '*Full Car Growth*' this reduction is negated by the large increase in vehicles accessing new developments within the Green Square Urban Renewal Area (i.e. travelling westbound), as the half road closure restricts traffic flows in an easterly direction only.

Under Scenario 2 '*No Car Growth*' the half road closure of Lenthall Street will result in reduced traffic volumes on Lenthall Street and Todman Avenue⁹ with the exception of the section of Todman Avenue between Lenthall Street and South Dowling Street. Volumes on this section of Todman Avenue will increase by approximately 446 in the AM peak and 514 in the PM peak. To accommodate this increase in traffic volume it will be necessary to line-mark this section of Todman Avenue to provide two lanes in each direction (currently line-marked as one lane in each direction). No road widening is required.

Approximately 30% of the through traffic from Epsom Road, that will be redirected by the Lenthall Street half road closure, is considered to have origins from areas west of Green Square, e.g. Mascot, St Peters, Tempe, etc. This traffic is likely to use Gardeners Road to access their eastern destinations. However, these volumes are relatively low, contributing, for example, an additional 33 vehicles per hour on Tunstall Avenue in the AM peak and 19 vehicles in the PM peak period.

⁹ 744 vehicles in the AM peak and 856 in the PM peak

7 RECOMMENDATIONS

Following investigations and research of historical data, previous traffic and transportation studies, and future proposals which may impact on the Kensington and West Kingsford areas, the consultant team recommends that:

1. Council take appropriate action to ensure an active role on the Corridor Working Group to be formed for the proposed Transit Corridors within the Randwick LGA recommended by the Green Square TMAP report.
2. Council support the objectives of the Green Square TMAP subject to the Ministry of Transport, City of Sydney and Landcom agreeing to set targets to ensure the balance between new development and the implementation of transport initiatives to achieve '*No Car Growth*' .
3. Council undertake intersection traffic surveys on a regular basis at key locations to monitor traffic movements to and from the Green Square Urban Renewal Area. This regular monitoring will indicate any changes to traffic volumes within the residential areas of Kensington and West Kingsford. Such information could then be promptly acted upon.
4. Council write to the Minister for Roads and Minister for Planning to confirm the current status of the proposed ramps on Gardeners Road at Southern Cross Drive.
5. In the event that the proposed ramps secure the required AusLink funding, Council seek funding from the RTA to develop a Traffic Management Strategy for the Kensington and West Kingsford areas. The Traffic Management Strategy should be undertaken in association with local residents, RTA and other key stakeholders to include, but not be limited to:
 - a. Upgrading of the Nine Ways.
 - b. Upgrading of the signalised intersections on Gardeners Road between the proposed ramps and the Nine Ways.
 - c. Improving or at least maintaining the existing levels of service and residential amenity of the Kensington and West Kingsford areas.
 - d. The provision of cycle ways on Gardeners Road.
 - e. The provision of additional pedestrian facilities.

6. Council support the RTA's proposal to prevent eastbound traffic on Epsom Road (buses and cyclists excepted) from travelling through the intersection of Link Road to Lenthall Street. However, Council should enter into discussions with the RTA and City of Sydney to ban the left turn movement from Link Road into Epsom Road and the right turn movement from the Dolina development in order to achieve the equivalent of a half road closure on Lenthall Street.
7. Todman Avenue, between South Dowling Street and Lenthall Street, be line-marked to provide two lanes in each direction, in conjunction with the restriction of eastbound traffic on Lenthall Street.

Further Investigations

Some of the issues examined in this report have raised the need to undertake the following:

8. A Pedestrian and Mobility Plan (PAMP) to enhance pedestrian access and safety within the Kensington and West Kingsford areas. Funding for this study may be available from the RTA.
9. An investigation to identify the causes of road crashes and recommend remedial treatments at Tresidder Avenue and at the intersections of Kensington Road /Duke Street and Kensington Avenue/Todman Avenue.
10. The RTA be requested to undertake investigations to identify the causes of road crashes and implement remedial treatments along Anzac Parade. Alternatively, the RTA may be prepared to fund Council to undertake these investigations.

8 CONCLUSION

The investigation of existing traffic conditions in the Kensington and West Kingsford areas indicate that the majority of local residential roads are operating within their intended road function and within acceptable environmental capacities. Some exceptions to these findings include Eastern Avenue, Day Avenue, Kensington Road, Lenthall Street and Tunstall Avenue. Lenthall Street carries traffic volumes more than three times its acceptable environmental capacity, despite the implementation of traffic calming measures. Many of the representations made to Council regarding traffic concerns originate from residents of these roads. It is understandable that these residents are apprehensive about any proposal that may increase traffic volumes and therefore, impact on access to their properties and amenity.

City of Sydney provides information on its website that the Green Square Urban Renewal Area will accommodate approximately 33,150 new residents and 28,400 employees when fully developed by the year 2021. However, the *Green Square Urban Renewal Area Transport Management and Accessibility Plan (TMAP)* released in January 2009 now appears to revise down the City of Sydney's population forecasts and expected date for full development to 2031.

A '*Full Car Growth*' scenario for Green Square will have a significant impact on the Kensington and West Kingsford area and such a scenario should not be permitted to develop. The Green Square TMAP recommends a package of comprehensive transport and integrated planning measures to support their '*No Car Growth*' objective. It is of concern that these measures are not guaranteed and that there is currently no government commitment to the implementation of these initiatives. Development within the Green Square Urban Renewal Area is continuing and there are no other alternatives put forward by the Ministry of Transport, City of Sydney and Landcom to control the growth of private vehicle trips from Green Square. Vigilance is required and monitoring of traffic movements and parking intrusion associated with Green Square should be undertaken on a regular basis to ensure that the development versus transport initiative balance is maintained, i.e. '*No Car Growth*' from Green Square.

An initiative recommended by the Green Square TMAP is the creation of Transit Corridors on Lenthall Street and Todman Avenue. No details on these proposals are provided and the TMAP report recommends the preparation of 'Corridor Action Plans' to develop strategies for implementation. It is essential that Council take an active role in the development of these plans.

The RTA has recently advised that the proposed Gardeners Road ramps to and from Southern Cross Drive have been deferred for at least four years due to reduced Federal Government AusLink funding levels. Council and residents are rightly concerned about the impact these ramps will have on the Kensington and West Kingsford areas. Traffic modelling indicates that the proposed ramps will result in substantial traffic intrusion, delays and reduced amenity for local residents if ameliorative measures are not put in place. Turning restrictions and road closures alone will not address the problems created by the additional traffic volumes anticipated on Gardeners Road. Should the proposed ramps proceed, it is essential that improvements are also implemented at the signalised intersections along Gardeners Road, specifically at the intersection of Anzac Parade/Rainbow Street/Bunnerong Road/Gardeners Road, i.e. the Nine Ways. These improvements should be determined in consultation with local residents, the RTA and other key stakeholders and result in a Traffic Management Strategy for the Kensington and West Kingsford areas.

The proposed half road closure of Lenthall Street can be replaced by the RTA's proposal to prevent eastbound traffic on Epsom Road passing Link Road (with the exception of buses and cyclists), providing that left turn movements are banned from Link Road into Epsom Road. Such an intersection arrangement will achieve the objectives of Council's half road closure of Lenthall Street and provide more effective control of eastbound traffic. It will result in reduced traffic volumes on Lenthall Street and Todman Avenue (east of Lenthall Street) and will also provide improved access and residential amenity on these and adjacent roads. However, the proposal will result in an increase in traffic volumes on Todman Avenue between Lenthall Street and South Dowling Street, requiring the line-marking of that section of road to provide two lanes in each direction.

The potential impacts of the proposals considered in this report will have significant effects on the performance of roads within the study area. To promote resident access and amenity it is essential that Council regularly monitor the status of the RTA's Epsom Road/Link Road and Gardeners Road Ramp proposals and actively participate in the development of transport initiatives for Green Square.

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APPENDIX 1 STUDY AREA TRAFFIC VOLUMES

Table A1-1: Study area AM and PM peak hour traffic volumes (2005 – 2008)

Road	Location	Date	AM Peak Hour (veh/h)	PM Peak Hour (veh/h)
Aboud Av	Btw Gardeners Rd & Tresidder Av	Feb 2005	34	30
		Mar 2005	34	30
Boronia Ave	South of Anzac Pd	Feb 2005	381	364
		Mar 2005	383	345
Borrodale Rd	Btw Bruce St & Bruce La	Feb 2005	324	313
		Mar 2005	336	303
Cottenham Av	Btw Gardeners Rd & Borrodale Rd	Nov 2008	215	96
Day Av	Btw Doncaster Av & Houston Rd	Feb 2005	732	551
		Mar 2005	731	560
	Btw Eastern Av & Cottenham Av	Jun 2005	546	485
		Nov 2008	659	455
	West of Eastern Av Intersection	Nov 2008	432	204
Doncaster Av	South of Alison Rd Intersection	Nov 2008	1423	1424
	North of Todman Av Intersection	Nov 2008	1809	1649
	South of Todman Av Intersection	Nov 2008	676	637
	North of Roma Av Intersection	Nov 2008	667	569
	South of Roma Av Intersection	Nov 2008	547	445
	Btw Koorinda Av & Day Av	Feb 2005	458	383
		Mar 2005	451	373
Eastern Av	North of Day Av Intersection	Nov 2008	27	26
	South of Day Av Intersection	Nov 2008	304	289
	North of Gardeners Rd Intersection	Nov 2008	508	527
Epsom Rd	West of Link Rd Intersection	Nov 2008	2518	2175
	East of Link Rd Intersection	Nov 2008	1697	1337
Gardeners Rd	West of Tunstall Av	Feb 2005	4040	3576
	West of Eastern Av Intersection	Nov 2008	3287	3209
	East of Eastern Av Intersection	Nov 2008	2896	2781
Houston Rd	Btw Strachan St & Barker St	Feb 2005	588	477
		Mar 2005	607	524
Kensington Rd	Btw Addison St & Todman Av	Feb 2005	625	543
		Mar 2005	620	491
		Nov 2008	666	516
	North of Todman Av Intersection	Nov 2008	301	348
Lenthall St	Btw Southern Cross Dr overbridge & Virginia St	Feb 2005	1841	1557
	South of Todman Av Intersection	Nov 2008	1664	1340

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Table A1-1: Study area AM and PM peak hour traffic volumes (2005 – 2008) cont.

Road	Location	Date	AM Peak Hour (veh/h)	PM Peak Hour (veh/h)
Leonard Av	Btw Borrodale Rd & Edward Av	Mar 2005	22	23
Link Rd	North of Epsom Rd Intersection	Nov 2008	1857	1580
Maitland Av	Btw Gardeners Rd & Tresidder Av	Feb 2005	24	20
		Mar 2005	24	19
Roma Av	West of Doncaster Av Intersection	Nov 2008	186	170
Todman Av	Btw Brompton Rd & Baker St	Feb 2005	1295	1329
		Mar 2005	1210	1267
	West of Lenthall St Intersection	Nov 2008	1333	1317
	East of Lenthall St Intersection	Nov 2008	2895	2551
	West of Kensington Rd Intersection	Nov 2008	2701	2475
	Btw Kensington Rd & Villiers St	Feb 2005	2195	2190
		Mar 2005	2251	2074
		Nov 2008	2370	2195
	East of Anzac Pd	Nov 2008	1267	1180
Tunstall Av	Btw Gardeners Rd & Tresidder Av	Oct 2005	476	229
		Nov 2008	509	225
	Btw Tresidder Av & Goodrich Av	Feb 2005	448	247
		Mar 2005	479	241
	House No. 36	Oct 2005	339	196
	Btw Tedwin Av & Addison St	Feb 2005	347	250
		Mar 2005	331	238

Source: Randwick City Council (2005 data) and gtk consulting (2008 data)

Table A1-2: Study area av. daily traffic volumes (1975 – 2008)

Road	Location	Date	Av. Daily Traffic Volumes
Aboud Av	Btw Gardeners Rd & Tresidder Av	Feb 2005	340
		Mar 2005	340
Boronia Ave	South of Anzac Pd	2001	3090
		Feb 2005	3810
		Mar 2005	3830
Borrodale Rd	Btw Bruce St & Bruce La	1985	1949
		2001	2470
		Feb 2005	3240
		Mar 2005	3360
Cottenham Av	Btw Roma Av & Koorinda Av	1978	3150
		2001	4065
	Btw Gardeners Rd & Borrodale Rd	Nov 2008	2150
Day Av	Btw Doncaster Av & Houston Rd	Feb 2005	7320
		Mar 2005	7310
	Btw Eastern Av & Cottenham Av	Jun 2005	5460
		Nov 2008	6590
	West of Eastern Av Intersection	Nov 2008	4320
Doncaster Av	South of Alison Rd Intersection	1978	12092
		1998	17402
		2001	13280
		Nov 2008	14230
	North of Todman Av Intersection	Nov 2008	18090
	South of Todman Av Intersection	1985	8170
		2001	7490
		Nov 2008	6760
	North of Roma Av Intersection	1984	5921
		Nov 2008	6670
	South of Roma Av Intersection	1984	4118
		Nov 2008	5470
	Btw Koorinda Av & Day Av	2001	3900
		Feb 2005	4580
		Mar 2005	4510
Eastern Av	North of Day Av Intersection	1984	329
		Nov 2008	270
	South of Day Av Intersection	1991	3300
		Nov 2008	3040
	North of Gardeners Rd Intersection	1985	3736
		1991	4800
		2001	4790
		Nov 2008	5080

continued overleaf

Table A1-2: Study area av. daily traffic volumes (1975 – 2008) cont.

Road	Location	Date	Av. Daily Traffic Volumes
Epsom Rd	West of Link Rd Intersection	Nov 2008	25180
	East of Link Rd Intersection	Nov 2008	16970
Gardeners Rd	West of Tunstall Av	Feb 2005	40400
	West of Eastern Av Intersection	Nov 2008	32870
	East of Eastern Av Intersection	Nov 2008	28960
Houston Rd	Btw Strachan St & Barker St	Feb 2005	5880
		Mar 2005	6070
Kensington Rd	Btw Addison St & Todman Av	1984	2804
		1994	3460
		Feb 2005	6250
		Mar 2005	6200
		Nov 2008	6660
	North of Todman Av Intersection	1984	1957
		Nov 2008	3010
Lenthall St	Btw Southern Cross Dr overbridge & Todman Av	1983	8550
		1987	9256
		1988	10281
		1993	10623
		1995	9250
		1996	9134
		1998	11900
		2001	12710
		Feb 2005	18410
		Nov 2008	16640
Leonard Av	Btw Borrodale Rd & Edward Av	Mar 2005	220
Link Rd	North of Epsom Rd Intersection	Nov 2008	18570
Maitland Av	Btw Gardeners Rd & Tresidder Av	Feb 2005	240
		Mar 2005	240
Roma Av	West of Doncaster Av Intersection	Nov 2008	1860
Todman Av	Btw Brompton Rd & Baker St	1989	10700
		Feb 2005	12950
		Mar 2005	12100
	West of Lenthall St Intersection	1984	7483
		Nov 2008	13330
	East of Lenthall St Intersection	1977	17720
		1993	11491
		2005	30012
		Nov 2008	28950

continued overleaf

Table A1-2: Study area av. daily traffic volumes (1975 – 2008) cont.

Road	Location	Date	Av. Daily Traffic Volumes
Todman Av	West of Kensington Rd Intersection	Nov 2008	27010
	Btw Kensington Rd & Villiers St	Feb 2005	21950
		Mar 2005	22510
		Nov 2008	23700
	East of Anzac Pd	1984	8020
		Nov 2008	12670
Tunstall Av	Btw Gardeners Rd & Tresidder Av	1975	4930
		1983	2940
		1991	3100
		1992	2400
		Oct 2005	4760
		Nov 2008	5090
	Btw Tresidder Av & Goodrich Av	2001	3065
		Feb 2005	4480
		Mar 2005	4790
	House No. 36	Oct 2005	3390
	Btw Tedwin Av & Addison St	1984	2584
		1991	2800
		1994	2354
		2001	2445
		Feb 2005	3470
		Mar 2005	3310

Source: Randwick City Council (1975 – 2005 data) and gtk consulting (2008 data)

APPENDIX 2 INTERSECTION DATA ALISON RD/DONCASTER AV



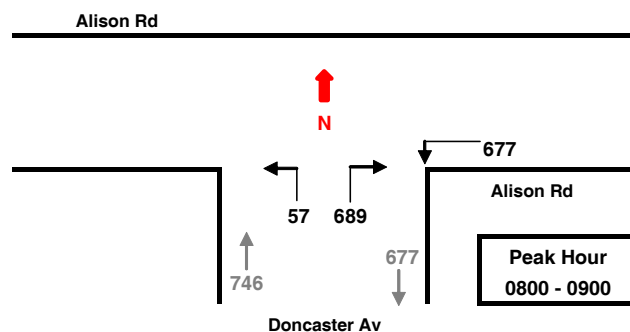
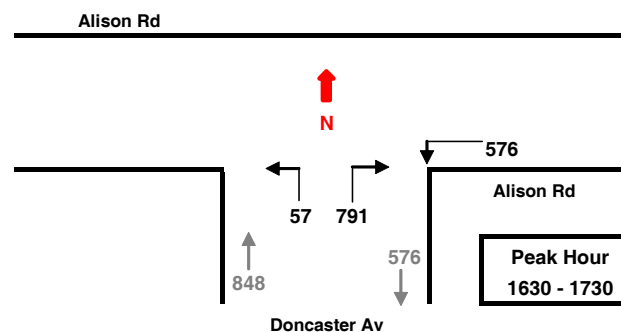
Client: Randwick City Council
 Intersection: Alison Rd/Doncaster Av
 Day/Date: Friday 21 November 2008
 Description: Intersection Count All Vehicles/15 Minute Data

All Vehicles	NORTH BOUND		WEST BOUND		TOT
	Doncaster Av		Alison Rd		
Time Per	L	R	L	T	
0700 - 0715	10	151	95	Not Counted	256
0715 - 0730	12	171	116		299
0730 - 0745	12	213	137		362
0745 - 0800	15	178	159		352
0800 - 0815	14	134	150		298
0815 - 0830	11	183	177		371
0830 - 0845	16	180	178		374
0845 - 0900	16	201	172		389
AM Totals	106	1411	1184		2701

All Vehicles	NORTH BOUND		SOUTH BOUND		TOT
	Doncaster Av		Alison Rd		
Time Per	L	R	L	T	
1600 - 1615	15	194	163	Not Counted	372
1615 - 1630	15	175	173		363
1630 - 1645	10	184	144		338
1645 - 1700	17	193	132		342
1700 - 1715	16	197	147		360
1715 - 1730	14	217	153		384
1730 - 1745	15	192	117		324
1745 - 1800	13	202	117		332
PM Totals	115	1554	1146		2815

		NORTH BOUND		SOUTH BOUND			
		Doncaster Av		Alison Rd			
Peak Time	L	R	L	T	Not Counted	TOT	
0700 - 0800	49	713	507			1269	
0715 - 0815	53	696	562			1311	
0730 - 0830	52	708	623			1383	
0745 - 0845	56	675	664			1395	
0800 - 0900	57	698	677			1432	
Peak Hour	57	698	677			1432	

	NORTH BOUND		SOUTH BOUND		
	Doncaster Av		Alison Rd		
Peak Time	L	R	L	T	TOT
1600 - 1700	57	746	612	Not Counted	1415
1615 - 1715	58	749	596		1403
1630 - 1730	57	791	576		1424
1645 - 1745	62	799	549		1410
1700 - 1800	58	808	534		1400
Peak Hour	57	791	576		1424



APPENDIX 3 INTERSECTION DATA DONCASTER AV/TODMAN AV



Client: Randwick City Council
 Intersection: Doncaster Av/Todman Av
 Day/Date: Friday 21 November 2008
 Description: Intersection Count All Vehicles/15 Minu

All Vehicles	NORTH BOUND		SOUTH BOUND		EAST BOUND		TOT
	Doncaster Av	Todman Av	Doncaster Av	Todman Av	Doncaster Av	Todman Av	
Time Per	L	T	T	R	L	R	
0700 - 0715	12	37	21	27	27	5	129
0715 - 0730	14	58	31	58	74	5	240
0730 - 0745	6	73	24	61	195	3	362
0745 - 0800	5	76	38	95	182	4	400
0800 - 0815	14	95	61	125	200	10	505
0815 - 0830	10	71	42	75	190	6	394
0830 - 0845	4	113	63	84	201	12	477
0845 - 0900	7	80	84	76	249	4	500
AM Totals	72	603	364	601	1318	49	3007

School Traffic

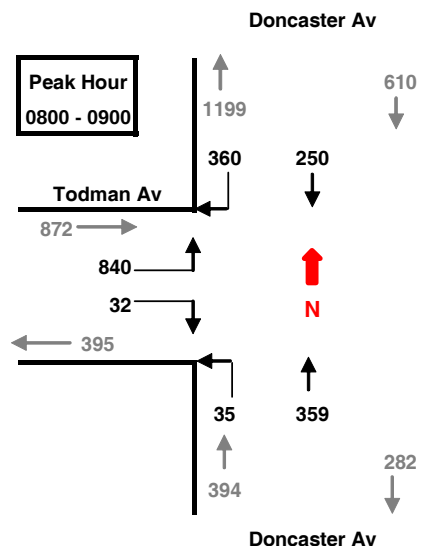
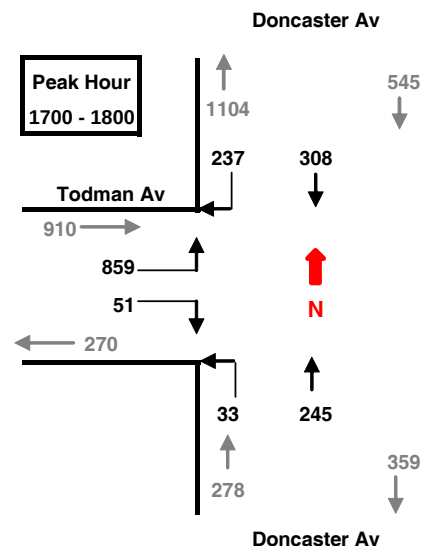
All Vehicles	NORTH BOUND		SOUTH BOUND		EAST BOUND		TOT
	Doncaster Av	Todman Av	Doncaster Av	Todman Av	Doncaster Av	Todman Av	
Time Per	L	T	T	R	L	R	
1600 - 1615	25	67	67	78	189	25	451
1615 - 1630	17	53	77	76	195	5	423
1630 - 1645	6	69	54	61	194	8	392
1645 - 1700	5	60	45	43	185	6	344
1700 - 1715	9	61	80	64	202	14	430
1715 - 1730	9	64	95	58	218	16	460
1730 - 1745	8	69	78	68	238	11	472
1745 - 1800	7	51	55	47	201	10	371
PM Totals	86	494	551	495	1622	95	3343

Peak Time	NORTH BOUND		SOUTH BOUND		EAST BOUND		TOT
	Doncaster Av	Todman Av	Doncaster Av	Todman Av	Doncaster Av	Todman Av	
Peak Time	L	T	T	R	L	R	
0700 - 0800	37	244	114	241	478	17	1131
0715 - 0815	39	302	154	339	651	22	1507
0730 - 0830	35	315	165	356	767	23	1661
0745 - 0845	33	355	204	379	773	32	1776
0800 - 0900	35	359	250	360	840	32	1876

Peak Hour	35	359	250	360	840	32	1876
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Peak Time	NORTH BOUND		SOUTH BOUND		EAST BOUND		TOT
	Doncaster Av	Todman Av	Doncaster Av	Todman Av	Doncaster Av	Todman Av	
Peak Time	L	T	T	R	L	R	
1600 - 1700	53	249	243	258	763	44	1610
1615 - 1715	37	243	256	244	776	33	1589
1630 - 1730	29	254	274	226	799	44	1626
1645 - 1745	31	254	298	233	843	47	1706
1700 - 1800	33	245	308	237	859	51	1733

Peak Hour	33	245	308	237	859	51	1733
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APPENDIX 4 INTERSECTION DATA DONCASTER AV/ROMA AV



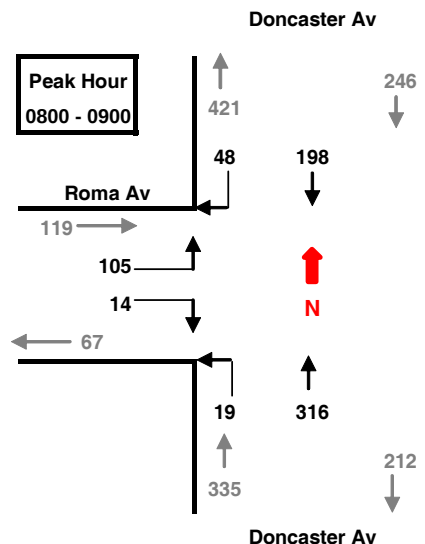
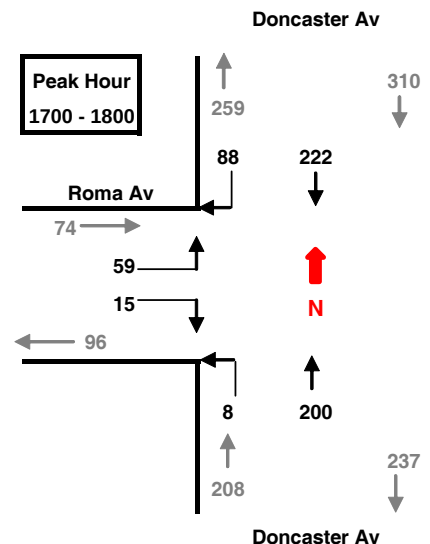
Client: Randwick City Council
 Intersection: Doncaster Av/Roma Av
 Day/Date: Thursday 27 November 2008
 Description: Intersection Count All Vehicles/15 Minu

All Vehicles	NORTH BOUND		SOUTH BOUND		EAST BOUND		TOT
	Doncaster Av		Doncaster Av		Roma Av		
	L	T	T	R	L	R	
Time Per	L	T	T	R	L	R	TOT
0700 - 0715	1	36	15	6	13	1	72
0715 - 0730	1	58	14	3	13	0	89
0730 - 0745	2	83	26	9	14	1	135
0745 - 0800	5	101	24	12	10	5	157
0800 - 0815	4	69	36	5	25	5	144
0815 - 0830	7	68	46	18	30	2	171
0830 - 0845	5	82	54	16	24	5	186
0845 - 0900	3	97	62	9	26	2	199
AM Totals	28	594	277	78	155	21	1153

All Vehicles	NORTH BOUND		SOUTH BOUND		EAST BOUND		TOT
	Doncaster Av		Doncaster Av		Roma Av		
	L	T	T	R	L	R	
Time Per	L	T	T	R	L	R	TOT
1600 - 1615	4	34	48	15	18	4	123
1615 - 1630	6	37	79	9	8	3	142
1630 - 1645	1	42	67	12	16	3	141
1645 - 1700	1	43	51	11	14	3	123
1700 - 1715	3	45	58	19	19	4	148
1715 - 1730	1	53	61	17	12	3	147
1730 - 1745	4	60	51	37	15	4	171
1745 - 1800	0	42	52	15	13	4	126
PM Totals	20	356	467	135	115	28	1121

	NORTH BOUND		SOUTH BOUND		EAST BOUND		
	Doncaster Av		Doncaster Av		Roma Av		
Peak Time	L	T	T	R	L	R	TOT
0700 - 0800	9	278	79	30	50	7	453
0715 - 0815	12	311	100	29	62	11	525
0730 - 0830	18	321	132	44	79	13	607
0745 - 0845	21	320	160	51	89	17	658
0800 - 0900	19	316	198	48	105	14	700
Peak Hour	19	316	198	48	105	14	700

	NORTH BOUND		SOUTH BOUND		EAST BOUND		
	Doncaster Av		Doncaster Av		Roma Av		
Peak Time	L	T	T	R	L	R	TOT
1600 - 1700	12	156	245	47	56	13	529
1615 - 1715	11	167	255	51	57	13	554
1630 - 1730	6	183	237	59	61	13	559
1645 - 1745	9	201	221	84	60	14	589
1700 - 1800	8	200	222	88	59	15	592
Peak Hour	8	200	222	88	59	15	592



APPENDIX 5 INTERSECTION DATA GARDENERS RD/TUNSTALL AV



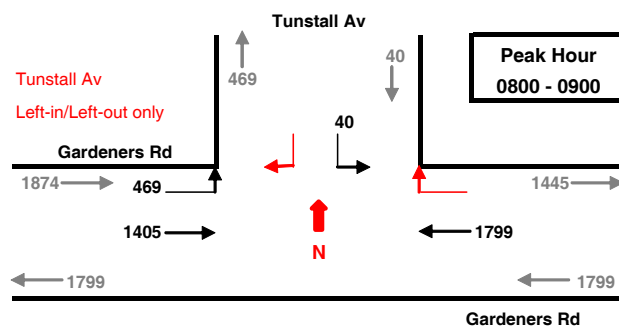
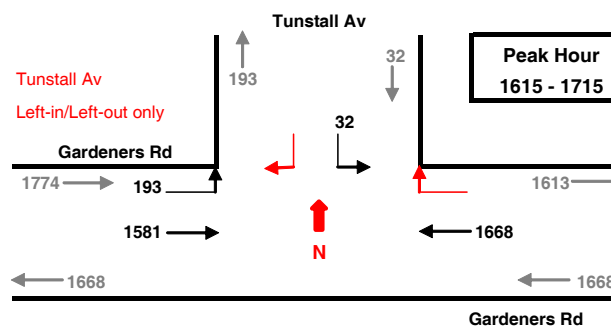
Client: Randwick City Council
 Intersection: Gardeners Rd/Tunstall Av
 Day/Date: Thursday 13 November 2008
 Description: Intersection Count All Vehicles/15 Minute Data

All Vehicles	EAST BOUND		WEST BOUND		SOUTH BOUND		TOT
	Gardeners Rd		Gardeners Rd		Tunstall Av		
Time Per	L	T	T	R	L	R	
0700 - 0715	43	237	206		2		488
0715 - 0730	57	250	291		6		604
0730 - 0745	65	259	349		8		681
0745 - 0800	112	310	427		4		853
0800 - 0815	121	341	374		8		844
0815 - 0830	146	395	467		12		1020
0830 - 0845	113	343	503		7		966
0845 - 0900	89	326	455		13		883
AM Totals	746	2461	3072	Not Permitted	60	Not Permitted	6339

All Vehicles	EAST BOUND		WEST BOUND		SOUTH BOUND		TOT
	Gardeners Rd		Gardeners Rd		Tunstall Av		
Time Per	L	T	T	R	L	R	
1600 - 1615	35	357	378		6		776
1615 - 1630	42	381	448		5		876
1630 - 1645	43	392	378		8		821
1645 - 1700	56	424	410		10		900
1700 - 1715	52	384	432		9		877
1715 - 1730	54	367	349		14		784
1730 - 1745	57	357	352		16		782
1745 - 1800	53	345	297		5		700
PM Totals	392	3007	3044	Not Permitted	73	Not Permitted	6516

Peak Time	EAST BOUND		WEST BOUND		SOUTH BOUND		TOT
	Gardeners Rd		Gardeners Rd		Tunstall Av		
Peak Time	L	T	T	R	L	R	
0700 - 0800	277	1056	1273		20		2626
0715 - 0815	355	1160	1441		26		2982
0730 - 0830	444	1305	1617		32		3398
0745 - 0845	492	1389	1771		31		3683
0800 - 0900	469	1405	1799		40		3713
Peak Hour	469	1405	1799		40		3713

Peak Time	EAST BOUND		WEST BOUND		SOUTH BOUND		TOT
	Gardeners Rd		Gardeners Rd		Tunstall Av		
Peak Time	L	T	T	R	L	R	
1600 - 1700	176	1554	1614		29		3373
1615 - 1715	193	1581	1668		32		3474
1630 - 1730	205	1567	1569		41		3382
1645 - 1745	219	1532	1543		49		3343
1700 - 1800	216	1453	1430		44		3143
Peak Hour	193	1581	1668		32		3474



APPENDIX 6 INTERSECTION DATA GARDENERS RD/EASTERN AV



Client: Randwick City Council
 Intersection: Gardeners Rd/Eastern Av
 Day/Date: Thursday 6 November 2008
 Description: Intersection Count All Vehicles/15 Minute Data

All Vehicles Time Per	NORTHBOUND Garden Centre			SOUTHBOUND Eastern Av			EASTBOUND Gardeners Rd			WESTBOUND Gardeners Rd			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
0700 - 0715	0	0	0	1	0	38	5	235	0	0	164	5	448
0715 - 0730	0	0	0	1	0	28	16	245	1	1	253	6	551
0730 - 0745	0	1	0	4	0	45	22	261	0	1	281	5	620
0745 - 0800	0	0	0	2	0	51	17	307	3	1	318	7	706
0800 - 0815	0	1	0	4	0	77	17	335	0	1	313	5	753
0815 - 0830	1	0	1	4	0	82	13	384	4	1	352	10	852
0830 - 0845	0	1	2	3	1	131	13	335	0	4	403	8	901
0845 - 0900	3	0	1	9	1	97	20	323	1	4	383	11	853
AM Totals	4	3	4	28	2	549	123	2425	9	13	2467	57	5684

All Vehicles Time Per	NORTHBOUND Garden Centre*			SOUTHBOUND Eastern Av			EASTBOUND Gardeners Rd			WESTBOUND Gardeners Rd			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
1600 - 1615	7	1	4	3	3	78	8	351	6	5	261	9	736
1615 - 1630	3	2	3	2	2	112	15	364	5	2	289	16	815
1630 - 1645	6	1	3	4	0	108	16	371	2	1	318	6	836
1645 - 1700	4	1	4	1	0	93	17	331	0	2	274	9	736
1700 - 1715	4	0	5	4	0	107	7	359	0	0	292	15	793
1715 - 1730	2	0	0	1	0	113	14	496	0	0	275	10	911
1730 - 1745	0	0	0	4	0	82	14	385	0	0	248	8	741
1745 - 1800	0	0	0	5	0	81	13	402	0	0	208	12	721
PM Totals	26	5	19	24	5	774	104	3059	13	10	2165	85	6289

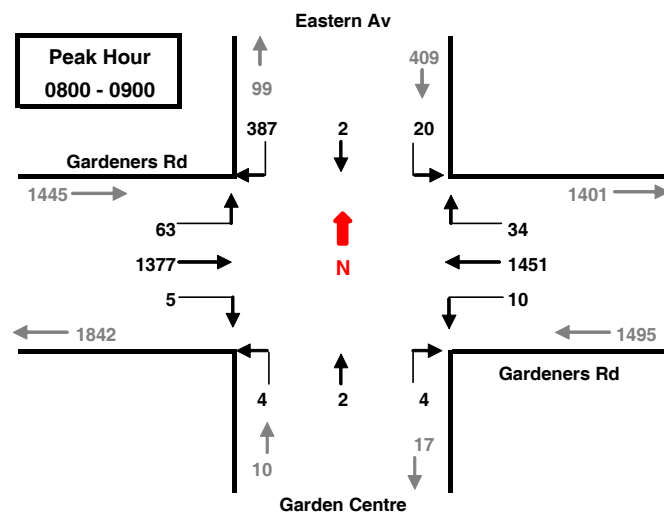
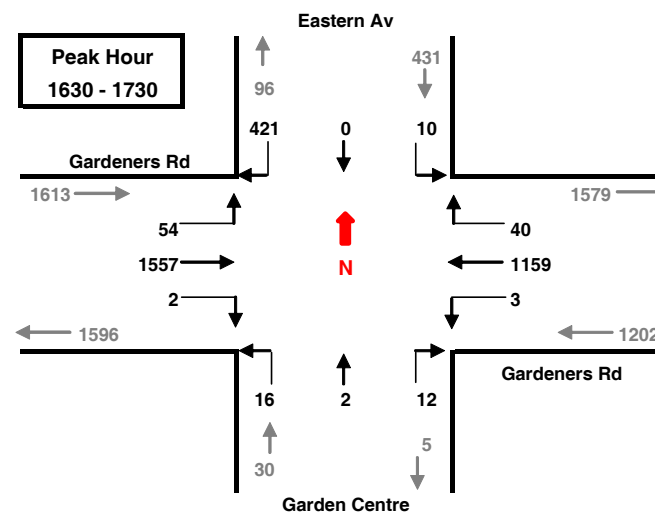
*Garden Centre Gates Closed 5.10pm

Peak Time	NORTHBOUND Garden Centre			SOUTHBOUND Eastern Av			EASTBOUND Gardeners Rd			WESTBOUND Gardeners Rd			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
0700 - 0800	0	1	0	8	0	162	60	1048	4	3	1016	23	2325
0715 - 0815	0	2	0	11	0	201	72	1148	4	4	1165	23	2630
0730 - 0830	1	2	1	14	0	255	69	1287	7	4	1264	27	2931
0745 - 0845	1	2	3	13	1	341	60	1361	7	7	1386	30	3212
0800 - 0900	4	2	4	20	2	387	63	1377	5	10	1451	34	3359

Peak Time	NORTHBOUND Garden Centre			SOUTHBOUND Eastern Av			EASTBOUND Gardeners Rd			WESTBOUND Gardeners Rd			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
1600 - 1700	20	5	14	10	5	391	56	1417	13	10	1142	40	3123
1615 - 1715	17	4	15	11	2	420	55	1425	7	5	1173	46	3180
1630 - 1730	16	2	12	10	0	421	54	1557	2	3	1159	40	3276
1645 - 1745	10	1	9	10	0	395	52	1571	0	2	1089	42	3181
1700 - 1800	6	0	5	14	0	383	48	1642	0	0	1023	45	3166

Peak Hour	4	2	4	20	2	387	63	1377	5	10	1451	34	3359
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Peak Hour	16	2	12	10	0	421	54	1557	2	3	1159	40	3276
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APPENDIX 7 INTERSECTION DATA GARDENERS RD/COTTENHAM AV



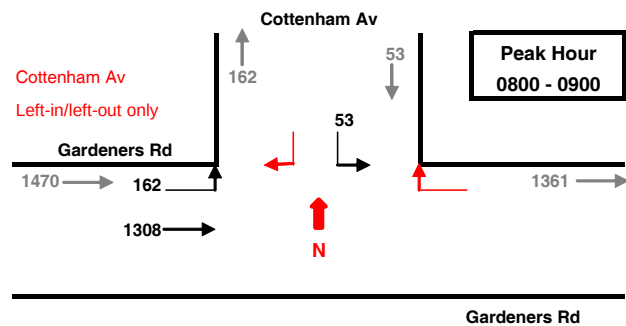
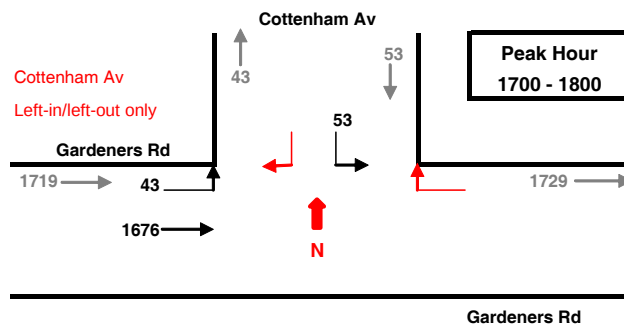
Client: Randwick City Council
 Intersection: Gardeners Rd/Cottenham Av
 Day/Date: Thursday 13 November 2008
 Description: Intersection Count All Vehicles/15 Minute Data

All Vehicles	EAST BOUND		WEST BOUND		SOUTH BOUND		TOT
	Gardeners Rd		Gardeners Rd		Cottenham Av		
Time Per	L	T	T	R	L	R	
0700 - 0715	13	229			2		244
0715 - 0730	25	238			4		267
0730 - 0745	25	234			2		261
0745 - 0800	31	266			11		308
0800 - 0815	46	327			6		379
0815 - 0830	47	367			16		430
0830 - 0845	37	311			17		365
0845 - 0900	32	303			14		349
AM Totals	256	2275	Not Counted	Not Permitted	72	Not Permitted	2603

All Vehicles	EAST BOUND		WEST BOUND		SOUTH BOUND		TOT
	Gardeners Rd		Gardeners Rd		Cottenham Av		
Time Per	L	T	T	R	L	R	
1600 - 1615	12	355			12		379
1615 - 1630	12	343			12		367
1630 - 1645	12	354			13		379
1645 - 1700	9	386			8		403
1700 - 1715	19	402			17		438
1715 - 1730	3	449			10		462
1730 - 1745	7	378			11		396
1745 - 1800	14	447			15		476
PM Totals	88	3114	Not Counted	Not Permitted	98	Not Permitted	3300

Peak Time	EAST BOUND		WEST BOUND		SOUTH BOUND		TOT
	Gardeners Rd		Gardeners Rd		Cottenham Av		
Peak Time	L	T	T	R	L	R	
0700 - 0800	94	967			19		1080
0715 - 0815	127	1065			23		1215
0730 - 0830	149	1194			35		1378
0745 - 0845	161	1271			50		1482
0800 - 0900	162	1308			53		1523
Peak Hour	162	1308			53		1523

Peak Time	EAST BOUND		WEST BOUND		SOUTH BOUND		TOT
	Gardeners Rd		Gardeners Rd		Cottenham Av		
Peak Time	L	T	T	R	L	R	
1600 - 1700	45	1438			45		1528
1615 - 1715	52	1485			50		1587
1630 - 1730	43	1591			48		1682
1645 - 1745	38	1615			46		1699
1700 - 1800	43	1676			53		1772
Peak Hour	43	1676			53		1772



APPENDIX 8 INTERSECTION DATA EASTERN AV/DAY AV



Client: Randwick City Council
 Intersection: Day Av/Eastern Av
 Day/Date: Friday 14 November 2008
 Description: Intersection Count All Vehicles/15 Minute Data

All Vehicles Time Per	NORTHBOUND Eastern Av			SOUTHBOUND Eastern Av			EASTBOUND Day Av			WESTBOUND Day Av			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
0700 - 0715	1	0	10	3	0	0	0	25	0	24	4	4	71
0715 - 0730	0	0	13	1	0	1	0	37	2	19	7	1	81
0730 - 0745	0	4	29	3	2	0	0	50	2	29	15	0	134
0745 - 0800	3	0	18	1	0	0	1	66	0	22	6	0	117
0800 - 0815	1	2	24	4	1	1	0	81	3	28	18	0	163
0815 - 0830	6	2	15	0	0	0	1	92	6	41	16	1	180
0830 - 0845	5	5	33	1	0	0	3	82	9	54	23	1	216
0845 - 0900	3	1	21	2	0	0	0	65	3	41	14	2	152
AM Totals	19	14	163	15	3	2	5	498	25	258	103	9	1114

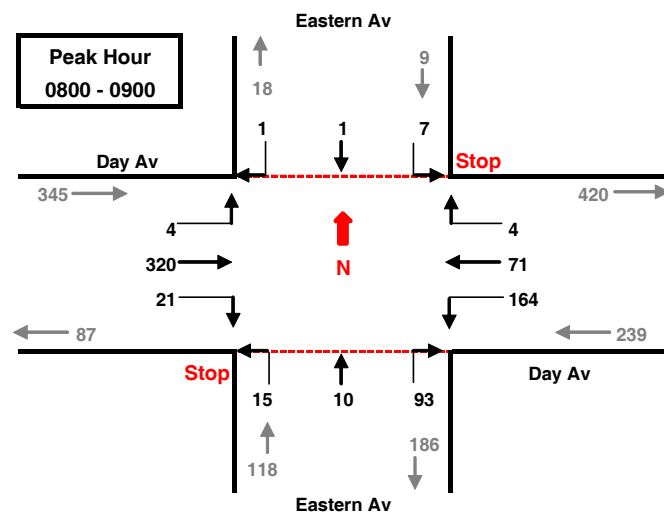
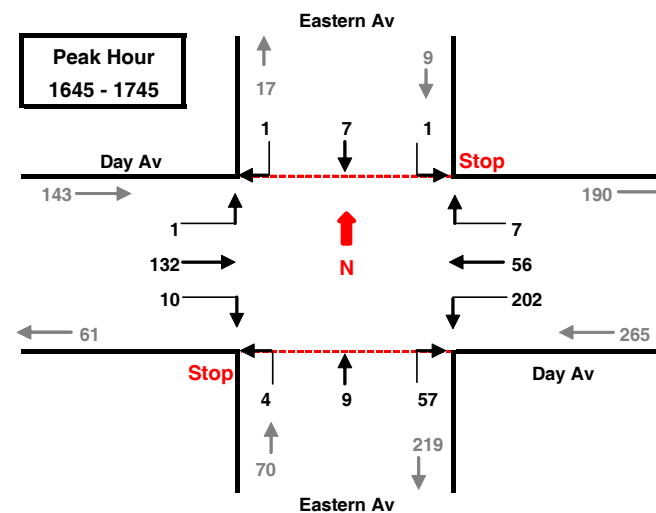
All Vehicles Time Per	NORTHBOUND Eastern Av			SOUTHBOUND Eastern Av			EASTBOUND Day Av			WESTBOUND Day Av			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
1600 - 1615	0	4	14	3	2	0	1	27	2	57	15	1	126
1615 - 1630	0	0	16	0	0	0	0	25	3	49	10	3	106
1630 - 1645	1	0	12	0	1	0	0	28	3	52	7	5	109
1645 - 1700	3	2	11	0	2	0	0	31	1	45	10	1	106
1700 - 1715	0	2	12	0	0	0	1	46	1	65	14	0	141
1715 - 1730	1	4	14	0	3	0	0	28	6	54	17	3	130
1730 - 1745	0	1	20	1	2	1	0	27	2	38	15	3	110
1745 - 1800	0	1	13	1	2	0	0	29	3	39	9	0	97
PM Totals	5	14	112	5	12	1	2	241	21	399	97	16	925

Peak Time	NORTHBOUND Eastern Av			SOUTHBOUND Eastern Av			EASTBOUND Day Av			WESTBOUND Day Av			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
0700 - 0800	4	4	70	8	2	1	1	178	4	94	32	5	403
0715 - 0815	4	6	84	9	3	2	1	234	7	98	46	1	495
0730 - 0830	10	8	86	8	3	1	2	289	11	120	55	1	594
0745 - 0845	15	9	90	6	1	1	5	321	18	145	63	2	676
0800 - 0900	15	10	93	7	1	1	4	320	21	164	71	4	711

Peak Time	NORTHBOUND Eastern Av			SOUTHBOUND Eastern Av			EASTBOUND Day Av			WESTBOUND Day Av			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
1600 - 1700	4	6	53	3	5	0	1	111	9	203	42	10	447
1615 - 1715	4	4	51	0	3	0	1	130	8	211	41	9	462
1630 - 1730	5	8	49	0	6	0	1	133	11	216	48	9	486
1645 - 1745	4	9	57	1	7	1	1	132	10	202	56	7	487
1700 - 1800	1	8	59	2	7	1	1	130	12	196	55	6	478

Peak Hour	15	10	93	7	1	1	4	320	21	164	71	4	711
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Peak Hour	4	9	57	1	7	1	1	132	10	202	56	7	487
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APPENDIX 9 INTERSECTION DATA TODMAN AV/LENTHALL ST



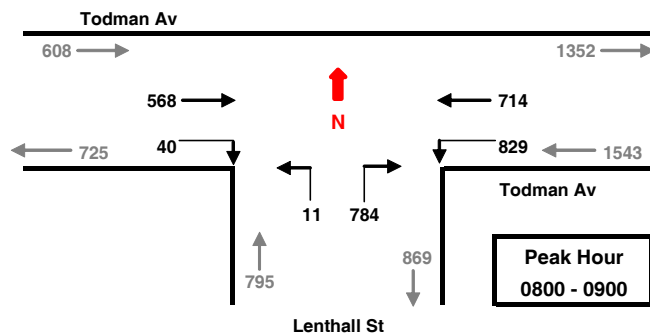
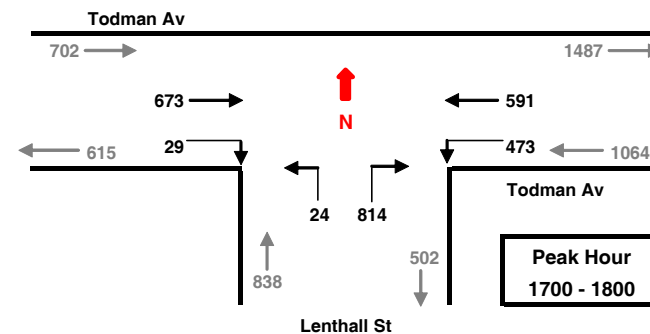
Client: Randwick City Council
 Intersection: Todman Av/Lenthall St
 Day/Date: Wednesday 12 November 2008
 Description: Intersection Count All Vehicles/15 Minute Data

All Vehicles	EAST BOUND		WEST BOUND		NORTH BOUND		TOT
	Todman Av		Todman Av		Lenthall St		
Time Per	T	R	L	T	L	R	
0700 - 0715	75	3	90	89	1	157	415
0715 - 0730	119	7	143	131	4	182	586
0730 - 0745	107	6	129	138	3	165	548
0745 - 0800	115	12	187	197	5	169	685
0800 - 0815	142	14	171	186	3	222	738
0815 - 0830	166	7	244	164	4	176	761
0830 - 0845	133	6	190	182	2	191	704
0845 - 0900	127	13	224	182	2	195	743
AM Totals	984	68	1378	1269	24	1457	5180

All Vehicles	EAST BOUND		WEST BOUND		NORTH BOUND		
	Todman Av		Todman Av		Lenthall St		
Time Per	T	R	L	T	L	R	TOT
1600 - 1615	100	8	126	186	8	155	583
1615 - 1630	140	9	121	176	5	145	596
1630 - 1645	155	3	128	168	13	195	662
1645 - 1700	149	7	100	148	6	163	573
1700 - 1715	133	10	121	177	12	176	629
1715 - 1730	181	8	144	152	6	223	714
1730 - 1745	177	4	111	139	1	211	643
1745 - 1800	182	7	97	123	5	204	618
PM Totals	1217	56	948	1269	56	1472	5018

	EAST BOUND		WEST BOUND		NORTH BOUND		
	Todman Av		Todman Av		Lenthall St		
Peak Time	T	R	L	T	L	R	TOT
0700 - 0800	416	28	549	555	13	673	2234
0715 - 0815	483	39	630	652	15	738	2557
0730 - 0830	530	39	731	685	15	732	2732
0745 - 0845	556	39	792	729	14	758	2888
0800 - 0900	568	40	829	714	11	784	2946
Peak Hour	568	40	829	714	11	784	2946

	EAST BOUND		WEST BOUND		NORTH BOUND		
	Todman Av		Todman Av		Lenthall St		
Peak Time	T	R	L	T	L	R	TOT
1600 - 1700	544	27	475	678	32	658	2414
1615 - 1715	577	29	470	669	36	679	2460
1630 - 1730	618	28	493	645	37	757	2578
1645 - 1745	640	29	476	616	25	773	2559
1700 - 1800	673	29	473	591	24	814	2604
Peak Hour	673	29	473	591	24	814	2604



APPENDIX 10 INTERSECTION DATA TODMAN AV/KENSINGTON RD



Client: Randwick City Council
 Intersection: Kensington Rd/Todman Av
 Day/Date: Thursday 20 November 2008
 Description: Intersection Count All Vehicles/15 Minute Data

All Vehicles Time Per	NORTHBOUND Kensington Rd			SOUTHBOUND Kensington Rd			EASTBOUND Todman Av			WESTBOUND Todman Av			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
0700 - 0715	18	3	4	3	3	4	5	195	12	7	131	4	389
0715 - 0730	26	5	10	8	3	8	3	196	25	3	173	8	468
0730 - 0745	28	20	3	10	2	11	9	239	29	11	201	10	573
0745 - 0800	36	8	12	16	5	9	3	273	29	2	273	9	675
0800 - 0815	50	22	9	6	6	16	6	238	43	7	271	43	717
0815 - 0830	56	33	10	13	11	6	9	268	61	7	330	7	811
0830 - 0845	63	18	18	9	6	10	3	244	69	6	318	9	773
0845 - 0900	59	22	8	14	11	7	5	246	57	14	266	9	718
AM Totals	336	131	74	79	47	71	43	1899	325	57	1963	99	5124

60% westbound traffic turning right make U-Turn

All Vehicles Time Per	NORTHBOUND Kensington Rd			SOUTHBOUND Kensington Rd			EASTBOUND Todman Av			WESTBOUND Todman Av			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
1600 - 1615	25	8	6	14	9	11	7	212	24	12	224	13	565
1615 - 1630	27	13	9	13	1	9	9	209	37	8	207	9	551
1630 - 1645	36	14	6	11	9	5	39	297	39	11	220	20	707
1645 - 1700	33	15	5	13	6	10	43	243	43	17	176	10	614
1700 - 1715	46	19	4	21	4	9	11	316	49	11	243	20	753
1715 - 1730	56	14	7	15	3	4	9	301	56	13	191	24	693
1730 - 1745	37	19	9	13	13	6	13	288	51	13	195	21	678
1745 - 1800	29	6	6	23	8	7	14	271	42	9	154	10	579
PM Totals	289	108	52	123	53	61	145	2137	341	94	1610	127	5140

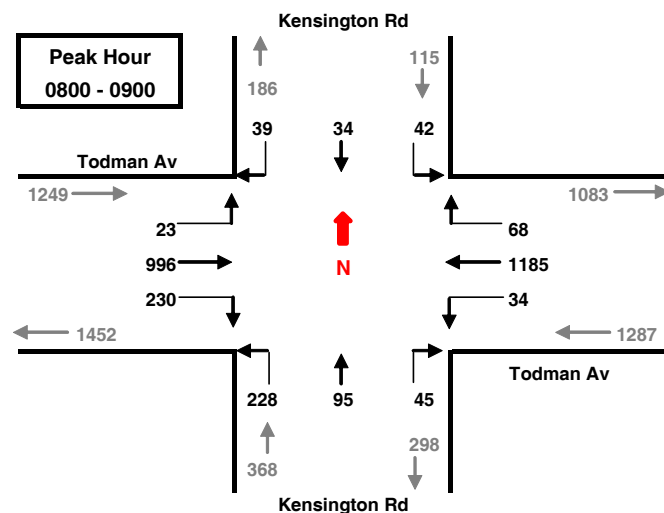
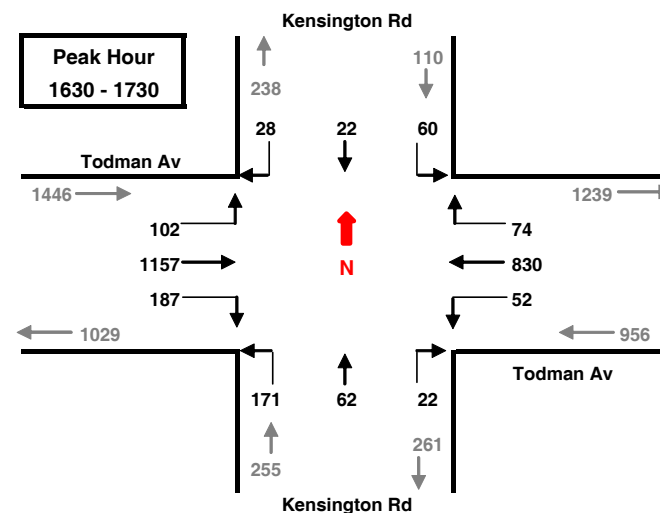
Traffic banked back from Anzac Pd through roundabout

Peak Time	NORTHBOUND Kensington Rd			SOUTHBOUND Kensington Rd			EASTBOUND Todman Av			WESTBOUND Todman Av			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
0700 - 0800	108	36	29	37	13	32	20	903	95	23	778	31	2105
0715 - 0815	140	55	34	40	16	44	21	946	126	23	918	70	2433
0730 - 0830	170	83	34	45	24	42	27	1018	162	27	1075	69	2776
0745 - 0845	205	81	49	44	28	41	21	1023	202	22	1192	68	2976
0800 - 0900	228	95	45	42	34	39	23	996	230	34	1185	68	3019

Peak Hour	228	95	45	42	34	39	23	996	230	34	1185	68	3019
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Peak Time	NORTHBOUND Kensington Rd			SOUTHBOUND Kensington Rd			EASTBOUND Todman Av			WESTBOUND Todman Av			TOT
	L	T	R	L	T	R	L	T	R	L	T	R	
1600 - 1700	121	50	26	51	25	35	98	961	143	48	827	52	2437
1615 - 1715	142	61	24	58	20	33	102	1065	168	47	846	59	2625
1630 - 1730	171	62	22	60	22	28	102	1157	187	52	830	74	2767
1645 - 1745	172	67	25	62	26	29	76	1148	199	54	805	75	2738
1700 - 1800	168	58	26	72	28	26	47	1176	198	46	783	75	2703

Peak Hour	171	62	22	60	22	28	102	1157	187	52	830	74	2767
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APPENDIX 11 INTERSECTION DATA EPSOM RD/LINK RD



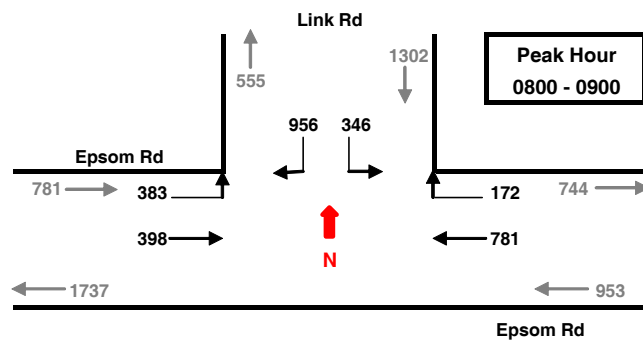
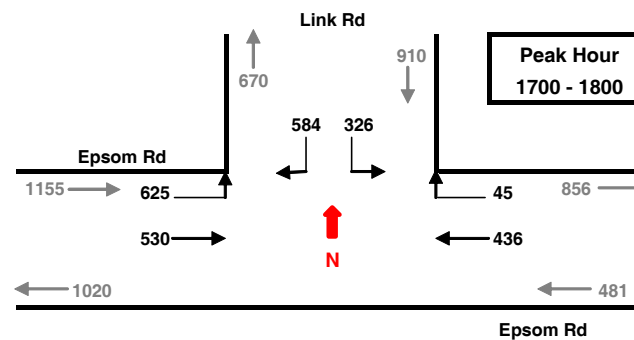
Client: Randwick City Council
 Intersection: Epsom Rd/Link Rd
 Day/Date: Wednesday 12 November 2008
 Description: Intersection Count All Vehicles/15 Minute Data

All Vehicles	EAST BOUND		WEST BOUND		SOUTH BOUND		
	Epsom Rd		Epsom Rd		Link Rd		
Time Per	L	T	T	R	L	R	TOT
0700 - 0715	55	72	89	19	112	181	528
0715 - 0730	84	69	126	26	99	168	572
0730 - 0745	92	73	128	34	68	292	687
0745 - 0800	98	100	129	56	98	187	668
0800 - 0815	96	103	177	37	89	201	703
0815 - 0830	100	88	178	59	88	207	720
0830 - 0845	95	101	195	45	86	249	771
0845 - 0900	92	106	231	31	83	299	842
AM Totals	712	712	1253	307	723	1784	5491

All Vehicles	EAST BOUND		WEST BOUND		SOUTH BOUND		TOT
	Epsom Rd		Epsom Rd		Link Rd		
	L	T	T	R	L	R	
Time Per	L	T	T	R	L	R	TOT
1600 - 1615	118	112	90	15	86	154	575
1615 - 1630	101	92	114	23	49	39	418
1630 - 1645	140	122	102	10	88	183	645
1645 - 1700	112	104	82	17	48	34	397
1700 - 1715	173	132	122	18	87	156	688
1715 - 1730	144	117	109	8	79	152	609
1730 - 1745	152	163	100	9	96	143	663
1745 - 1800	156	118	105	10	64	133	586
PM Totals	1096	960	824	110	597	994	4581

	EAST BOUND		WEST BOUND		SOUTH BOUND		TOT
	Epsom Rd		Epsom Rd		Link Rd		
	L	T	T	R	L	R	
Peak Time	L	T	T	R	L	R	TOT
0700 - 0800	329	314	472	135	377	828	2455
0715 - 0815	370	345	560	153	354	848	2630
0730 - 0830	386	364	612	186	343	887	2778
0745 - 0845	389	392	679	197	361	844	2862
0800 - 0900	383	398	781	172	346	956	3036
Peak Hour	383	398	781	172	346	956	3036

	EAST BOUND		WEST BOUND		SOUTH BOUND		TOT
	Epsom Rd		Epsom Rd		Link Rd		
	L	T	T	R	L	R	
Peak Time							
1600 - 1700	471	430	388	65	271	410	2035
1615 - 1715	526	450	420	68	272	412	2148
1630 - 1730	569	475	415	53	302	525	2339
1645 - 1745	581	516	413	52	310	485	2357
1700 - 1800	625	530	436	45	326	584	2546
Peak Hour	625	530	436	45	326	584	2546



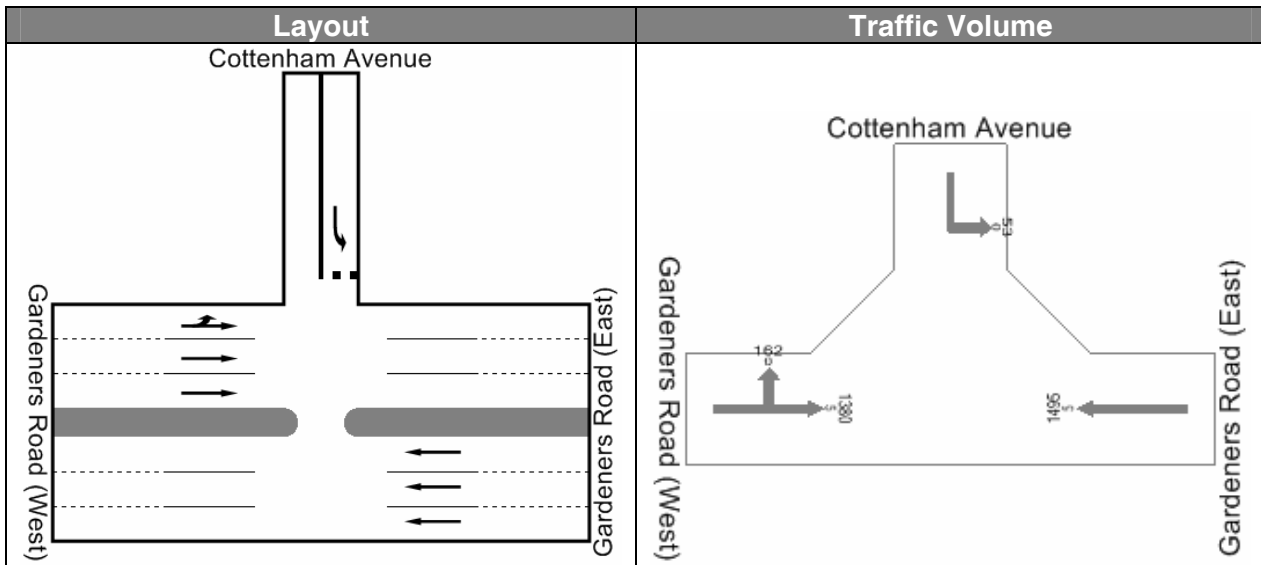
APPENDIX 12 SIDRA RESULTS EXISTING ROAD NETWORK

AM Results

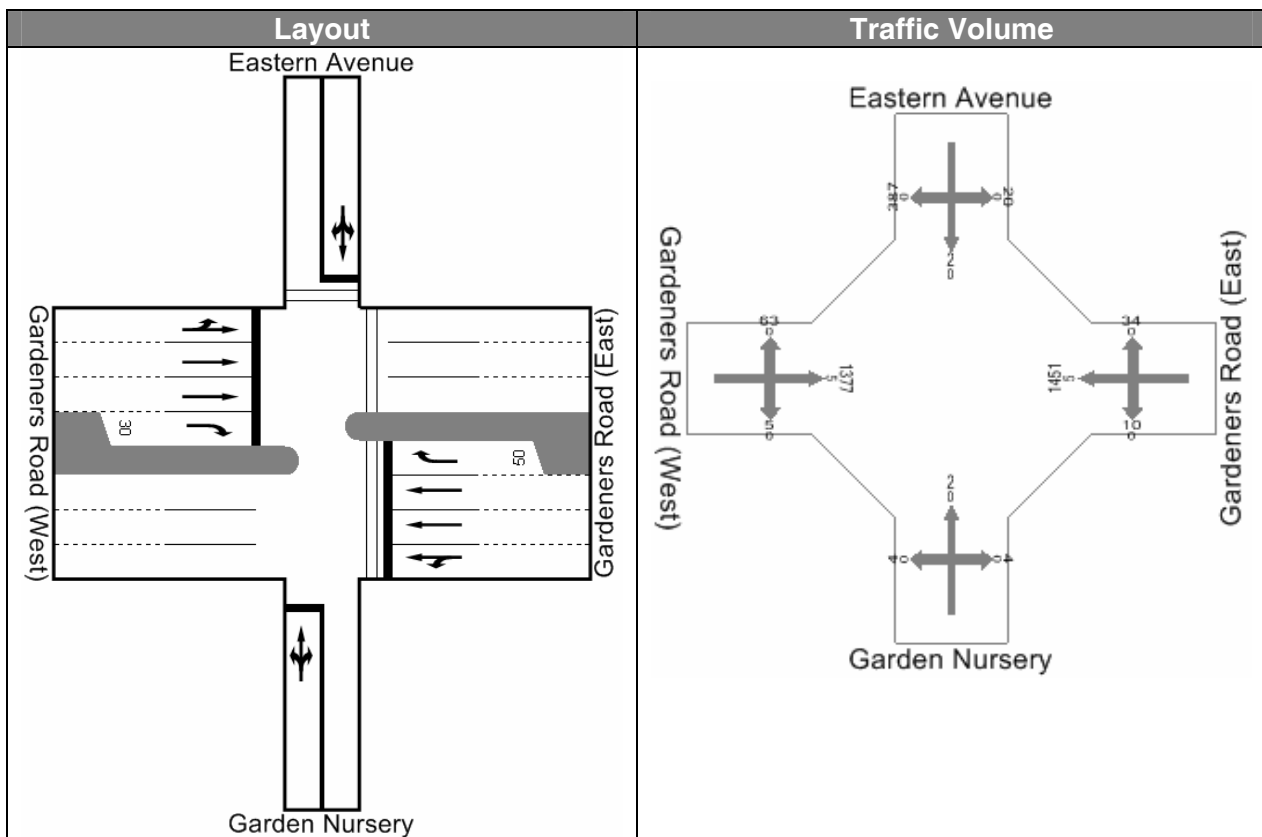
Location: Gardeners Road and Cottenham Avenue

AM Peak: 8:00am to 9:00am

Control Type: Left-in left-out (Give-way)



Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gardeners Road (East)										
5	T	1574	5.0	0.278	0.0	LOS A	0	0.00	0.00	60.0
Approach		1574	5.0	0.278	0.0	LOS A		0.00	0.00	60.0
Cottenham Avenue										
7	L	56	0.0	0.350	34.1	LOS C	11	0.91	1.02	28.4
Approach		56	0.0	0.351	34.1	LOS C	11	0.91	1.02	28.4
Gardeners Road (West)										
10	L	171	0.0	0.287	8.2	LOS A	0	0.00	0.67	49.0
11	T	1453	5.0	0.287	0.0	LOS A	0	0.00	0.00	60.0
Approach		1624	4.5	0.287	0.9	LOS A		0.00	0.07	58.6
All Vehicles		3254	4.7	0.350	1.0	Not Applicable	11	0.02	0.05	58.2

Location: Gardeners Road and Eastern Avenue**AM Peak:** 8:00am to 9:00am**Control Type:** Signalised

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Garden Nursery										
1	L	4	0.0	0.011	11.4	LOS A	1	0.47	0.67	40.4
2	T	2	0.0	0.011	4.2	LOS A	1	0.47	0.30	46.2
3	R	4	0.0	0.011	10.9	LOS A	1	0.47	0.64	40.8
Approach		10	0.0	0.011	9.8	LOS A	1	0.47	0.58	41.6
Gardeners Road (East)										
4	L	11	0.0	0.700	26.2	LOS B	107	0.90	0.88	34.8
5	T	1527	5.0	0.708	18.1	LOS B	107	0.90	0.82	40.1
6	R	36	0.0	0.229	33.6	LOS C	11	0.90	0.74	31.2
Approach		1574	4.8	0.708	18.5	LOS B	107	0.90	0.82	39.8
Eastern Avenue										
7	L	21	0.0	0.672	23.4	LOS B	86	0.87	0.86	33.1
8	T	2	0.0	0.686	16.2	LOS B	86	0.87	0.77	37.3
9	R	407	0.0	0.672	22.0	LOS B	81	0.81	0.83	33.8
Approach		430	0.0	0.672	22.0	LOS B	81	0.81	0.83	33.8
Gardeners Road (West)										
10	L	66	0.0	0.697	26.0	LOS B	104	0.90	0.87	35.0
11	T	1449	5.0	0.698	17.8	LOS B	105	0.90	0.81	40.3
12	R	5	0.0	0.032	32.1	LOS C	1	0.86	0.67	31.8
Approach		1520	4.7	0.698	18.2	LOS B	105	0.90	0.81	40.0
All Vehicles		3534	4.2	0.708	18.8	LOS B	107	0.89	0.82	39.1

Pedestrian Movements						
Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	53	23.4	LOS C	0	0.88	0.88
P5	53	13.3	LOS B	0	0.67	0.67
All Peds	106	18.4	LOS B	0	0.78	0.78

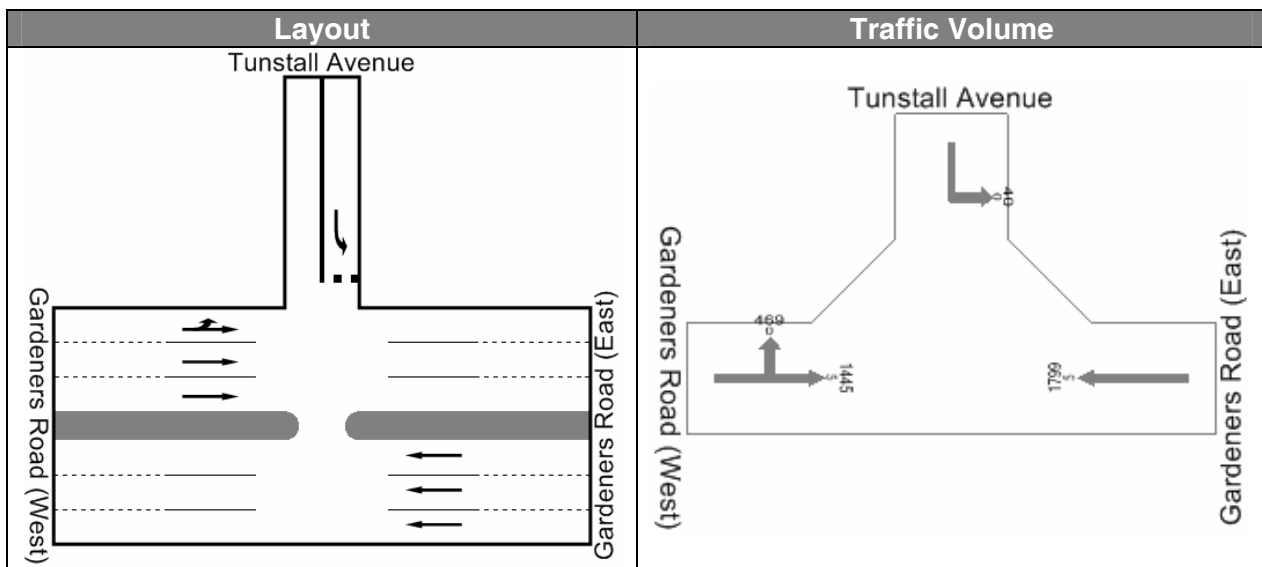
9.1.1 Phase Summary	9.1.2
9.1.3 Phase A	9.1.4 Phase B
Green Time = 23 seconds Phase Time = 29 seconds Phase Split = 48 %	Green Time = 25 seconds Phase Time = 31 seconds Phase Split = 52 %

Normal Movement	Permitted/Opposed
Slip-Lane	Opposed Slip-Lane
Stopped Movement	Continuous
Turn On Red	

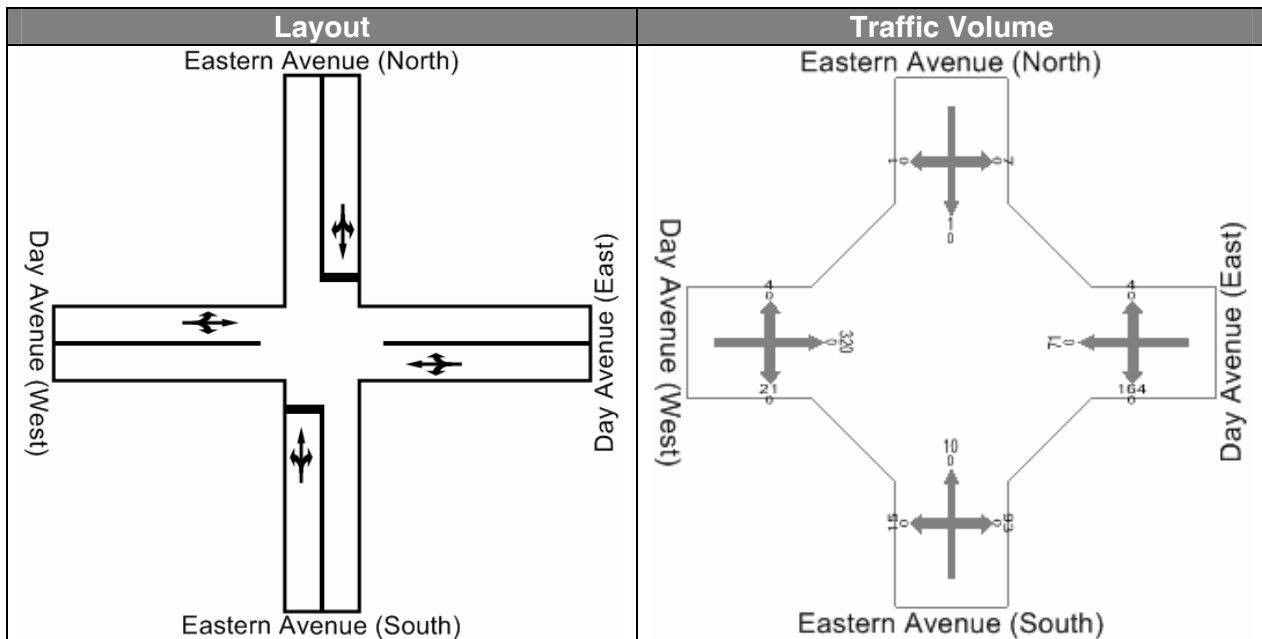
C = 90 seconds

Cycle Time Option: Program calculated cycle time

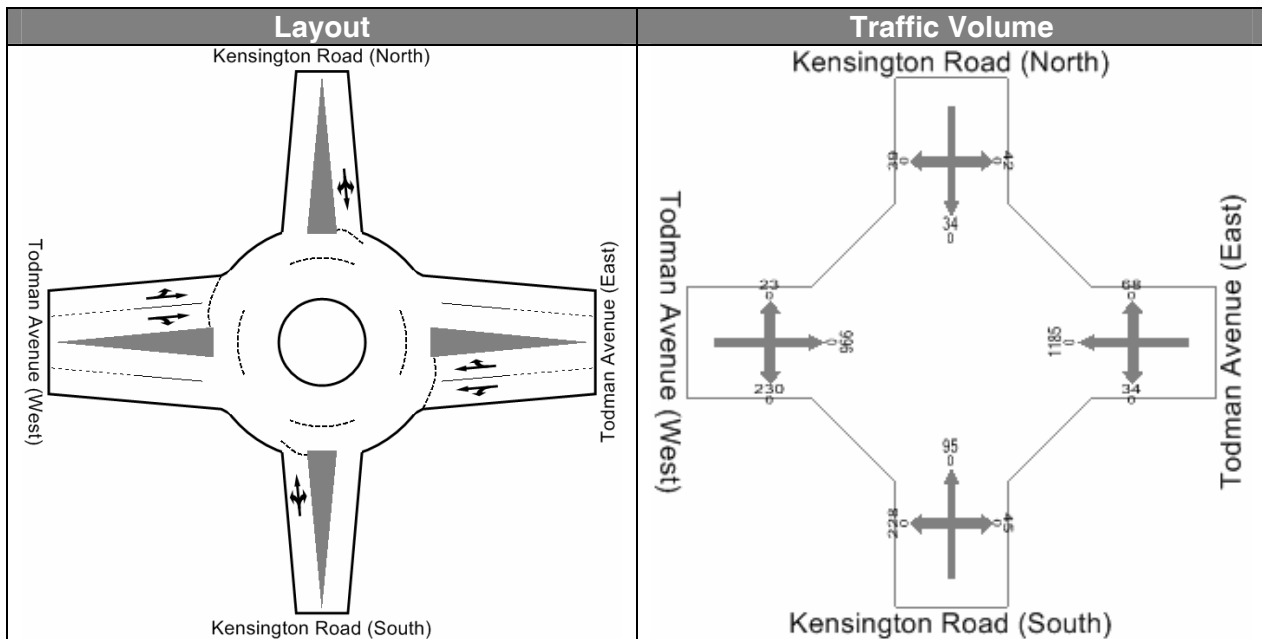
Phase times determined by the program.

Location: Gardeners Road and Tunstall Avenue**AM Peak:** 8:00am to 9:00am**Control Type:** Left-in left-out (Give-Way)

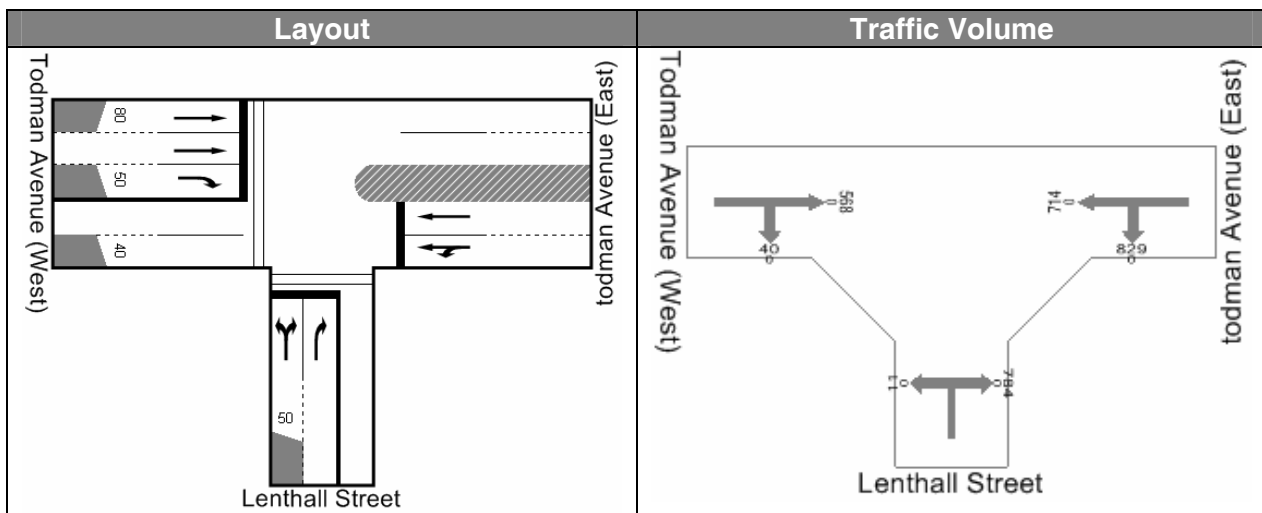
Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gardeners Road (East)										
5	T	1894	5.0	0.334	0.0	LOS A	0	0.00	0.00	60.0
Approach		1894	5.0	0.334	0.0	LOS A		0.00	0.00	60.0
Tunstall Avenue										
7	L	42	0.0	0.393	50.0	LOS D	11	0.94	1.02	25.2
Approach		42	0.0	0.393	50.0	LOS D	11	0.94	1.02	25.2
Gardeners Road (West)										
10	L	494	0.0	0.357	8.2	LOS A	0	0.00	0.67	49.0
11	T	1521	5.0	0.357	0.0	LOS A	0	0.00	0.00	60.0
Approach		2015	3.8	0.357	2.0	LOS A		0.00	0.16	56.9
All Vehicles		3951	4.3	0.393	1.6	Not Applicable	11	0.01	0.09	57.5

Location: Eastern Avenue and Day Avenue**AM Peak:** 8:00am to 9:00am**Control Type:** Priority (Stop Sign)

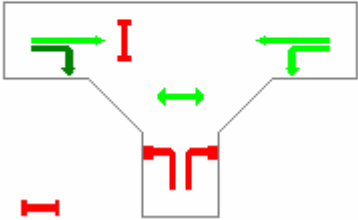
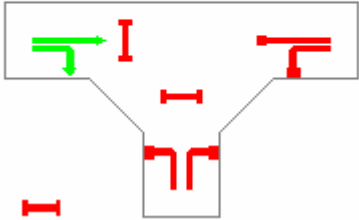
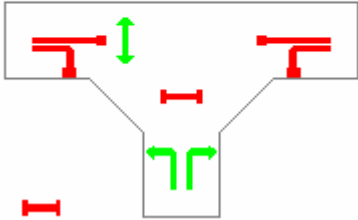
Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Eastern Avenue (South)										
1	L	16	0.0	0.291	18.2	LOS B	11	0.59	0.84	40.9
2	T	11	0.0	0.289	17.8	LOS B	11	0.59	1.03	41.1
3	R	98	0.0	0.289	18.0	LOS B	11	0.59	0.99	40.8
Approach		125	0.0	0.289	18.0	LOS B	11	0.59	0.97	40.9
Day Avenue (East)										
4	L	173	0.0	0.136	9.9	LOS A	9	0.78	0.15	45.7
5	T	75	0.0	0.136	1.7	LOS A	9	0.78	0.00	50.7
6	R	4	0.0	0.133	10.2	LOS A	9	0.78	0.75	45.7
Approach		252	0.0	0.136	7.5	LOS A	9	0.78	0.11	47.1
Eastern Avenue (North)										
7	L	7	0.0	0.013	13.4	LOS A	0	0.45	0.84	44.6
8	T	1	0.0	0.013	13.0	LOS A	0	0.45	0.92	45.0
9	R	1	0.0	0.013	13.2	LOS A	0	0.45	0.86	44.6
Approach		9	0.0	0.013	13.4	LOS A	0	0.45	0.85	44.7
Day Avenue (West)										
10	L	4	0.0	0.190	9.5	LOS A	13	0.44	0.38	47.1
11	T	337	0.0	0.195	1.3	LOS A	13	0.44	0.00	54.4
12	R	22	0.0	0.195	9.7	LOS A	13	0.44	0.70	46.9
Approach		363	0.0	0.195	1.9	LOS A	13	0.44	0.05	53.8
All Vehicles		749	0.0	0.291	6.6	Not Applicable	13	0.58	0.23	48.8

Location: Todman Avenue and Kensington Road**AM Peak:** 8:00am to 9:00am**Control Type:** Roundabout

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Kensington Road (South)										
1	L	240	0.0	0.845	24.5	LOS B	60	0.93	1.23	35.8
2	T	100	0.0	0.847	23.7	LOS B	60	0.93	1.23	36.3
3	R	47	0.0	0.839	28.0	LOS B	60	0.93	1.24	34.3
Approach		387	0.0	0.846	24.7	LOS B	60	0.93	1.23	35.7
Todman Avenue (East)										
4	L	36	0.0	0.632	10.7	LOS A	48	0.68	0.79	46.2
5	T	1247	0.0	0.635	9.6	LOS A	48	0.68	0.76	47.0
6	R	72	0.0	0.637	14.0	LOS A	48	0.68	0.82	43.6
Approach		1355	0.0	0.635	9.9	LOS A	48	0.68	0.76	46.8
Kensington Road (North)										
7	L	44	0.0	0.247	12.2	LOS A	9	0.73	0.90	44.8
8	T	36	0.0	0.247	11.5	LOS A	9	0.73	0.88	45.6
9	R	41	0.0	0.247	15.8	LOS B	9	0.73	0.91	42.2
Approach		121	0.0	0.247	13.2	LOS A	9	0.73	0.90	44.1
Todman Avenue (West)										
10	L	24	0.0	0.571	9.2	LOS A	37	0.56	0.69	46.9
11	T	1048	0.0	0.567	8.0	LOS A	37	0.56	0.64	47.6
12	R	242	0.0	0.567	12.3	LOS A	37	0.57	0.72	44.4
Approach		1314	0.0	0.567	8.8	LOS A	37	0.56	0.66	47.0
All Vehicles		3177	0.0	0.847	11.4	LOS A	60	0.66	0.78	45.0

Location: Todman Avenue and Lenthall Street**AM Peak:** 8:00am to 9:00am**Control Type:** Signalised

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lenthall Street										
1	L	12	0.0	0.981	52.8	LOS D	92	0.97	0.84	24.4
3	R	825	0.0	0.979	82.6	LOS F	357	0.99	1.14	18.3
Approach		837	0.0	0.979	82.2	LOS F	357	0.99	1.13	18.3
Todman Avenue (East)										
4	L	873	0.0	0.970	77.4	LOS F	500	1.00	1.22	19.1
5	T	752	0.0	0.796	29.9	LOS C	272	0.91	0.83	33.0
Approach		1625	0.0	0.970	55.4	LOS D	500	0.96	1.04	23.8
Todman Avenue (West)										
11	T	598	0.0	0.363	14.9	LOS B	104	0.55	0.48	42.6
12	R	42	0.0	0.285	68.7	LOS E	26	0.98	0.72	20.7
Approach		640	0.0	0.363	18.4	LOS B	104	0.58	0.49	39.8
All Vehicles										
		3102	0.0	0.981	55.0	LOS D	500	0.89	0.95	23.9

9.1.5 Phase Summary	9.1.6	9.1.7
9.1.8 Phase A	9.1.9 Phase B	9.1.10 Phase C
		
Green Time = 63 seconds Phase Time = 69 seconds Phase Split = 53 %	Green Time = 6 seconds Phase Time = 12 seconds Phase Split = 9 %	Green Time = 43 seconds Phase Time = 49 seconds Phase Split = 38 %

C = 130 seconds

Cycle Time Option: Optimum cycle time (Minimum Delay)

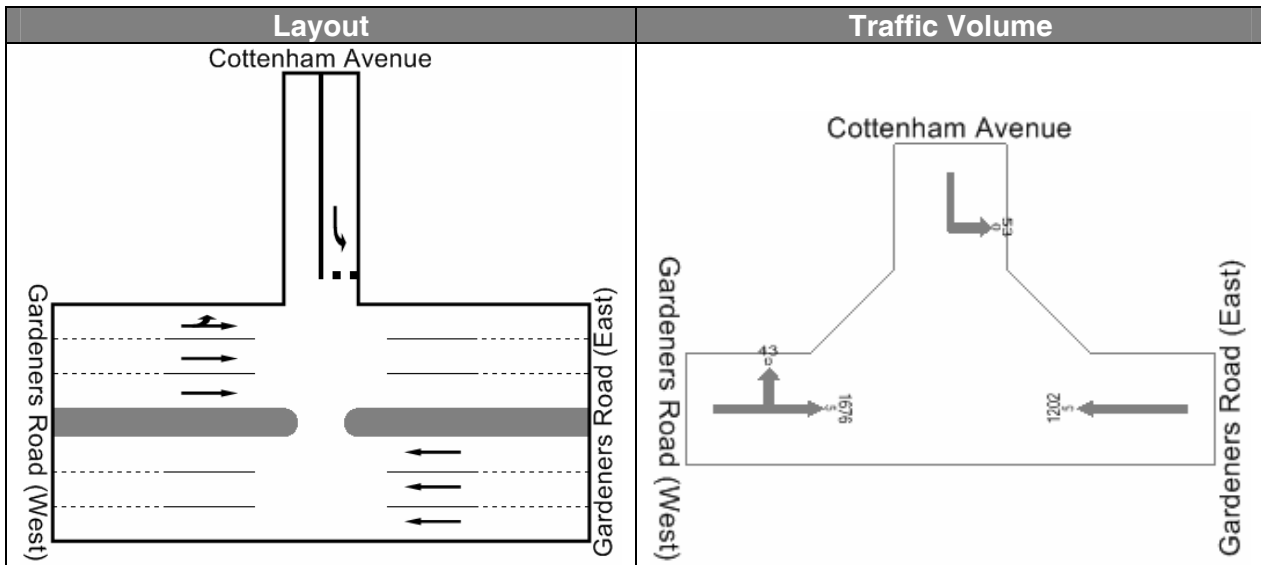
Phase times determined by the program.

PM Results

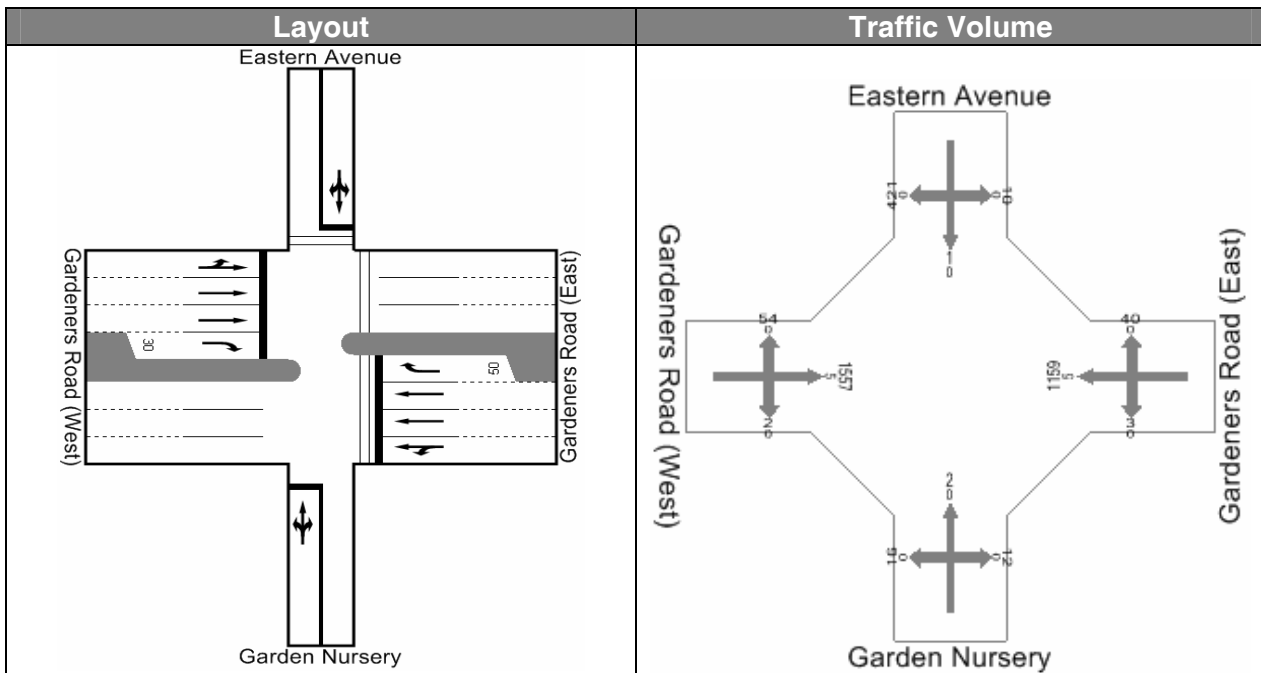
Location: Gardeners Road and Cottenham Avenue

PM Peak: 17:00pm to 18:00pm

Control Type: Left-in left-out (Give-way)



Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gardeners Road (East)										
5	T	1265	5.0	0.223	0.0	LOS A	0	0.00	0.00	60.0
Approach		1265	5.0	0.223	0.0	LOS A		0.00	0.00	60.0
Cottenham Avenue										
7	L	56	0.0	0.544	58.5	LOS E	16	0.96	1.07	21.6
Approach		56	0.0	0.546	58.5	LOS E	16	0.96	1.07	21.6
Gardeners Road (West)										
10	L	45	0.0	0.319	8.2	LOS A	0	0.00	0.67	49.0
11	T	1764	5.0	0.319	0.0	LOS A	0	0.00	0.00	60.0
Approach		1809	4.9	0.319	0.2	LOS A		0.00	0.02	59.7
All Vehicles		3130	4.8	0.544	1.2	Not Applicable	16	0.02	0.03	58.0

Location: Gardeners Road and Eastern Avenue**PM Peak:** 16:30pm to 17:30pm**Control Type:** Signalised

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Garden Nursery										
1	L	17	0.0	0.035	10.3	LOS A	3	0.42	0.69	41.2
2	T	2	0.0	0.035	3.1	LOS A	3	0.42	0.28	47.2
3	R	13	0.0	0.035	9.8	LOS A	3	0.40	0.66	41.6
Approach		32	0.0	0.035	9.7	LOS A	3	0.41	0.65	41.7
Gardeners Road (East)										
4	L	3	0.0	0.559	24.2	LOS B	82	0.84	0.83	36.0
5	T	1220	5.0	0.563	16.0	LOS B	82	0.84	0.72	41.7
6	R	42	0.0	0.291	35.9	LOS C	13	0.94	0.75	30.2
Approach		1265	4.8	0.563	16.7	LOS B	82	0.84	0.72	41.1
Eastern Avenue										
7	L	11	0.0	0.714	24.9	LOS B	95	0.89	0.90	32.3
8	T	1	0.0	0.800	17.8	LOS B	95	0.89	0.83	36.3
9	R	443	0.0	0.721	23.3	LOS B	89	0.83	0.87	33.1
Approach		455	0.0	0.721	23.4	LOS B	89	0.83	0.87	33.1
Gardeners Road (West)										
10	L	57	0.0	0.783	29.1	LOS C	126	0.94	0.95	33.3
11	T	1639	5.0	0.781	20.9	LOS B	127	0.94	0.91	38.1
12	R	2	0.0	0.011	28.8	LOS C	1	0.80	0.64	33.5
Approach		1698	4.8	0.781	21.2	LOS B	127	0.94	0.91	37.9
All Vehicles		3450	4.1	0.800	19.7	LOS B	127	0.89	0.84	38.3

Pedestrian Movements						
Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	53	23.4	LOS C	0	0.88	0.88
P5	53	13.3	LOS B	0	0.67	0.67
All Peds	106	18.4	LOS B	0	0.78	0.78

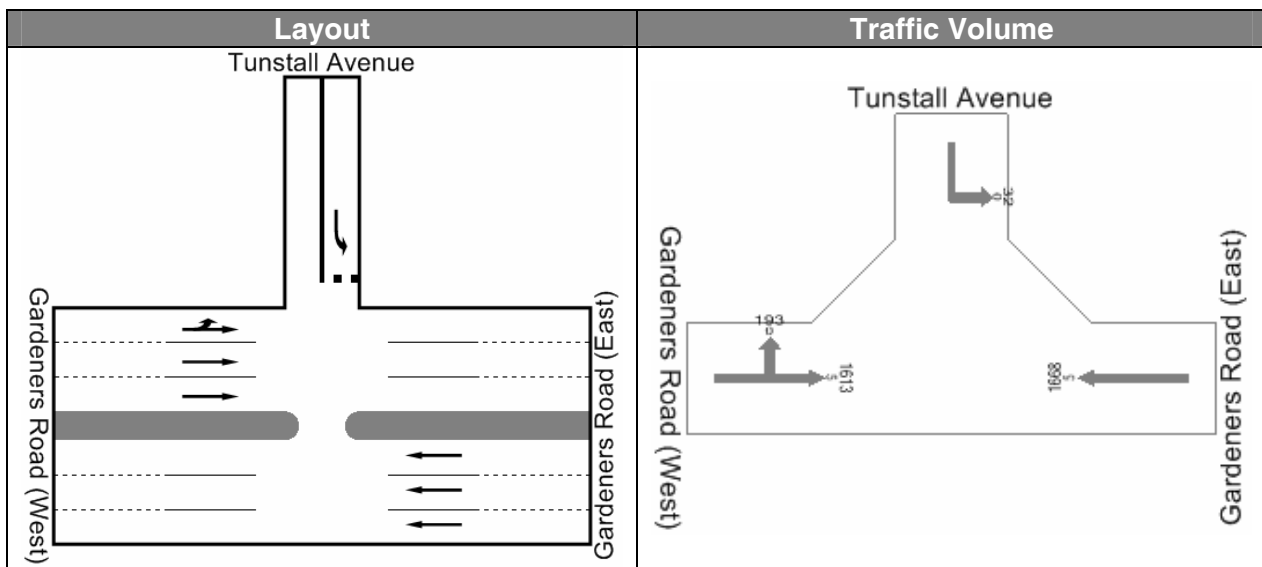
9.1.11 Phase Summary	9.1.12
9.1.13 Phase A	9.1.14 Phase B
Green Time = 23 seconds Phase Time = 29 seconds Phase Split = 48 %	Green Time = 25 seconds Phase Time = 31 seconds Phase Split = 52 %

Normal Movement	Permitted/Opposed
Slip-Lane	Opposed Slip-Lane
Stopped Movement	Continuous
Turn On Red	

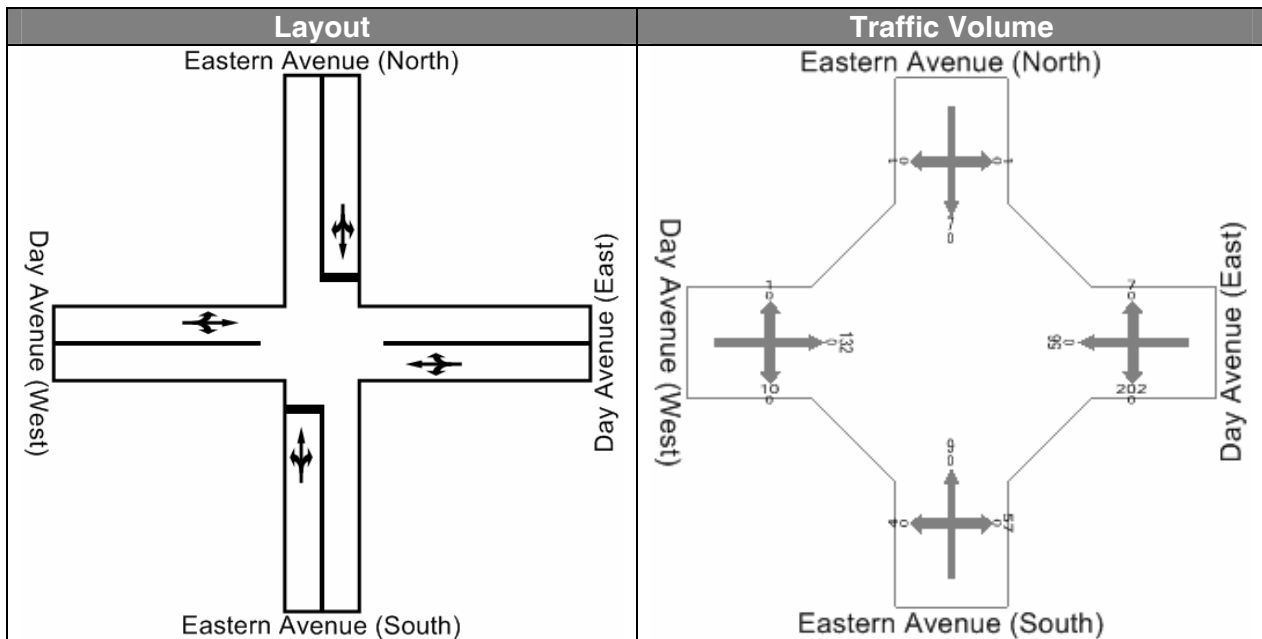
C = 60 seconds

Cycle Time Option: Program calculated cycle time

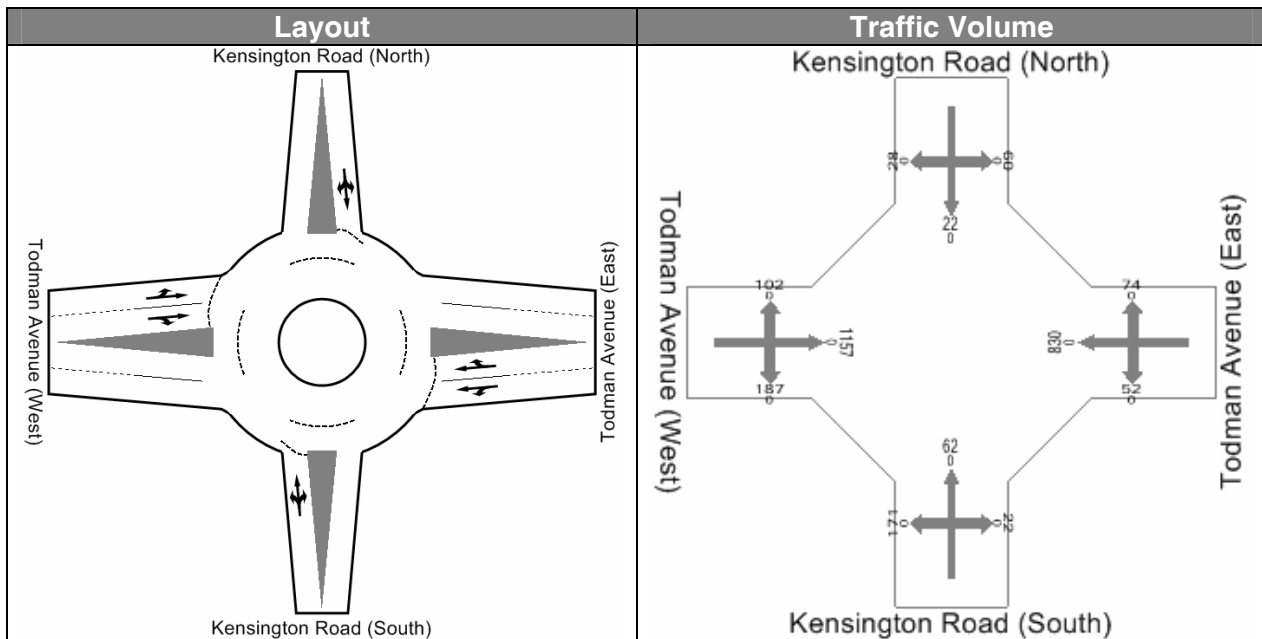
Phase times determined by the program.

Location: Gardeners Road and Tunstall Avenue**PM Peak:** 16:30pm to 17:30pm**Control Type:** Left-in left-out (Give-Way)

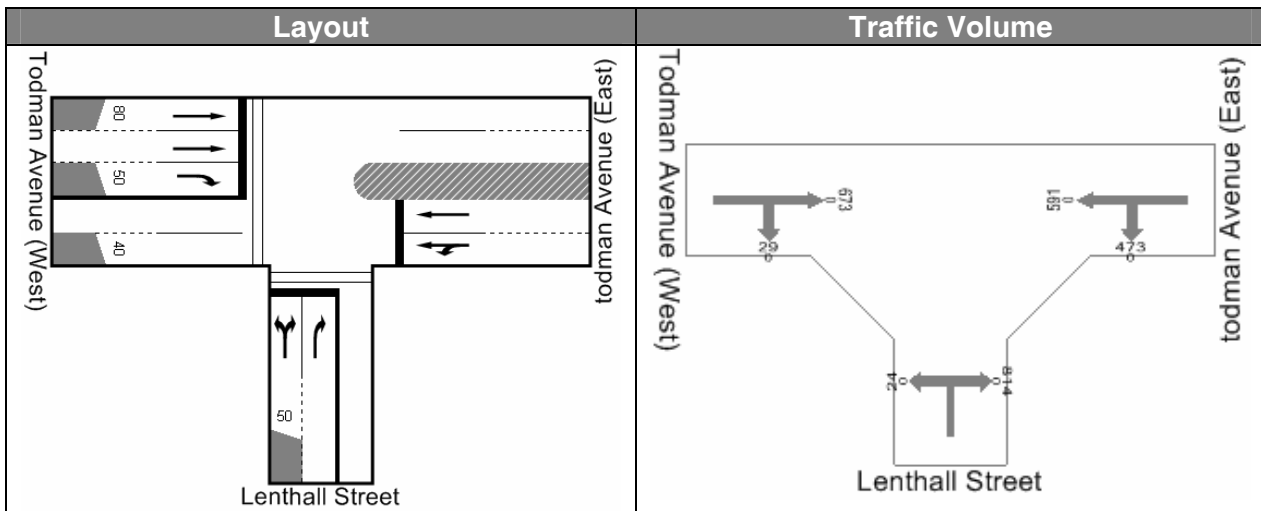
Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gardeners Road (East)										
5	T	1756	5.0	0.310	0.0	LOS A	0	0.00	0.00	60.0
Approach		1756	5.0	0.310	0.0	LOS A		0.00	0.00	60.0
Tunstall Avenue										
7	L	34	0.0	0.340	50.3	LOS D	9	0.94	1.01	25.1
Approach		34	0.0	0.339	50.3	LOS D	9	0.94	1.01	25.1
Gardeners Road (West)										
10	L	203	0.0	0.336	8.2	LOS A	0	0.00	0.67	49.0
11	T	1698	5.0	0.336	0.0	LOS A	0	0.00	0.00	60.0
Approach		1901	4.5	0.336	0.9	LOS A		0.00	0.07	58.6
All Vehicles										
		3691	4.7	0.340	0.9	Not Applicable	9	0.01	0.05	58.5

Location: Eastern Avenue and Day Avenue**PM Peak:** 16:30pm to 17:30pm**Control Type:** Priority (Stop Sign)

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Eastern Avenue (South)										
1	L	4	0.0	0.129	14.2	LOS A	4	0.48	0.81	44.0
2	T	9	0.0	0.127	13.8	LOS A	4	0.48	0.91	44.3
3	R	60	0.0	0.127	14.0	LOS A	4	0.48	0.88	44.0
Approach		73	0.0	0.127	14.0	LOS A	4	0.48	0.88	44.0
Day Avenue (East)										
4	L	213	0.0	0.151	8.8	LOS A	9	0.53	0.32	46.7
5	T	59	0.0	0.151	0.6	LOS A	9	0.53	0.00	53.4
6	R	7	0.0	0.149	9.1	LOS A	9	0.53	0.61	46.6
Approach		279	0.0	0.151	7.1	LOS A	9	0.53	0.26	48.0
Eastern Avenue (North)										
7	L	1	0.0	0.015	14.2	LOS A	1	0.46	0.75	44.0
8	T	7	0.0	0.015	13.8	LOS A	1	0.46	0.88	44.3
9	R	1	0.0	0.015	14.0	LOS A	1	0.46	0.79	44.0
Approach		9	0.0	0.015	13.8	LOS A	1	0.46	0.85	44.2
Day Avenue (West)										
10	L	1	0.0	0.083	9.4	LOS A	5	0.41	0.39	47.2
11	T	139	0.0	0.082	1.2	LOS A	5	0.41	0.00	54.7
12	R	11	0.0	0.082	9.7	LOS A	5	0.41	0.68	47.0
Approach		151	0.0	0.082	1.9	LOS A	5	0.41	0.05	54.0
All Vehicles		512	0.0	0.151	6.7	Not Applicable	9	0.49	0.30	48.9

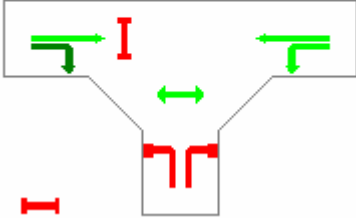
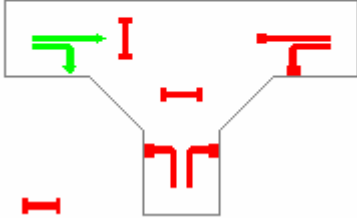
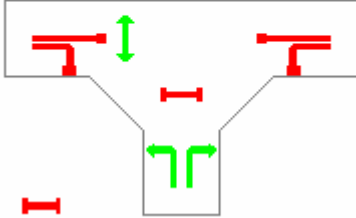
Location: Todman Avenue and Kensington Road**PM Peak:** 16:30pm to 17:30pm**Control Type:** Roundabout

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Kensington Road (South)										
1	L	180	0.0	0.441	12.4	LOS A	20	0.72	0.93	44.6
2	T	65	0.0	0.442	11.7	LOS A	20	0.72	0.92	45.4
3	R	23	0.0	0.442	16.0	LOS B	20	0.72	0.97	42.0
Approach		268	0.0	0.441	12.6	LOS A	20	0.72	0.93	44.6
Todman Avenue (East)										
4	L	55	0.0	0.447	9.2	LOS A	24	0.50	0.69	47.2
5	T	874	0.0	0.447	8.0	LOS A	24	0.50	0.64	47.9
6	R	78	0.0	0.448	12.3	LOS A	24	0.50	0.73	44.7
Approach		1007	0.0	0.447	8.4	LOS A	24	0.50	0.65	47.6
Kensington Road (North)										
7	L	63	0.0	0.243	12.7	LOS A	9	0.74	0.90	44.4
8	T	23	0.0	0.242	12.0	LOS A	9	0.74	0.88	45.2
9	R	29	0.0	0.244	16.3	LOS B	9	0.74	0.92	41.8
Approach		115	0.0	0.243	13.5	LOS A	9	0.74	0.90	43.8
Todman Avenue (West)										
10	L	107	0.0	0.611	8.9	LOS A	42	0.50	0.65	47.1
11	T	1218	0.0	0.612	7.8	LOS A	42	0.51	0.60	47.9
12	R	197	0.0	0.612	12.1	LOS A	42	0.51	0.70	44.6
Approach		1522	0.0	0.612	8.4	LOS A	42	0.51	0.62	47.4
All Vehicles		2912	0.0	0.612	9.0	LOS A	42	0.53	0.67	47.0

Location: Todman Avenue and Lenthall Street**PM Peak:** 17:00pm to 18:00pm**Control Type:** Signalised

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lenthall Street										
1	L	25	0.0	0.892	38.3	LOS C	92	0.85	0.92	29.2
3	R	857	0.0	0.895	44.9	LOS D	184	0.95	1.04	26.8
Approach		882	0.0	0.895	44.7	LOS D	184	0.95	1.03	26.8
todman Avenue (East)										
4	L	498	0.0	0.740	33.6	LOS C	130	0.93	0.89	31.1
5	T	622	0.0	0.880	36.0	LOS C	194	1.00	1.06	30.2
Approach		1120	0.0	0.880	35.0	LOS C	194	0.97	0.99	30.6
Todman Avenue (West)										
11	T	708	0.0	0.428	12.6	LOS A	84	0.64	0.56	44.6
12	R	31	0.0	0.125	37.3	LOS C	11	0.90	0.72	29.5
Approach		739	0.0	0.428	13.6	LOS A	84	0.65	0.56	43.6
All Vehicles		2741	0.0	0.895	32.4	LOS C	194	0.88	0.89	31.7

Pedestrian Movements						
Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	20.3	LOS C	0	0.71	0.71
P7	53	25.6	LOS C	0	0.80	0.80
All Peds	106	23.0	LOS B	0	0.76	0.76

9.1.15 Phase Summary	9.1.16	9.1.17
9.1.18 Phase A	9.1.19 Phase B	9.1.20 Phase C
		
Green Time = 29 seconds Phase Time = 35 seconds Phase Split = 44 %	Green Time = 6 seconds Phase Time = 12 seconds Phase Split = 15 %	Green Time = 27 seconds Phase Time = 33 seconds Phase Split = 41 %

C = 80 seconds

Cycle Time Option: Optimum cycle time (Minimum Delay)

Phase time determined by the program.

APPENDIX 13 CRASH DATA

Study Area Crash Statistics 1/7/2004 - 30/6/2007

Page 1

Accident Street	Accident Date	Accident Degree*	Accident Distance (metres)	Accident Direction#	Accident Identifying Object	Number Persons Killed	Number Persons Injured	Number Peds. Killed	Number Peds. Injured
Abbotford La	No crashes recorded for period 1/7/2004 - 30/6/2007								
Abbotford St	17/04/2005	3	0	0	Doncaster Av	0	0	0	0
	21/06/2005	2	0	0	Doncaster Av	0	1	0	0
Aboud Av	No crashes recorded for period 1/7/2004 - 30/6/2007								
Addison St	14/05/2005	3	0	0	Kensington Rd	0	0	0	0
	30/05/2006	3	0	0	Kensington Rd	0	0	0	0
	02/07/2006	3	0	0	Kensington Rd	0	0	0	0
	10/07/2006	3	0	0	Kensington Rd	0	0	0	0
Alison Rd	08/08/2004	3	45	3	Anzac Pd	0	0	0	0
	08/09/2004	3	30	3	Anzac Pd	0	0	0	0
	16/10/2004	3	50	3	Tay St	0	0	0	0
	19/02/2005	1	0	0	Doncaster Av	1	0	1	0
	03/06/2005	3	5	3	Anzac Pd	0	0	0	0
	21/06/2005	3	100	3	Anzac Pd	0	0	0	0
	27/06/2005	3	50	3	Anzac Pd	0	0	0	0
	30/07/2005	3	0	0	Doncaster Av	0	0	0	0
	13/08/2005	2	5	4	Doncaster Av	0	1	0	0
	04/10/2005	2	100	3	Anzac Pd	0	1	0	0
	09/02/2006	2	0	0	Doncaster Av	0	1	0	0
	29/06/2006	3	30	3	Anzac Pd	0	0	0	0
	01/07/2006	2	10	3	Anzac Pd	0	1	0	0
	21/08/2006	3	0	0	Doncaster Av	0	0	0	0
	22/09/2006	2	2	4	Doncaster Av	0	1	0	0
	09/11/2006	2	30	3	Anzac Pd	0	1	0	0
	29/12/2006	3	5	4	Doncaster Av	0	0	0	0
	22/03/2007	3	0	0	Doncaster Av	0	0	0	0
	05/04/2007	3	50	3	Anzac Pd	0	0	0	0
	27/06/2007	3	15	4	Doncaster Av	0	0	0	0
Anzac Pd	03/07/2004	3	0	0	Barker St	0	0	0	0
	06/07/2004	3	100	2	High St	0	0	0	0
	19/07/2004	3	0	0	Boronia St	0	0	0	0
	27/07/2004	3	0	0	Rainbow St	0	0	0	0
	03/08/2004	2	5	1	High St	0	1	0	0
	10/08/2004	3	0	0	Todman Av	0	0	0	0
	14/08/2004	3	0	0	Rainbow St	0	0	0	0
	16/08/2004	3	0	0	Barker St	0	0	0	0
	16/08/2004	3	2	2	Rainbow St	0	0	0	0
	20/08/2004	2	5	1	Rainbow St	0	1	0	0
	24/08/2004	2	0	0	Barker St	0	1	0	0
	25/08/2004	3	5	2	Dacey Av	0	0	0	0
	03/09/2004	3	0	0	Rainbow St	0	0	0	0
	04/09/2004	3	0	0	Barker St	0	0	0	0
	19/09/2004	3	0	0	Barker St	0	0	0	0
	20/09/2004	2	0	0	Bunnerong Rd	0	1	0	0
	21/09/2004	2	10	1	Todman Av	0	1	0	1
	22/09/2004	2	15	1	Todman Av	0	1	0	0
	24/09/2004	2	0	0	Boronia St	0	2	0	0
	27/09/2004	2	40	2	High St	0	1	0	0
	05/10/2004	3	0	0	Rainbow St	0	0	0	0
	07/10/2004	3	0	0	Rainbow St	0	0	0	0
	08/10/2004	2	50	1	Ascot St	0	1	0	0
	17/10/2004	3	10	2	Todman Av	0	0	0	0
	18/10/2004	2	0	0	Gardeners Rd	0	1	0	1
	18/10/2004	2	5	2	Barker St	0	1	0	0
	19/10/2004	2	100	2	High St	0	1	0	0
	20/10/2004	2	65	1	Carlton St	0	1	0	1
	23/10/2004	1	80	1	Day Av	1	0	1	0
	25/10/2004	3	0	0	High St	0	0	0	0
	27/10/2004	3	0	0	High St	0	0	0	0
	02/11/2004	2	5	1	High St	0	1	0	0

Study Area Crash Statistics 1/7/2004 - 30/6/2007

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Accident Street	Accident Date	Accident Degree*	Accident Distance (metres)	Accident Direction#	Accident Identifying Object	Number Persons Killed	Number Persons Injured	Number Peds. Killed	Number Peds. Injured
Anzac Pd	02/11/2004	3	0	0	Ascot St	0	0	0	0
	06/11/2004	2	200	2	Boronia St	0	1	0	0
	11/11/2004	3	15	1	Bowral St	0	0	0	0
	15/11/2004	2	0	0	Rainbow St	0	1	0	0
	15/11/2004	3	50	1	Day Av	0	0	0	0
	20/11/2004	3	0	0	Rainbow St	0	0	0	0
	24/11/2004	2	30	2	Middle St	0	1	0	0
	27/11/2004	3	100	2	Dacey Av	0	0	0	0
	27/11/2004	3	230	2	High St	0	0	0	0
	28/11/2004	2	20	1	Bowral St	0	1	0	0
	30/11/2004	3	0	0	Rainbow St	0	0	0	0
	06/12/2004	2	0	0	Rainbow St	0	1	0	0
	08/12/2004	2	0	0	Todman Av	0	1	0	0
	10/12/2004	3	30	1	Borrodale Rd	0	0	0	0
	20/12/2004	3	0	0	High St	0	0	0	0
	20/12/2004	3	0	0	Rainbow St	0	0	0	0
	24/12/2004	2	0	0	Todman Av	0	2	0	0
	05/01/2005	3	15	4	Doncaster Av	0	0	0	0
	07/01/2005	3	100	1	Rainbow St	0	0	0	0
	19/01/2005	2	0	0	Todman Av	0	2	0	1
	25/01/2005	2	0	0	Boronia St	0	1	0	0
	25/01/2005	3	0	0	Todman Av	0	0	0	0
	27/01/2005	3	0	0	High St	0	0	0	0
	02/02/2005	3	0	0	Rainbow St	0	0	0	0
	15/02/2005	2	0	0	Todman Av	0	1	0	0
	18/02/2005	3	0	0	Ascot St	0	0	0	0
	27/02/2005	3	70	1	High St	0	0	0	0
	03/02/2005	3	0	0	Day Av	0	0	0	0
	02/03/2005	2	0	0	Boronia St	0	3	0	0
	11/03/2005	3	0	0	Rainbow St	0	0	0	0
	18/03/2005	2	0	0	Abbotford St	0	1	0	0
	22/03/2005	2	0	0	Ascot St	0	1	0	0
	23/03/2005	2	33	1	Day Av	0	1	0	1
	30/03/2005	2	110	2	Meeks St	0	1	0	0
	29/04/2005	3	0	0	Rainbow St	0	0	0	0
	03/05/2005	3	50	2	Day Av	0	0	0	0
	03/05/2005	3	40	2	Ascot St	0	0	0	0
	08/05/2005	3	0	0	Boronia St	0	0	0	0
	19/05/2005	2	0	0	High St	0	2	0	0
	19/05/2005	2	300	1	Todman Av	0	1	0	1
	22/05/2005	2	20	2	Carlton St	0	1	0	0
	27/05/2005	2	20	1	Barker St	0	1	0	0
	31/05/2005	2	0	0	Boronia St	0	1	0	0
	03/06/2005	2	0	0	Boronia St	0	1	0	0
	22/06/2005	2	5	2	Rainbow St	0	1	0	0
	22/06/2005	3	0	0	Rainbow St	0	0	0	0
	24/06/2005	3	20	2	Todman Av	0	0	0	0
	09/07/2005	3	0	0	High St	0	0	0	0
	12/07/2005	3	0	0	Rainbow St	0	0	0	0
	12/07/2005	2	0	0	Barker St	0	1	0	1
	17/07/2005	2	100	2	Middle St	0	2	0	0
	26/07/2005	3	10	1	High St	0	0	0	0
	08/08/2005	3	0	0	Todman Av	0	0	0	0
	08/08/2005	3	10	1	Todman Av	0	0	0	0
	10/08/2005	3	50	2	Carlton St	0	0	0	0
	13/08/2005	3	0	0	High St	0	0	0	0
	16/08/2005	2	0	0	Rainbow St	0	1	0	0
	23/08/2005	2	30	2	Barker St	0	1	0	1
	24/08/2005	2	0	0	Strachan St	0	1	0	1
	30/08/2005	2	0	0	Todman Av	0	1	0	0

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Accident Street	Accident Date	Accident Degree*	Accident Distance (metres)	Accident Direction#	Accident Identifying Object	Number Persons Killed	Number Persons Injured	Number Peds. Killed	Number Peds. Injured
Anzac Pd	02/09/2005	2	20	1	Meeks St	0	1	0	0
	06/09/2005	3	20	1	Bowral St	0	0	0	0
	07/09/2005	2	0	0	Day Av	0	1	0	0
	11/09/2005	3	0	0	Meeks St	0	0	0	0
	11/09/2005	2	0	0	Carlton St	0	1	0	0
	20/09/2005	3	0	0	Meeks St	0	0	0	0
	21/09/2005	3	0	0	Gardeners Rd	0	0	0	0
	30/09/2005	2	10	1	Wallace St	0	1	0	0
	01/10/2005	3	0	0	Middle St	0	0	0	0
	07/10/2005	2	10	2	Boronia St	0	2	0	0
	13/10/2005	3	0	0	Todman Av	0	0	0	0
	15/10/2005	3	5	2	Rainbow St	0	0	0	0
	06/11/2005	3	0	0	Todman Av	0	0	0	0
	07/11/2005	3	10	2	Meeks St	0	0	0	0
	12/11/2005	2	50	2	Barker St	0	1	0	0
	12/11/2005	3	10	1	Borrodale Rd	0	0	0	0
	24/11/2005	3	0	0	Barker St	0	0	0	0
	05/12/2005	3	0	0	Day Av	0	0	0	0
	15/12/2005	3	0	0	High St	0	0	0	0
	25/12/2005	3	0	0	Rainbow St	0	0	0	0
	14/01/2006	3	0	0	Rainbow St	0	0	0	0
	17/01/2006	3	130	1	High St	0	0	0	0
	20/01/2006	3	0	0	Todman Av	0	0	0	0
	27/01/2006	3	30	2	Goodwood St	0	0	0	0
	30/01/2006	1	0	0	Doncaster Av	1	0	0	0
	20/02/2006	2	10	2	Dacey Av	0	1	0	0
	02/02/2006	3	0	0	High St	0	0	0	0
	03/02/2006	3	0	0	Abbotford St	0	0	0	0
	07/02/2006	2	10	3	Doncaster Av	0	1	0	0
	23/02/2006	2	20	2	Addison St	0	1	0	1
	03/03/2006	2	10	1	Goodwood St	0	1	0	0
	07/03/2006	3	0	0	Barker St	0	0	0	0
	09/03/2006	2	0	0	Rainbow St	0	1	0	0
	09/03/2006	2	5	2	Middle St	0	1	0	0
	21/03/2006	3	0	0	Rainbow St	0	0	0	0
	23/03/2006	2	10	1	Meeks St	0	2	0	0
	24/03/2006	3	20	2	Dacey Av	0	0	0	0
	27/03/2006	3	0	0	Todman Av	0	0	0	0
	04/01/2006	3	0	0	Rainbow St	0	0	0	0
	13/04/2006	3	0	0	Meeks St	0	0	0	0
	17/04/2006	3	0	0	Barker St	0	0	0	0
	23/04/2006	3	0	0	Rainbow St	0	0	0	0
	24/04/2006	2	40	2	Meeks St	0	1	0	0
	26/04/2006	3	50	4	Doncaster Av	0	0	0	0
	27/04/2006	2	10	2	Darling St	0	1	0	0
	29/04/2006	3	0	0	Rainbow St	0	0	0	0
	02/05/2006	2	80	2	Todman Av	0	1	0	0
	03/05/2006	2	0	0	Boronia St	0	2	0	0
	15/05/2006	3	0	0	Barker St	0	0	0	0
	18/05/2006	3	0	0	Barker St	0	0	0	0
	23/05/2006	2	1	1	Barker St	0	1	0	1
	23/05/2006	2	1	1	Strachan St	0	1	0	1
	30/05/2006	2	0	0	Rainbow St	0	2	0	0
	02/06/2006	3	0	0	High St	0	0	0	0
	06/06/2006	2	70	1	Day Av	0	1	0	1
	13/06/2006	2	0	0	Barker St	0	1	0	0
	17/06/2006	2	0	0	Meeks St	0	1	0	0
	11/07/2006	3	0	0	Barker St	0	0	0	0
	05/08/2006	2	5	1	Todman Av	0	1	0	1
	14/08/2006	3	0	0	Doncaster Av	0	0	0	0

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Accident Street	Accident Date	Accident Degree*	Accident Distance (metres)	Accident Direction#	Accident Identifying Object	Number Persons Killed	Number Persons Injured	Number Peds. Killed	Number Peds. Injured
Anzac Pd	24/08/2006	2	20	1	Bowral St	0	2	0	0
	29/08/2006	2	0	0	Gardeners Rd	0	1	0	0
	30/08/2006	2	150	1	High St	0	3	0	0
	01/09/2006	2	0	0	Carlton St	0	1	0	0
	08/09/2006	2	5	2	Addison St	0	1	0	0
	12/09/2006	3	14	2	Goodwood St	0	0	0	0
	15/09/2006	3	10	1	Barker St	0	0	0	0
	21/09/2006	3	0	0	Meeks St	0	0	0	0
	22/09/2006	3	0	0	Barker St	0	0	0	0
	30/09/2006	3	20	3	Doncaster Av	0	0	0	0
	09/10/2006	2	100	2	Addison St	0	1	0	0
	17/10/2006	3	0	0	Todman Av	0	0	0	0
	31/10/2006	3	100	2	Borrodale Rd	0	0	0	0
	31/10/2006	2	0	0	Barker St	0	2	0	0
	01/11/2006	3	0	0	Todman Av	0	0	0	0
	03/11/2006	3	0	0	Rainbow St	0	0	0	0
	05/11/2006	3	0	0	Todman Av	0	0	0	0
	06/11/2006	3	0	0	Todman Av	0	0	0	0
	07/11/2006	3	0	0	Todman Av	0	0	0	0
	14/11/2006	2	200	2	Alison Rd	0	1	0	1
	21/11/2006	3	0	0	Rainbow St	0	0	0	0
	30/11/2006	2	50	1	Doncaster Av	0	1	0	0
	06/12/2006	3	300	1	Goodwood St	0	0	0	0
	13/12/2006	3	0	0	Rainbow St	0	0	0	0
	17/12/2006	2	0	0	Rainbow St	0	1	0	0
	12/01/2007	3	0	0	Todman Av	0	0	0	0
	17/01/2007	3	5	1	Rainbow St	0	0	0	0
	18/01/2007	3	10	2	High St	0	0	0	0
	23/01/2007	3	0	0	Rainbow St	0	0	0	0
	09/02/2007	3	30	2	Carlton St	0	0	0	0
	17/02/2007	2	0	0	Rainbow St	0	1	0	0
	21/02/2007	2	50	1	Rainbow St	0	1	0	1
	10/03/2007	2	0	0	Rainbow St	0	1	0	0
	12/03/2007	3	0	0	Day Av	0	0	0	0
	16/03/2007	3	20	2	High St	0	0	0	0
	21/03/2007	2	0	0	Doncaster Av	0	1	0	0
	22/03/2007	3	0	0	Todman Av	0	0	0	0
	22/03/2007	3	0	0	Middle St	0	0	0	0
	28/03/2007	3	10	1	Bowral St	0	0	0	0
	28/03/2007	3	0	0	Borrodale Rd	0	0	0	0
	29/03/2007	2	40	2	Dacey Av	0	1	0	0
	05/04/2007	2	0	0	Tay St	0	1	0	0
	06/04/2007	3	0	0	Gardeners Rd	0	0	0	0
	07/04/2007	2	40	2	Borrodale Rd	0	1	0	0
	19/04/2007	2	15	2	Todman Av	0	1	0	0
	19/04/2007	3	70	1	Barker St	0	0	0	0
	23/04/2007	3	0	0	Rainbow St	0	0	0	0
	30/04/2007	2	0	0	Meeks St	0	1	0	0
	04/05/2007	3	0	0	Rainbow St	0	0	0	0
	12/05/2007	3	0	0	Middle St	0	0	0	0
	19/05/2007	2	50	3	Doncaster Av	0	1	0	0
	26/05/2007	3	80	1	High St	0	0	0	0
	30/05/2007	2	0	0	Middle St	0	1	0	0
	03/06/2007	3	0	0	Rainbow St	0	0	0	0
	17/06/2007	3	30	2	Middle St	0	0	0	0
	18/06/2007	3	0	0	Barker St	0	0	0	0
	18/06/2007	3	10	2	Darling St	0	0	0	0
	18/06/2007	2	10	2	Darling St	0	1	0	0
	25/06/2007	2	0	0	Todman Av	0	1	0	0
	26/06/2007	3	10	2	Barker St	0	0	0	0

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Accident Street	Accident Date	Accident Degree*	Accident Distance (metres)	Accident Direction#	Accident Identifying Object	Number Persons Killed	Number Persons Injured	Number Peds. Killed	Number Peds. Injured
Ascot St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Baker St	18/08/2004	3	55	3	Virginia St	0	0	0	0
Balfour La	No crashes recorded for period 1/7/2004 - 30/6/2007								
Balfour Rd	16/10/2004	2	100	2	Todman Av	0	1	0	0
Barker La	No crashes recorded for period 1/7/2004 - 30/6/2007								
Barker St	14/07/2004	2	0	0	Houston Rd	0	1	0	0
	09/09/2005	3	30	4	Anzac Pd	0	0	0	0
Black Lion Pl	No crashes recorded for period 1/7/2004 - 30/6/2007								
Boronia St	16/11/2004	3	0	0	Salisbury Rd	0	0	0	0
	10/08/2006	3	50	2	Salisbury Rd	0	0	0	0
Borrodale Rd	20/07/2004	3	0	0	Houston Rd	0	0	0	0
	02/03/2005	2	20	4	Houston Rd	0	1	0	0
	20/06/2005	2	0	0	Leonard Av	0	1	0	0
	01/02/2007	3	0	0	Houston Rd	0	0	0	0
	29/05/2007	3	50	4	Anzac Pd	0	0	0	0
Bowral St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Brompton Rd	19/09/2004	2	300	3	Black Lion Pl	0	2	0	0
Bruce La	No crashes recorded for period 1/7/2004 - 30/6/2007								
Bruce St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Carlton La	No crashes recorded for period 1/7/2004 - 30/6/2007								
Carlton St	25/08/2004	3	0	0	Doncaster Av	0	0	0	0
	21/01/2006	3	0	0	Doncaster Av	0	0	0	0
Carminya St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Cottenham Av	28/07/2004	3	20	1	Day Av	0	0	0	0
	15/05/2005	2	0	0	Day Av	0	3	0	0
	11/09/2005	2	20	1	Day Av	0	1	0	0
	14/10/2005	3	0	0	Day Av	0	0	0	0
	09/06/2006	2	0	0	Edward Av	0	1	0	0
Court Av	No crashes recorded for period 1/7/2004 - 30/6/2007								
Darling St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Day Av	07/09/2004	2	50	4	Houston Rd	0	2	0	0
	09/12/2004	3	0	0	Houston Rd	0	0	0	0
	06/05/2005	2	0	0	Doncaster Av	0	1	0	0
	14/05/2005	3	0	0	Houston Rd	0	0	0	0
	27/05/2005	3	10	4	Anzac Pd	0	0	0	0
	05/12/2005	3	30	3	Tunstall Av	0	0	0	0
	28/02/2006	3	0	0	Mooramie Av	0	0	0	0
Day La	No crashes recorded for period 1/7/2004 - 30/6/2007								
Doncaster Av	06/08/2004	3	25	1	Barker St	0	0	0	0
	03/09/2004	2	0	0	Goodwood St	0	1	0	0
	08/05/2005	3	10	2	Ascot St	0	0	0	0
	18/05/2005	3	0	0	Todman Av	0	0	0	0
	05/11/2005	3	20	1	Carlton St	0	0	0	0
	25/12/2005	3	20	2	Borrodale Rd	0	0	0	0
	14/01/2006	3	0	0	Todman Av	0	0	0	0
	17/05/2006	2	0	0	Goodwood St	0	1	0	0
	06/09/2006	2	2	2	Bowral St	0	1	0	0
	01/05/2007	2	30	2	Alison Rd	0	1	0	0
	26/06/2007	3	0	0	Todman Av	0	0	0	0
Doran St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Duke St	24/06/2005	3	0	0	Kensington Rd	0	0	0	0
	16/11/2005	2	0	0	Kensington Rd	0	1	0	0
	10/05/2006	2	0	0	Kensington Rd	0	1	0	0
	01/11/2006	3	0	0	Kensington Rd	0	0	0	0
	23/04/2007	3	0	0	Kensington Rd	0	0	0	0
Eastern Av	03/06/2005	2	125	2	Day Av	0	1	0	1
	13/06/2006	3	200	2	Day Av	0	0	0	0
	26/11/2006	3	10	1	Goodrich Av	0	0	0	0
Eastern Dist.	13/09/2005	3	255	2	Todman Av	0	0	0	0
Edward Av	No crashes recorded for period 1/7/2004 - 30/6/2007								

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Accident Street	Accident Date	Accident Degree*	Accident Distance (metres)	Accident Direction#	Accident Identifying Object	Number Persons Killed	Number Persons Injured	Number Peds. Killed	Number Peds. Injured
Elsmere St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Gardeners La	No crashes recorded for period 1/7/2004 - 30/6/2007								
Gardeners Rd	09/07/2004	3	100	4	Tunstall Av	0	0	0	0
	14/10/2004	2	0	0	Tunstall Av	0	1	0	0
	05/11/2004	3	0	0	Gen. Bridges Cr	0	0	0	0
	09/12/2004	2	0	0	Houston Rd	0	1	0	1
	22/02/2005	3	20	4	Bruce St	0	0	0	0
	11/03/2005	3	40	4	Eastern Av	0	0	0	0
	25/04/2005	3	0	0	Aboud Av	0	0	0	0
	20/05/2005	2	5	4	Houston Rd	0	1	0	0
	29/05/2005	3	0	0	Houston Rd	0	0	0	0
	23/06/2005	2	16	4	Bunnerong Rd	0	1	0	1
	15/09/2005	2	0	0	Houston Rd	0	1	0	1
	09/03/2006	2	5	4	Anzac Pd	0	1	0	0
	01/04/2006	3	0	0	Houston Rd	0	0	0	0
	14/08/2006	3	20	4	Endeavour Rd	0	0	0	0
	23/10/2006	3	0	0	Eastern Av	0	0	0	0
	29/12/2006	3	0	0	Gen. Bridges Cr	0	0	0	0
	18/04/2007	2	10	4	Houston Rd	0	1	0	1
	04/05/2007	2	5	3	Houston Rd	0	1	0	1
	23/06/2007	3	0	0	Houston Rd	0	0	0	0
Gloucester Pl	No crashes recorded for period 1/7/2004 - 30/6/2007								
Goodrich Av	No crashes recorded for period 1/7/2004 - 30/6/2007								
Goodwood St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Grosvenor St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Houston La	16/02/2006	3	5	2	Strachan St	0	0	0	0
Houston Rd	06/08/2005	3	10	2	Barker St	0	0	0	0
	14/08/2005	2	20	1	Gardeners La	0	2	0	2
	17/05/2006	3	50	2	Day Av	0	0	0	0
	11/06/2006	3	50	2	Strachan St	0	0	0	0
	01/07/2006	3	60	1	Barker St	0	0	0	0
Inglethorpe Av	No crashes recorded for period 1/7/2004 - 30/6/2007								
Ingram St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Kensington Rd	30/01/2005	3	50	2	Todman Av	0	0	0	0
	29/06/2005	3	15	1	Roma Av	0	0	0	0
	04/08/2005	2	100	1	Todman Av	0	1	0	0
	03/09/2005	2	123	2	Todman Av	0	1	0	0
	09/06/2006	3	30	2	Todman Av	0	0	0	0
	18/07/2006	3	200	2	Todman Av	0	0	0	0
Koorinda Av	No crashes recorded for period 1/7/2004 - 30/6/2007								
Lenthall St	05/05/2005	2	10	2	Virginia St	0	1	0	0
	03/08/2006	3	395	4	Todman Av	0	0	0	0
	11/02/2007	3	30	4	Milroy Av	0	0	0	0
Leonard Av	No crashes recorded for period 1/7/2004 - 30/6/2007								
Lorne Av	30/04/2006	3	0	0	Roma Av	0	0	0	0
Maitland Av	25/01/2006	2	0	0	Tresidder Av	0	1	0	0
McDougall St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Milroy Av	No crashes recorded for period 1/7/2004 - 30/6/2007								
Minya Av	No crashes recorded for period 1/7/2004 - 30/6/2007								
Mooramie Av	27/10/2004	3	10	2	Day Av	0	0	0	0
	03/11/2004	3	0	0	Koorinda Av	0	0	0	0
Myrtle St	27/02/2006	2	0	0	Virginia St	0	3	0	0
Roma Av	No crashes recorded for period 1/7/2004 - 30/6/2007								
Salisbury Rd	No crashes recorded for period 1/7/2004 - 30/6/2007								
Sea La	No crashes recorded for period 1/7/2004 - 30/6/2007								
Sea St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Shaw Av	No crashes recorded for period 1/7/2004 - 30/6/2007								
Sherwood St	No crashes recorded for period 1/7/2004 - 30/6/2007								

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Accident Street	Accident Date	Accident Degree*	Accident Distance (metres)	Accident Direction#	Accident Identifying Object	Number Persons Killed	Number Persons Injured	Number Peds. Killed	Number Peds. Injured
South Dowling St	17/10/2004	3	20	2	Todman Av	0	0	0	0
	31/05/2005	3	0	0	Todman Av	0	0	0	0
	11/08/2005	3	0	0	O'Dea Av	0	0	0	0
	19/09/2005	3	250	2	Lenthall St	0	0	0	0
	18/10/2005	2	35	2	Todman Av	0	1	0	0
	28/11/2005	2	100	2	Todman Av	0	1	0	0
	12/01/2006	3	32	2	Todman Av	0	0	0	0
	04/02/2006	3	20	2	Todman Av	0	0	0	0
	10/02/2006	3	200	2	O'Dea Av	0	0	0	0
	20/06/2006	2	400	2	Todman Av	0	1	0	0
	16/02/2007	3	50	2	Todman Av	0	0	0	0
	24/02/2007	3	100	2	Todman Av	0	0	0	0
	27/04/2007	2	100	2	O'Dea Av	0	1	0	0
	01/05/2007	3	0	0	Baker St	0	0	0	0
Southern Cross Drive	02/09/2004	2	50	1	Lenthall St OP	0	1	0	0
	11/01/2005	2	500	2	Link Rd	0	1	0	0
	30/01/2005	2	200	2	Link Rd	0	2	0	0
	19/05/2005	2	250	2	Todman Av OP	0	1	0	0
	30/11/2005	2	200	2	Link Rd	0	1	0	0
	12/03/2006	3	50	1	Gardeners Rd OP	0	0	0	0
	14/06/2006	2	50	2	Link Rd	0	2	0	0
	19/06/2006	3	0	0	O'Dea Av	0	0	0	0
	17/07/2006	2	401	2	O'Dea Av	0	1	0	0
	24/07/2006	3	1000	2	Todman Av OP	0	0	0	0
	14/09/2006	2	300	2	Link Rd	0	1	0	0
	16/12/2006	3	500	1	Gardeners Rd OP	0	0	0	0
	22/04/2007	2	930	2	Epsom Rd OP	0	3	0	0
	22/04/2007	2	1000	2	Lenthall St OP	0	1	0	0
	05/05/2007	3	500	2	Epsom Rd OP	0	0	0	0
	23/05/2007	2	1000	2	Todman Av OP	0	1	0	0
	14/06/2007	3	400	1	Gardeners Rd OP	0	0	0	0
	26/06/2007	3	200	2	Link Rd	0	0	0	0
Strachan La	No crashes recorded for period 1/7/2004 - 30/6/2007								
Strachan St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Tay La	No crashes recorded for period 1/7/2004 - 30/6/2007								
Tay St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Tedwin Av	No crashes recorded for period 1/7/2004 - 30/6/2007								
The Serpentine	No crashes recorded for period 1/7/2004 - 30/6/2007								
Todman Av	07/08/2004	3	0	0	Kensington Rd	0	0	0	0
	13/08/2004	2	0	0	Baker St	0	1	0	0
	12/10/2004	2	0	0	Kensington Rd	0	1	0	0
	17/01/2005	3	10	2	Carminya St	0	0	0	0
	18/01/2005	3	10	4	Anzac Pd	0	0	0	0
	21/03/2005	3	10	2	Brompton Rd	0	0	0	0
	26/04/2005	2	5	3	Sth Dowling St	0	1	0	0
	25/05/2005	2	74	1	Baker St	0	1	0	0
	26/05/2005	3	105	3	Sth Dowling St	0	0	0	0
	06/06/2005	3	40	4	Anzac Pd	0	0	0	0
	17/06/2005	2	0	0	Gloucester Pl	0	1	0	0
	24/06/2005	3	0	0	Kensington Rd	0	0	0	0
	11/07/2005	3	0	0	Kensington Rd	0	0	0	0
	18/11/2005	3	5	4	Anzac Pd	0	0	0	0
	02/12/2005	3	50	4	Anzac Pd	0	0	0	0
	11/02/2006	3	0	0	Kensington Rd	0	0	0	0
	19/03/2006	3	10	1	Baker St	0	0	0	0
	30/03/2006	2	30	3	Kensington Rd	0	1	0	0
	05/06/2006	2	15	4	Anzac Pd	0	1	0	0
	01/08/2006	2	20	3	Sth Dowling St	0	1	0	0
	22/08/2006	3	80	3	Sth Dowling St	0	0	0	0
	25/08/2006	3	100	2	Carminya St	0	0	0	0

Study Area Crash Statistics 1/7/2004 - 30/6/2007

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Accident Street	Accident Date	Accident Degree*	Accident Distance (metres)	Accident Direction#	Accident Identifying Object	Number Persons Killed	Number Persons Injured	Number Peds. Killed	Number Peds. Injured
Todman Av	08/10/2006	3	0	0	Kensington Rd	0	0	0	0
	27/10/2006	3	0	0	Kensington Rd	0	0	0	0
	23/11/2006	3	0	0	Kensington Rd	0	0	0	0
	25/11/2006	3	0	0	Duke St	0	0	0	0
	14/01/2007	3	0	0	Kensington Rd	0	0	0	0
	28/02/2007	2	5	1	Lenthall St	0	1	0	0
	08/03/2007	3	0	0	Lenthall St	0	0	0	0
	08/04/2007	3	0	0	Lenthall St	0	0	0	0
Tresidder Av	13/07/2004	3	20	3	Tunstall Av	0	0	0	0
	13/01/2006	2	10	3	Shaw Av	0	1	0	0
	22/09/2006	1	10	4	Maitland Av	1	0	1	0
Tunstall Av	30/07/2004	3	40	1	Gardeners Rd	0	0	0	0
	20/12/2004	3	0	0	Tresidder Av	0	0	0	0
	20/02/2005	2	10	2	Goodrich Av	0	1	0	0
Villiers St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Virginia St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Winburn Av	No crashes recorded for period 1/7/2004 - 30/6/2007								
Winkurra St	No crashes recorded for period 1/7/2004 - 30/6/2007								
Wurley Av	No crashes recorded for period 1/7/2004 - 30/6/2007								
York Pl	No crashes recorded for period 1/7/2004 - 30/6/2007								

* Accident Degree: 1 = Fatality; 2 = Injury; 3 = Tow away

Accident Direction: 1 = North; 2 = South; 3 = East ; 4 = West

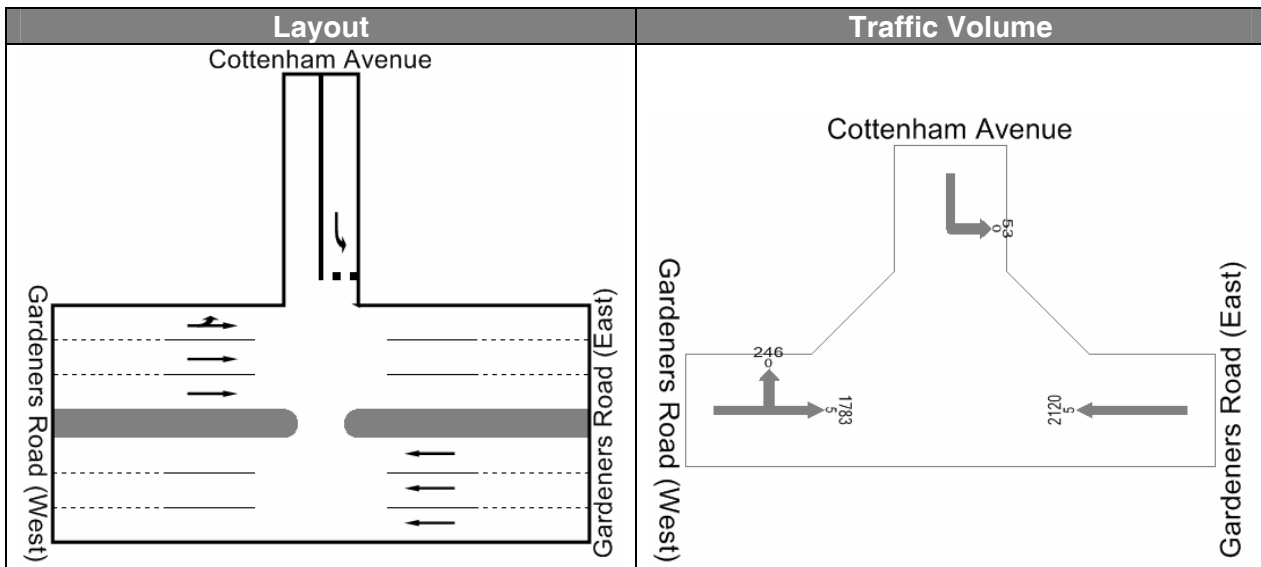
APPENDIX 14 SIDRA RESULTS SCENARIO 1

AM Results

Location: Gardeners Road and Cottenham Avenue

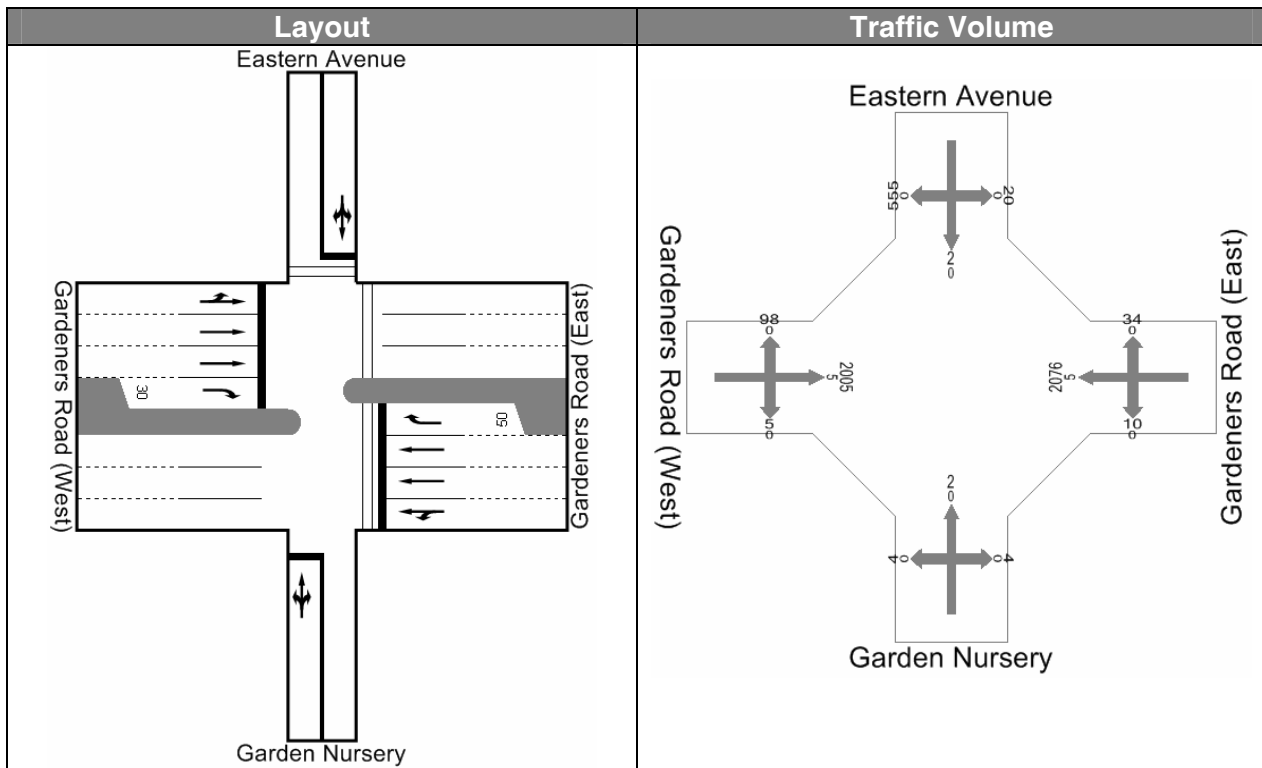
AM Peak: 8:00am to 9:00am

Control Type: Left-in left-out (Give-way)



Movement Summary

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gardeners Road (East)										
5	T	2232	5.0	0.394	0.0	LOS A	0	0.00	0.00	60.0
Approach		2232	5.0	0.394	0.0	LOS A		0.00	0.00	60.0
Cottenham Avenue										
7	L	56	0.0	0.836	130.5	LOS F	28	0.99	1.20	12.6
Approach		56	0.0	0.831	130.5	LOS F	28	0.99	1.20	12.6
Gardeners Road (West)										
10	L	259	0.0	0.378	8.2	LOS A	0	0.00	0.67	49.0
11	T	1877	5.0	0.378	0.0	LOS A	0	0.00	0.00	60.0
Approach		2136	4.4	0.378	1.0	LOS A		0.00	0.08	58.4
All Vehicles		4424	4.7	0.836	2.1	Not Applicable	28	0.01	0.05	56.6

Location: Gardeners Road and Eastern Avenue**AM Peak:** 8:00am to 9:00am**Control Type:** Signalised

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Garden Nursery										
1	L	4	0.0	0.011	18.7	LOS B	3	0.49	0.67	35.5
2	T	2	0.0	0.011	11.6	LOS A	3	0.49	0.33	40.2
3	R	4	0.0	0.011	17.5	LOS B	3	0.49	0.64	36.3
Approach		10	0.0	0.011	16.8	LOS B	3	0.49	0.59	36.7
Gardeners Road (East)										
4	L	11	0.0	0.900	49.4	LOS D	303	0.99	1.04	25.4
5	T	2185	5.0	0.888	41.2	LOS C	303	0.99	1.04	28.1
6	R	36	0.0	0.478	65.6	LOS E	21	0.99	0.75	21.4
Approach		2232	4.9	0.888	41.7	LOS C	303	0.99	1.03	28.0
Eastern Avenue										
7	L	21	0.0	0.906	57.3	LOS E	270	1.00	1.15	21.8
8	T	2	0.0	0.880	50.1	LOS D	270	1.00	1.15	23.6
9	R	584	0.0	0.913	52.8	LOS D	241	0.87	1.10	22.9
Approach		607	0.0	0.913	53.0	LOS D	241	0.88	1.10	22.9
Gardeners Road (West)										
10	L	103	0.0	0.897	51.1	LOS D	310	1.00	1.06	24.9
11	T	2111	5.0	0.896	42.9	LOS D	312	1.00	1.06	27.5
12	R	5	0.0	0.066	62.0	LOS E	3	0.95	0.67	22.2
Approach		2219	4.8	0.896	43.3	LOS D	312	1.00	1.06	27.4
All Vehicles		5068	4.2	0.913	43.7	LOS D	312	0.98	1.05	27.0

Pedestrian Movements						
Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	53	27.7	LOS C	0	0.71	0.71
P5	53	19.2	LOS B	0	0.59	0.59
All Peds	106	23.4	LOS B	0	0.65	0.65

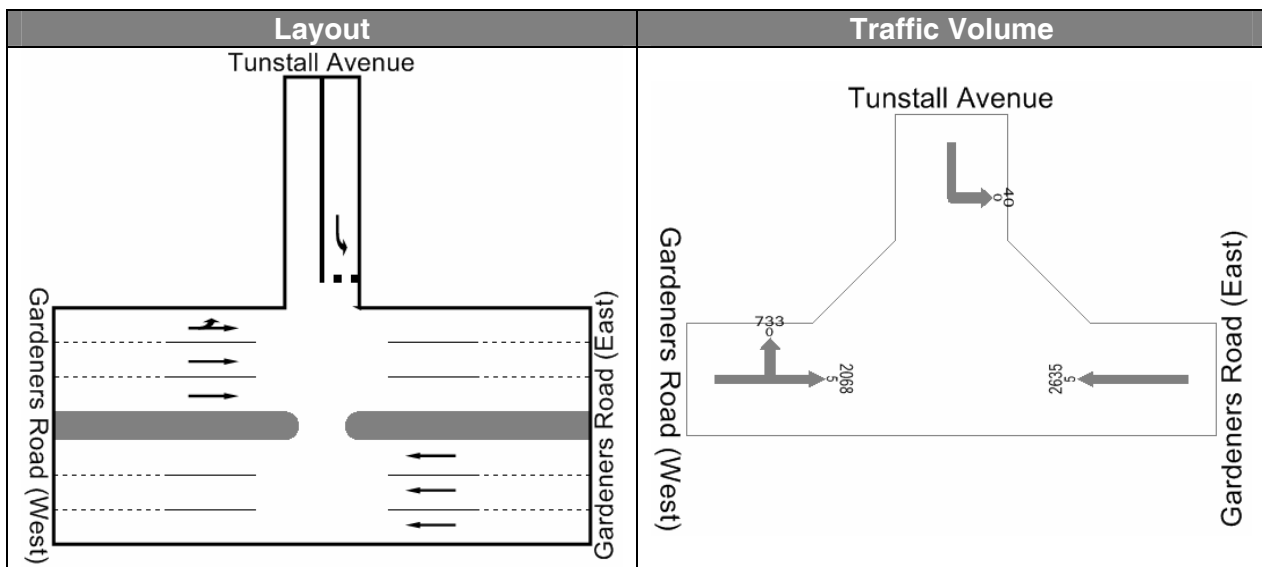
9.1.21 Phase Summary	9.1.22
9.1.23 Phase A	9.1.24 Phase B
Green Time = 48 seconds Phase Time = 54 seconds Phase Split = 49 %	Green Time = 50 seconds Phase Time = 56 seconds Phase Split = 51 %

Normal Movement	Permitted/Opposed
Slip-Lane	Opposed Slip-Lane
Stopped Movement	Continuous
Turn On Red	

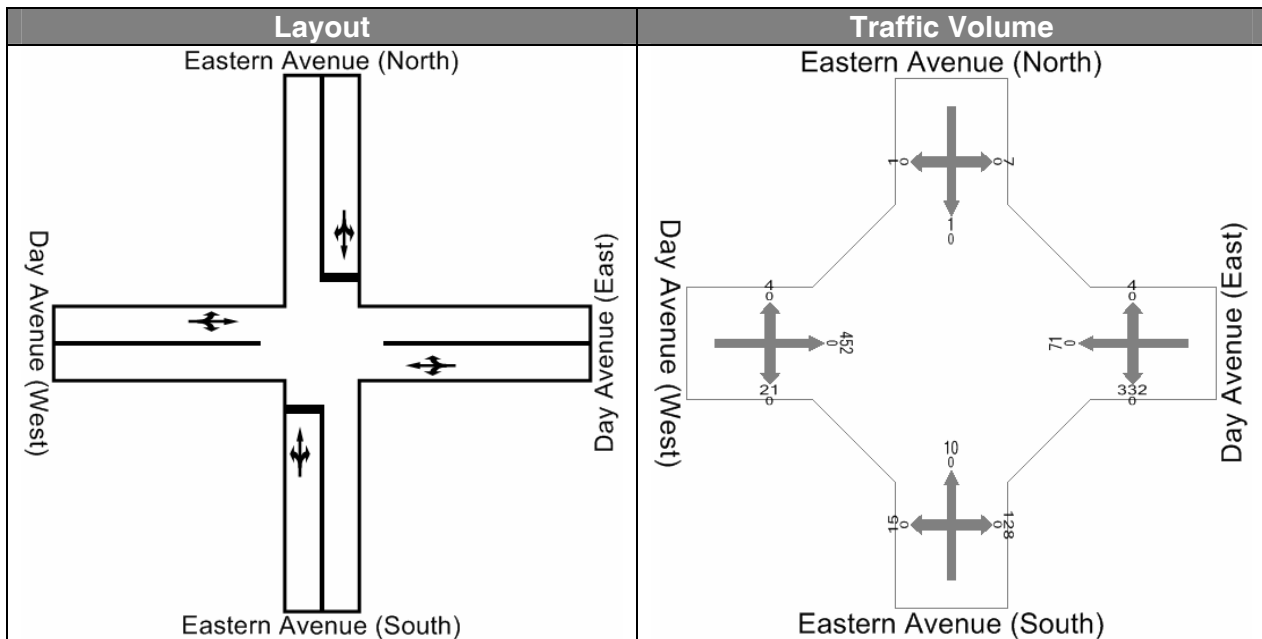
C = 110 seconds

Cycle Time Option: Optimum cycle time (Minimum Delay)

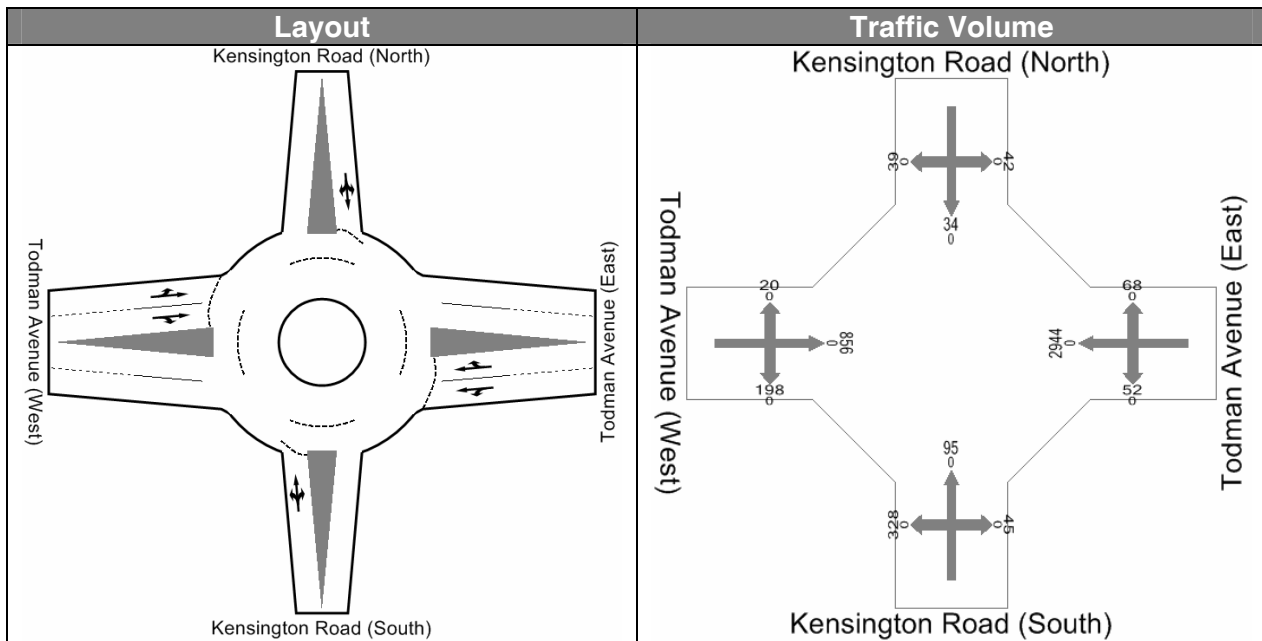
Phase times determined by the program

Location: Gardeners Road and Tunstall Avenue**AM Peak:** 8:00am to 9:00am**Control Type:** Left-in left-out (Give-Way)

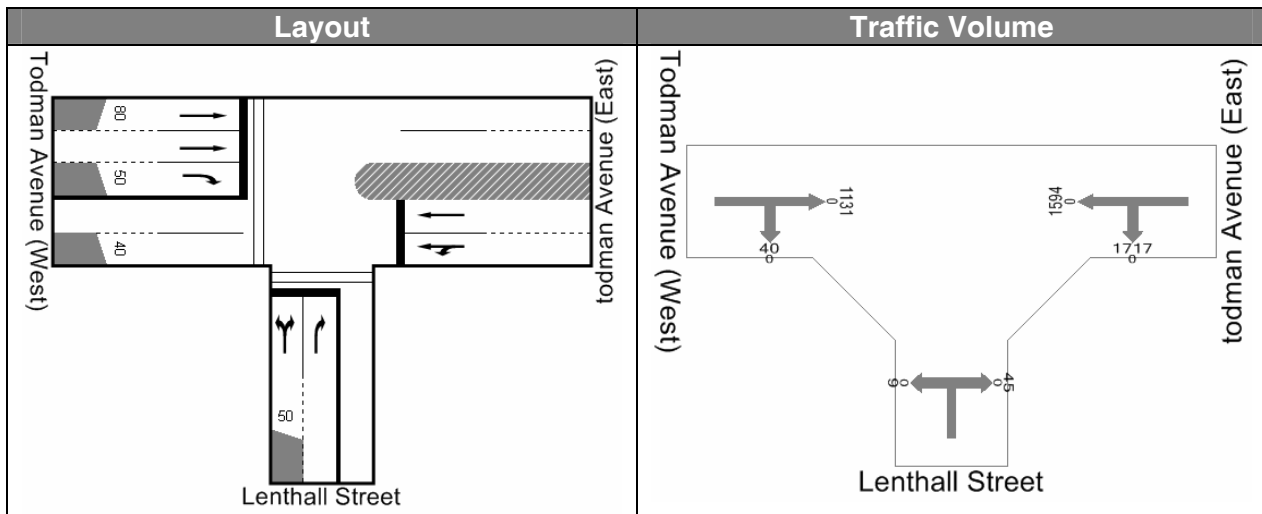
Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gardeners Road (East)										
5	T	2774	5.0	0.490	0.0	LOS A	0	0.00	0.00	60.0
Approach		2774	5.0	0.490	0.0	LOS A		0.00	0.00	60.0
Tunstall Avenue										
7	L	42	0.0	1.000*	419.6	LOS F	45	1.00	1.41	4.8
Approach		42	0.0	1.000	419.6	LOS F	45	1.00	1.41	4.8
Gardeners Road (West)										
10	L	772	0.0	0.523	8.2	LOS A	0	0.00	0.67	49.0
11	T	2177	5.0	0.523	0.0	LOS A	0	0.00	0.00	60.0
Approach		2949	3.7	0.523	2.1	LOS A		0.00	0.17	56.7
All Vehicles		5765	4.3	1.000	4.2	Not Applicable	45	0.01	0.10	53.9

Location: Eastern Avenue and Day Avenue**AM Peak:** 8:00am to 9:00am**Control Type:** Priority (Stop Sign)

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Eastern Avenue (South)										
1	L	16	0.0	0.571	30.4	LOS C	28	0.81	1.11	33.5
2	T	11	0.0	0.579	30.0	LOS C	28	0.81	1.16	33.6
3	R	135	0.0	0.570	30.2	LOS C	28	0.81	1.15	33.4
Approach		162	0.0	0.571	30.2	LOS C	28	0.81	1.15	33.4
Day Avenue (East)										
4	L	349	0.0	0.231	11.4	LOS A	20	1.00	0.00	44.8
5	T	75	0.0	0.231	3.2	LOS A	20	1.00	0.00	48.6
6	R	4	0.0	0.235	11.7	LOS A	20	1.00	0.92	45.0
Approach		428	0.0	0.231	10.0	LOS A	20	1.00	0.01	45.4
Eastern Avenue (North)										
7	L	7	0.0	0.018	15.6	LOS B	1	0.55	0.87	42.9
8	T	1	0.0	0.018	15.2	LOS B	1	0.55	0.98	43.2
9	R	1	0.0	0.018	15.4	LOS B	1	0.55	0.86	42.9
Approach		9	0.0	0.018	15.5	LOS B	1	0.55	0.88	42.9
Day Avenue (West)										
10	L	4	0.0	0.267	11.0	LOS A	23	0.64	0.24	46.0
11	T	476	0.0	0.270	2.9	LOS A	23	0.64	0.00	52.2
12	R	22	0.0	0.272	11.3	LOS A	23	0.64	0.82	45.7
Approach		502	0.0	0.270	3.3	LOS A	23	0.64	0.04	51.8
All Vehicles		1101	0.0	0.579	9.9	Not Applicable	28	0.80	0.20	45.6

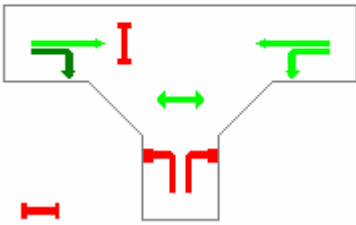
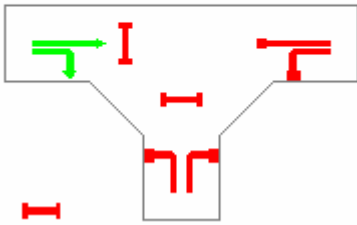
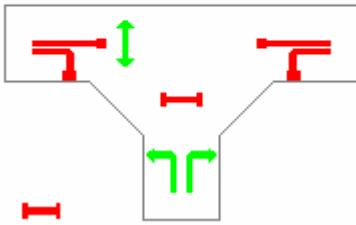
Location: Todman Avenue and Kensington Road**AM Peak:** 8:00am to 9:00am**Control Type:** Roundabout

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Kensington Road (South)										
1	L	345	0.0	2.634	1500.7	LOS F	1438	1.00	5.81	1.4
2	T	100	0.0	2.632	1499.9	LOS F	1438	1.00	5.81	1.4
3	R	47	0.0	2.611	1504.2	LOS F	1438	1.00	5.81	1.5
Approach		492	0.0	2.633	1500.9	LOS F	1438	1.00	5.81	1.4
Todman Avenue (East)										
4	L	55	0.0	1.410	370.8	LOS F	2263	1.00	7.34	5.3
5	T	3099	0.0	1.396	369.9	LOS F	2263	1.00	7.24	5.4
6	R	72	0.0	1.385	374.6	LOS F	2123	1.00	7.14	5.4
Approach		3226	0.0	1.396	370.0	LOS F	2263	1.00	7.24	5.4
Kensington Road (North)										
7	L	44	0.0	0.203	11.4	LOS A	7	0.65	0.87	45.6
8	T	36	0.0	0.202	10.7	LOS A	7	0.65	0.84	46.4
9	R	41	0.0	0.203	15.0	LOS B	7	0.65	0.88	42.8
Approach		121	0.0	0.203	12.4	LOS A	7	0.65	0.86	44.8
Todman Avenue (West)										
10	L	21	0.0	0.438	8.3	LOS A	25	0.33	0.62	47.9
11	T	901	0.0	0.433	7.1	LOS A	25	0.33	0.55	48.9
12	R	208	0.0	0.433	11.5	LOS A	25	0.34	0.67	45.2
Approach		1130	0.0	0.433	8.0	LOS A	25	0.33	0.58	48.1
All Vehicles		4969	0.0	2.634	391.0	LOS F	2263	0.84	5.43	5.1

Location: Todman Avenue and Lenthall Street**AM Peak:** 8:00am to 9:00am**Control Type:** Signalised

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lenthall Street										
1	L	6	0.0	0.142	73.1	LOS F	16	0.93	0.72	19.9
3	R	47	0.0	0.142	73.4	LOS F	20	0.93	0.73	19.8
Approach		53	0.0	0.142	73.4	LOS F	20	0.93	0.72	19.8
todman Avenue (East)										
4	L	1807	0.0	1.339	369.3	LOS F	2415	1.00	2.60	5.4
5	T	1678	0.0	1.184	219.8	LOS F	1792	1.00	2.03	8.5
Approach		3485	0.0	1.339	297.3	LOS F	2415	1.00	2.33	6.5
Todman Avenue (West)										
11	T	1191	0.0	0.502	5.1	LOS A	133	0.36	0.33	52.6
12	R	42	0.0	0.331	81.1	LOS F	30	0.99	0.71	18.5
Approach		1233	0.0	0.502	7.7	LOS A	133	0.39	0.34	49.6
All Vehicles										
		4771	0.0	1.339	220.0	LOS F	2415	0.84	1.80	8.5

Pedestrian Movement						
Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	7.4	LOS A	0	0.31	0.31
P7	53	69.1	LOS F	0	0.96	0.96
All Peds	106	38.2	LOS C	0	0.64	0.64

9.1.25 Phase Summary	9.1.26	9.1.27
9.1.28 Phase A	9.1.29 Phase B	9.1.30 Phase C
		
Green Time = 109 seconds Phase Time = 115 seconds Phase Split = 77 %	Green Time = 6 seconds Phase Time = 12 seconds Phase Split = 8 %	Green Time = 17 seconds Phase Time = 23 seconds Phase Split = 15 %

C = 150 seconds

Cycle Time Option: Optimum cycle time (Minimum Delay)

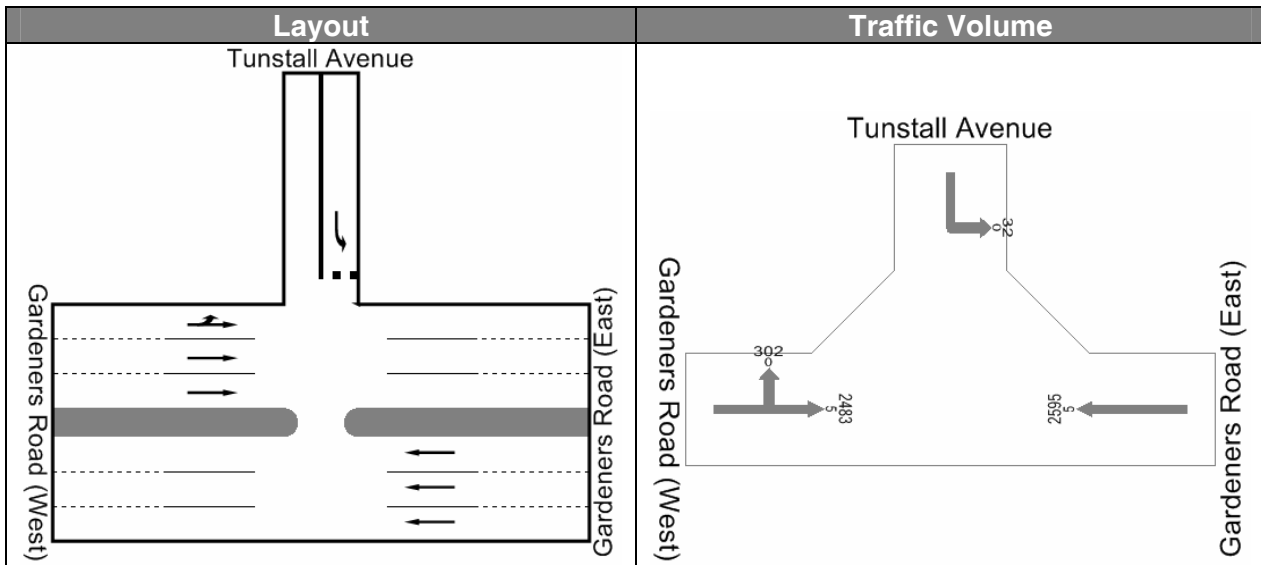
Phase times determined by the program.

PM Results

Location: Gardeners Road and Cottenham Avenue

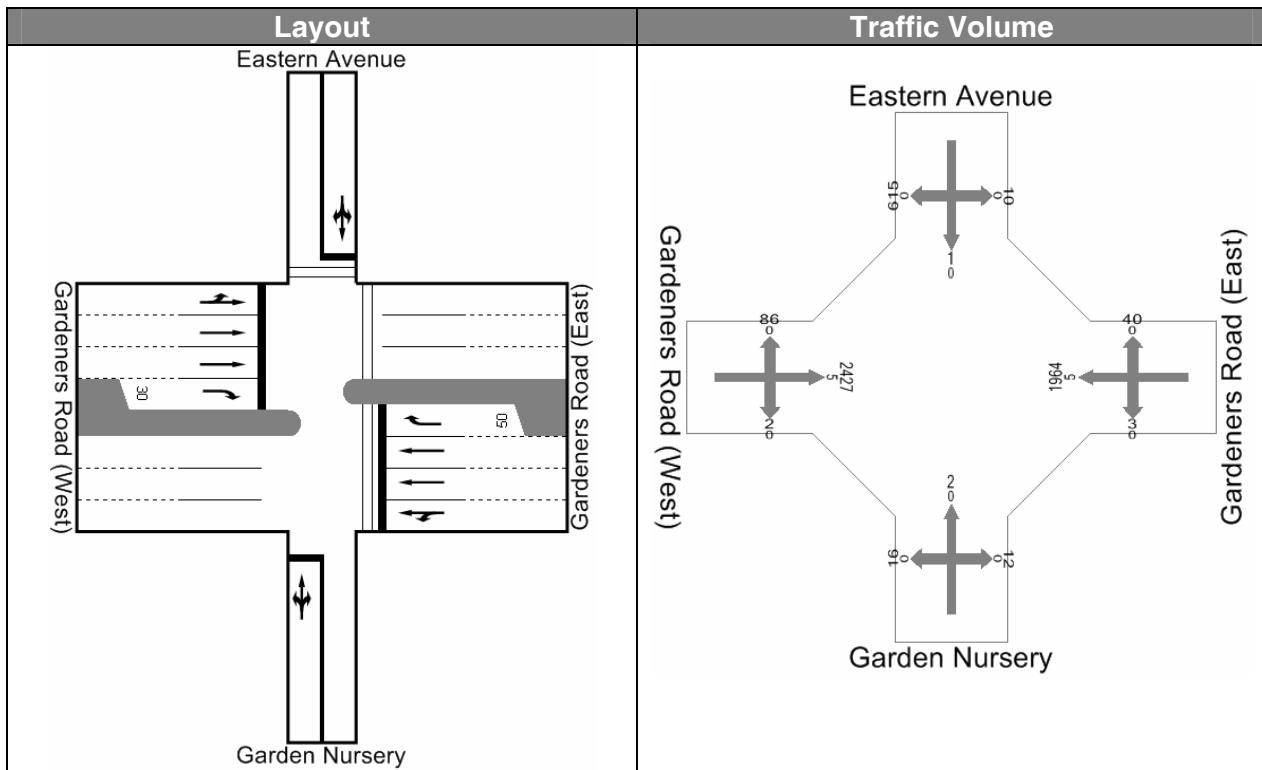
PM Peak: 17:00pm to 18:00pm

Control Type: Left-in left-out (Give-way)



Movement Summary

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gardeners Road (East)										
5	T	2113	5.0	0.373	0.0	LOS A	0	0.00	0.00	60.0
Approach		2113	5.0	0.373	0.0	LOS A		0.00	0.00	60.0
Cottenham Avenue										
7	L	56	0.0	1.000*	398.8	LOS F	54	1.00	1.66	4.9
Approach		56	0.0	1.000	398.8	LOS F	54	1.00	1.66	4.9
Gardeners Road (West)										
10	L	69	0.0	0.454	8.2	LOS A	0	0.00	0.67	49.0
11	T	2508	5.0	0.455	0.0	LOS A	0	0.00	0.00	60.0
Approach		2577	4.9	0.455	0.2	LOS A		0.00	0.02	59.6
All Vehicles		4746	4.9	1.000	4.8	Not Applicable	54	0.01	0.03	52.9

Location: Gardeners Road and Eastern Avenue**PM Peak:** 16:30pm to 17:30pm**Control Type:** Signalised

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Garden Nursery										
1	L	17	0.0	0.035	20.2	LOS B	11	0.46	0.71	34.7
2	T	2	0.0	0.035	13.1	LOS A	11	0.46	0.34	39.1
3	R	13	0.0	0.035	17.5	LOS B	9	0.42	0.66	36.4
Approach		32	0.0	0.035	18.7	LOS B	11	0.44	0.66	35.6
Gardeners Road (East)										
4	L	3	0.0	0.840	46.8	LOS D	312	0.94	0.90	26.2
5	T	2067	5.0	0.818	38.6	LOS C	312	0.94	0.86	29.1
6	R	42	0.0	0.795	96.1	LOS F	33	1.00	0.82	16.5
Approach		2112	4.9	0.818	39.7	LOS C	312	0.94	0.86	28.7
Eastern Avenue										
7	L	11	0.0	0.968	95.8	LOS F	454	1.00	1.28	15.7
8	T	1	0.0	1.056	88.7	LOS F	454	1.00	1.28	16.7
9	R	647	0.0	0.981	88.2	LOS F	397	0.88	1.23	16.7
Approach		659	0.0	0.981	88.4	LOS F	397	0.89	1.23	16.7
Gardeners Road (West)										
10	L	91	0.0	1.045	134.1	LOS F	722	1.00	1.47	12.8
11	T	2555	5.0	1.046	125.9	LOS F	726	1.00	1.47	13.5
12	R	2	0.0	0.032	72.8	LOS F	1	0.89	0.66	20.0
Approach		2648	4.8	1.046	126.2	LOS F	726	1.00	1.47	13.4
All Vehicles		5451	4.2	1.056	87.5	LOS F	726	0.96	1.20	17.5

Pedestrian Movements						
Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	53	31.4	LOS D	0	0.65	0.65
P5	53	24.7	LOS C	0	0.57	0.57
All Peds	106	28.0	LOS B	0	0.61	0.61

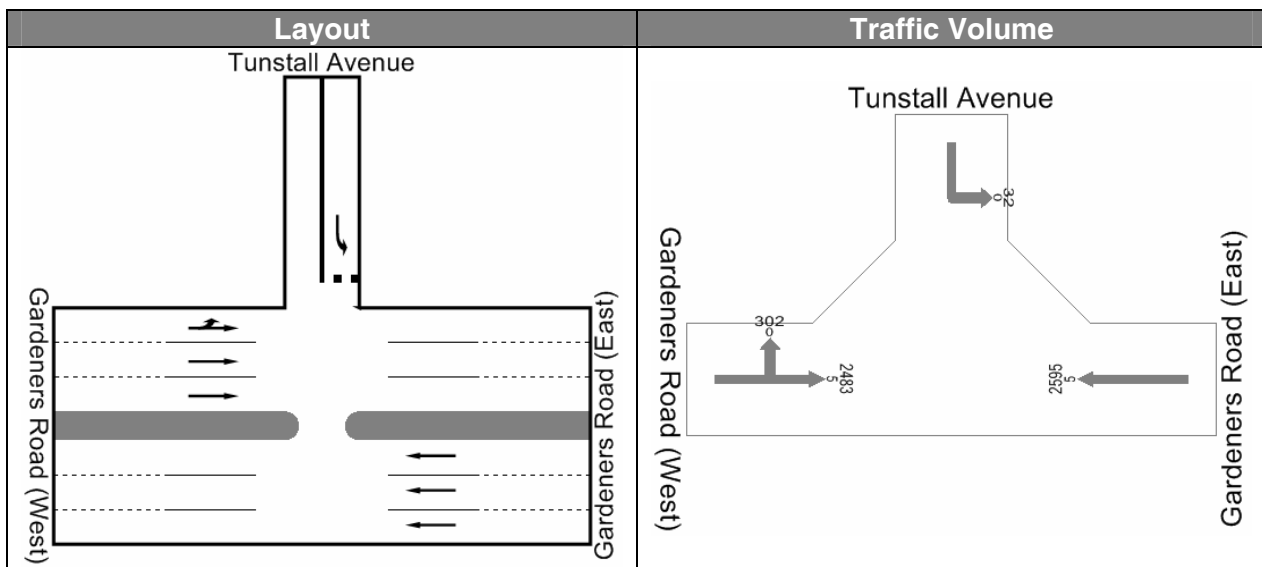
9.1.31 Phase Summary	9.1.32
9.1.33 Phase A	9.1.34 Phase B
Green Time = 67 seconds Phase Time = 73 seconds Phase Split = 49 %	Green Time = 71 seconds Phase Time = 77 seconds Phase Split = 51 %

Normal Movement	Permitted/Opposed
Slip-Lane	Opposed Slip-Lane
Stopped Movement	Continuous
Turn On Red	

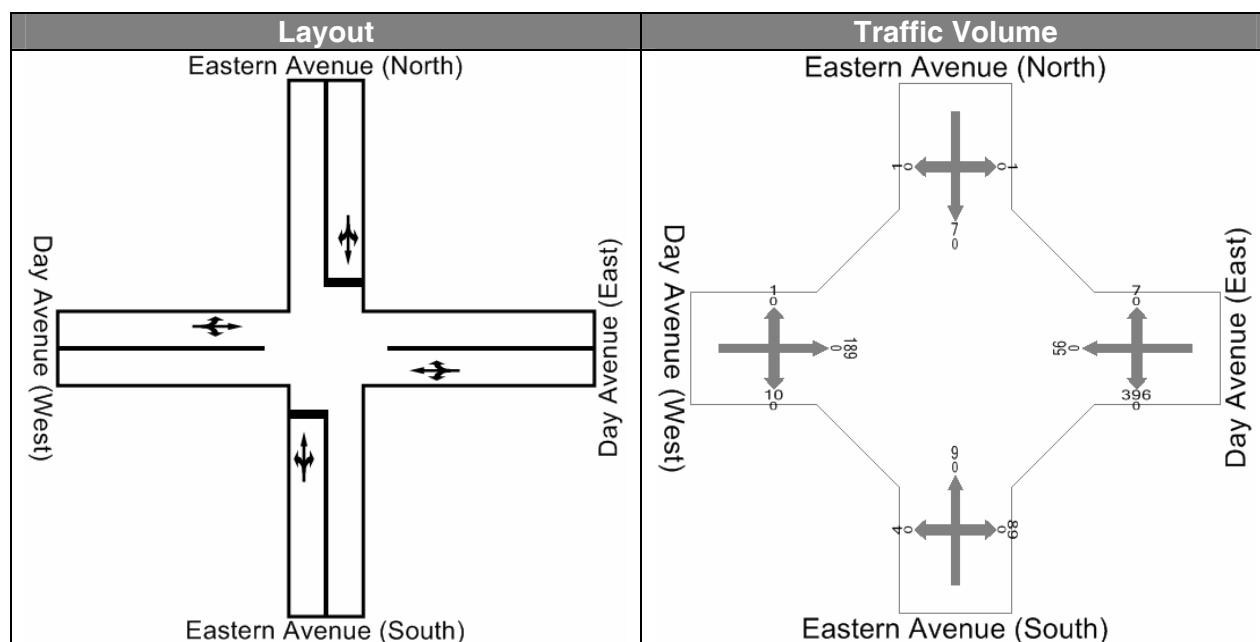
C = 150 seconds

Cycle Time Option: Optimum cycle time (Minimum Delay)

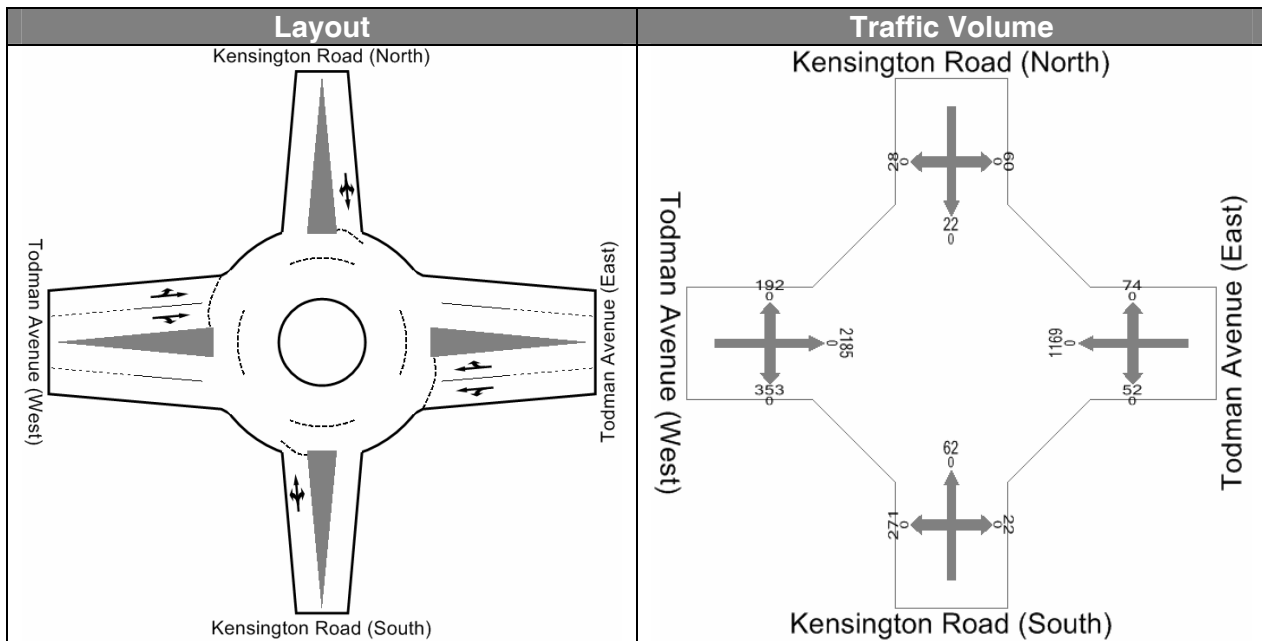
Phase times determined by the program

Location: Gardeners Road and Tunstall Avenue**PM Peak:** 16:30pm to 17:30pm**Control Type:** Left-in left-out (Give-Way)

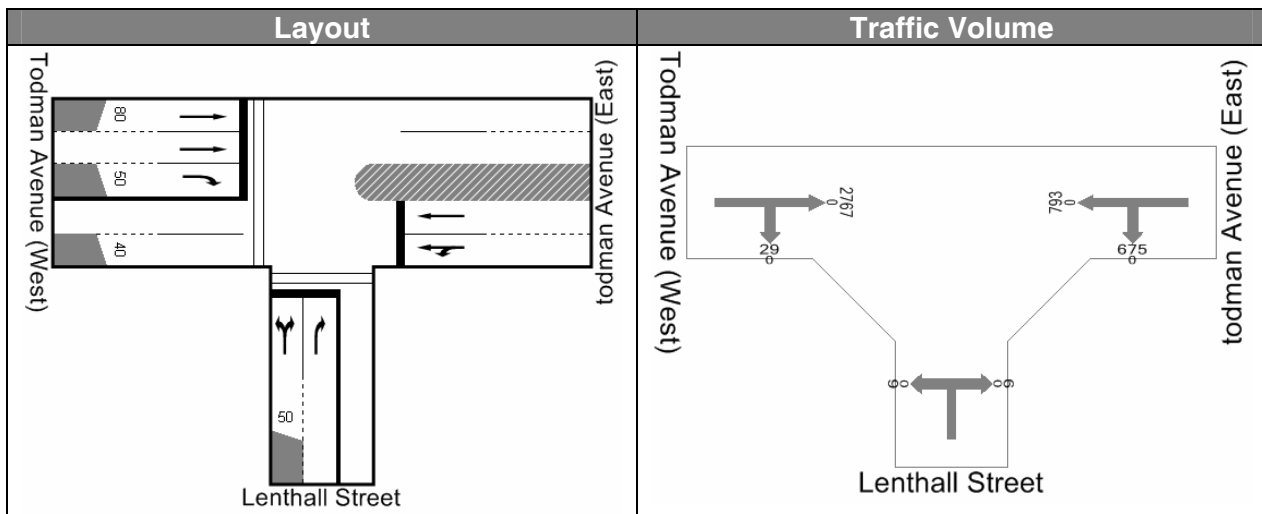
Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gardeners Road (East)										
5	T	2732	5.0	0.482	0.0	LOS A	0	0.00	0.00	60.0
Approach		2732	5.0	0.482	0.0	LOS A		0.00	0.00	60.0
Tunstall Avenue										
7	L	34	0.0	1.000*	607.0	LOS F	44	1.00	1.40	3.4
Approach		34	0.0	1.000	607.0	LOS F	44	1.00	1.40	3.4
Gardeners Road (West)										
10	L	318	0.0	0.519	8.2	LOS A	0	0.00	0.67	49.0
11	T	2614	5.0	0.518	0.0	LOS A	0	0.00	0.00	60.0
Approach		2932	4.5	0.518	0.9	LOS A		0.00	0.07	58.6
All Vehicles		5698	4.7	1.000	4.1	Not Applicable	44	0.01	0.05	54.0

Location: Eastern Avenue and Day Avenue**PM Peak:** 16:30pm to 17:30pm**Control Type:** Priority (Stop Sign)

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Eastern Avenue (South)										
1	L	4	0.0	0.250	17.5	LOS B	9	0.61	0.88	41.4
2	T	9	0.0	0.243	17.1	LOS B	9	0.61	1.01	41.7
3	R	94	0.0	0.246	17.3	LOS B	9	0.61	0.95	41.4
Approach		107	0.0	0.246	17.3	LOS B	9	0.61	0.95	41.4
Day Avenue (East)										
4	L	417	0.0	0.261	9.3	LOS A	18	0.90	0.07	45.2
5	T	59	0.0	0.261	1.1	LOS A	18	0.90	0.00	49.5
6	R	7	0.0	0.259	9.5	LOS A	18	0.90	0.66	45.3
Approach		483	0.0	0.261	8.3	LOS A	18	0.90	0.07	45.7
Eastern Avenue (North)										
7	L	1	0.0	0.023	18.1	LOS B	1	0.58	0.74	40.9
8	T	7	0.0	0.023	17.6	LOS B	1	0.58	0.94	41.2
9	R	1	0.0	0.023	17.9	LOS B	1	0.58	0.76	40.9
Approach		9	0.0	0.023	17.7	LOS B	1	0.58	0.90	41.1
Day Avenue (West)										
10	L	1	0.0	0.111	10.9	LOS A	9	0.57	0.28	46.1
11	T	199	0.0	0.115	2.7	LOS A	9	0.57	0.00	52.9
12	R	11	0.0	0.116	11.1	LOS A	9	0.57	0.79	45.8
Approach		211	0.0	0.116	3.2	LOS A	9	0.57	0.04	52.4
All Vehicles		810	0.0	0.261	8.2	Not Applicable	18	0.77	0.19	46.6

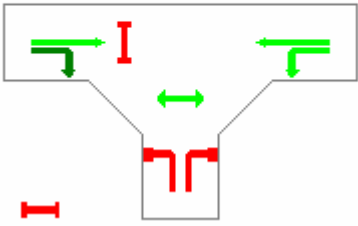
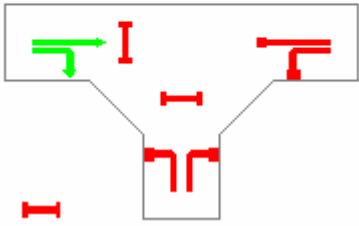
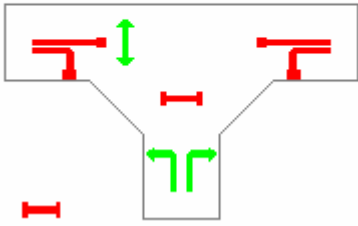
Location: Todman Avenue and Kensington Road**PM Peak:** 16:30pm to 17:30pm**Control Type:** Roundabout

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Kensington Road (South)										
1	L	285	0.0	0.874	26.9	LOS B	65	0.95	1.27	34.4
2	T	65	0.0	0.878	26.1	LOS B	65	0.95	1.26	34.9
3	R	23	0.0	0.885	30.4	LOS C	65	0.95	1.27	33.1
Approach		373	0.0	0.874	27.0	LOS B	65	0.95	1.27	34.4
Todman Avenue (East)										
4	L	55	0.0	0.705	12.4	LOS A	65	0.83	0.90	44.6
5	T	1231	0.0	0.705	11.3	LOS A	65	0.83	0.88	45.8
6	R	78	0.0	0.703	15.7	LOS B	65	0.84	0.92	42.2
Approach		1364	0.0	0.705	11.6	LOS A	65	0.83	0.89	45.5
Kensington Road (North)										
7	L	63	0.0	0.670	38.8	LOS C	33	0.96	1.10	28.9
8	T	23	0.0	0.676	38.0	LOS C	33	0.96	1.10	29.3
9	R	29	0.0	0.674	42.3	LOS C	33	0.96	1.11	28.1
Approach		115	0.0	0.670	39.5	LOS C	33	0.96	1.10	28.8
Todman Avenue (West)										
10	L	202	0.0	1.128	132.0	LOS F	1010	1.00	2.98	12.9
11	T	2300	0.0	1.130	131.2	LOS F	1010	1.00	2.96	13.0
12	R	372	0.0	1.131	136.0	LOS F	952	1.00	2.93	12.9
Approach		2874	0.0	1.130	131.9	LOS F	1010	1.00	2.96	13.0
All Vehicles		4726	0.0	1.131	86.7	LOS F	1010	0.95	2.18	17.8

Location: Todman Avenue and Lenthall Street**PM Peak:** 17:00pm to 18:00pm**Control Type:** Signalised

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lenthall Street										
1	L	6	0.0	0.037	71.8	LOS F	4	0.91	0.66	20.1
3	R	6	0.0	0.029	72.0	LOS F	4	0.91	0.67	20.1
Approach		12	0.0	0.037	71.9	LOS F	4	0.91	0.67	20.1
Todman Avenue (East)										
4	L	711	0.0	0.527	17.7	LOS B	160	0.48	0.79	40.3
5	T	835	0.0	0.589	10.3	LOS A	199	0.52	0.48	46.8
Approach		1546	0.0	0.589	13.7	LOS A	199	0.50	0.62	43.6
Todman Avenue (West)										
11	T	2913	0.0	1.343	264.0	LOS F	2840	1.00	2.15	7.3
12	R	31	0.0	0.148	23.3	LOS B	11	0.51	0.74	36.5
Approach		2944	0.0	1.343	261.5	LOS F	2840	0.99	2.13	7.3
All Vehicles		4502	0.0	1.343	175.9	LOS F	2840	0.83	1.61	10.3

Pedestrian Movements						
Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	7.4	LOS A	0	0.31	0.31
P7	53	69.1	LOS F	0	0.96	0.96
All Peds	106	38.2	LOS C	0	0.64	0.64

9.1.35 Phase Summary	9.1.36	9.1.37
9.1.38 Phase A	9.1.39 Phase B	9.1.40 Phase C
		
Green Time = 109 seconds Phase Time = 115 seconds Phase Split = 77 %	Green Time = 6 seconds Phase Time = 12 seconds Phase Split = 8 %	Green Time = 17 seconds Phase Time = 23 seconds Phase Split = 15 %

C = 150 seconds

Cycle Time Option: Optimum cycle time (Minimum Delay)

Phase times determined by the program

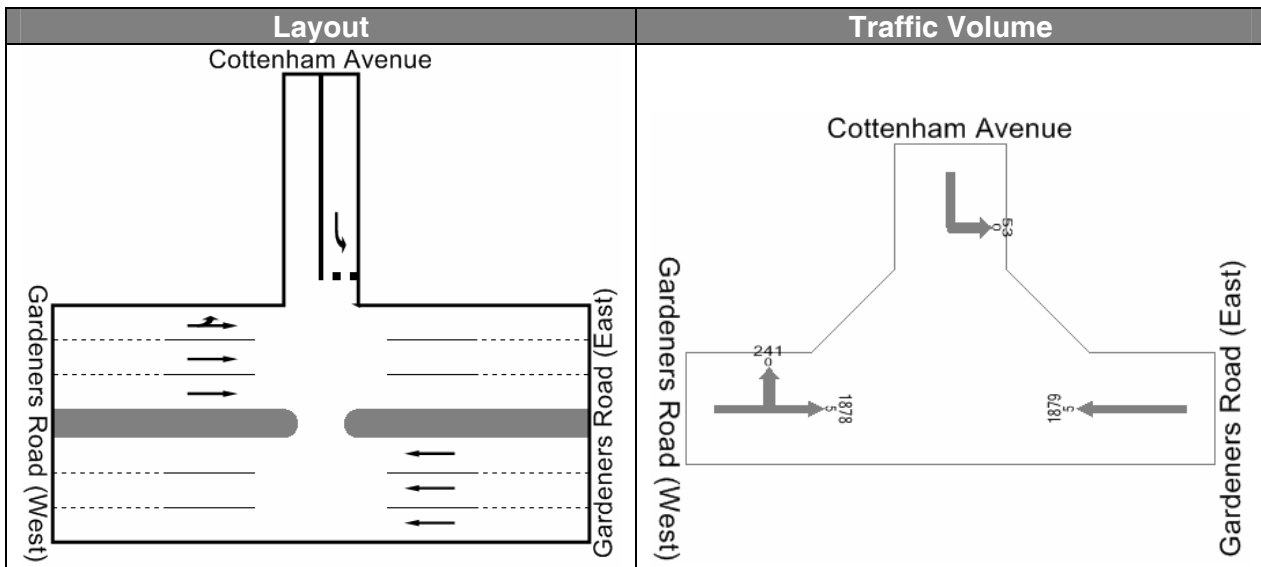
APPENDIX 15 SIDRA RESULTS SCENARIO 2

AM Results

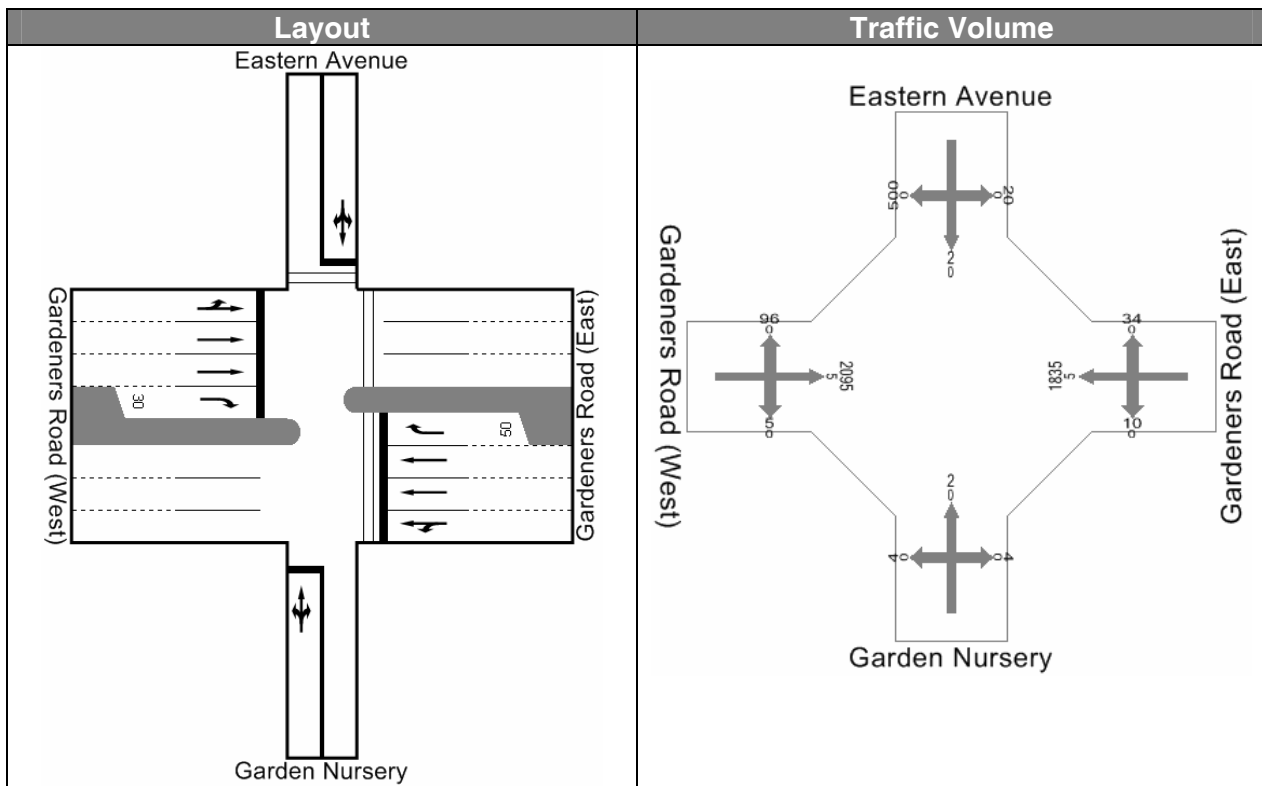
Location: Gardeners Road and Cottenham Avenue

AM Peak: 8:00am to 9:00am

Control Type: Left-in left-out (Give-way)



Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gardeners Road (East)										
5	T	1978	5.0	0.349	0.0	LOS A	0	0.00	0.00	60.0
Approach		1978	5.0	0.349	0.0	LOS A		0.00	0.00	60.0
Cottenham Avenue										
7	L	56	0.0	1.000*	221.7	LOS F	47	1.00	1.41	8.2
Approach		56	0.0	1.000	221.7	LOS F	47	1.00	1.41	8.2
Gardeners Road (West)										
10	L	254	0.0	0.394	8.2	LOS A	0	0.00	0.67	49.0
11	T	1977	5.0	0.395	0.0	LOS A	0	0.00	0.00	60.0
Approach		2231	4.4	0.395	0.9	LOS A		0.00	0.08	58.5
All Vehicles		4265	4.6	1.000	3.4	Not Applicable	47	0.01	0.06	54.8

Location: Gardeners Road and Eastern Avenue**AM Peak:** 8:00am to 9:00am**Control Type:** Signalised

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Garden Nursery										
1	L	4	0.0	0.013	13.6	LOS A	2	0.51	0.67	38.8
2	T	2	0.0	0.013	6.4	LOS A	2	0.51	0.33	44.2
3	R	4	0.0	0.013	12.8	LOS A	1	0.50	0.64	39.4
Approach		10	0.0	0.013	11.9	LOS A	2	0.51	0.59	40.0
Gardeners Road (East)										
4	L	11	0.0	0.776	28.4	LOS B	152	0.91	0.92	33.7
5	T	1932	5.0	0.774	20.2	LOS B	152	0.91	0.86	38.6
6	R	36	0.0	0.315	44.7	LOS D	14	0.98	0.73	26.9
Approach		1979	4.9	0.775	20.7	LOS B	152	0.91	0.86	38.2
Eastern Avenue										
7	L	21	0.0	0.939	53.3	LOS D	188	1.00	1.29	22.7
8	T	2	0.0	0.864	46.1	LOS D	188	1.00	1.29	24.7
9	R	526	0.0	0.934	50.8	LOS D	175	0.93	1.26	23.4
Approach		549	0.0	0.934	50.8	LOS D	175	0.94	1.26	23.4
Gardeners Road (West)										
10	L	101	0.0	0.920	45.5	LOS D	246	1.00	1.18	26.6
11	T	2205	5.0	0.920	37.3	LOS C	248	1.00	1.18	29.6
12	R	5	0.0	0.040	37.0	LOS C	2	0.87	0.67	29.7
Approach		2311	4.8	0.920	37.7	LOS C	248	1.00	1.18	29.5
All Vehicles		4849	4.3	0.939	32.2	LOS C	248	0.96	1.06	31.5

Pedestrian Movements						
Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	53	26.6	LOS C	0	0.87	0.87
P5	53	12.6	LOS B	0	0.60	0.60
All Peds	106	19.6	LOS B	0	0.74	0.74

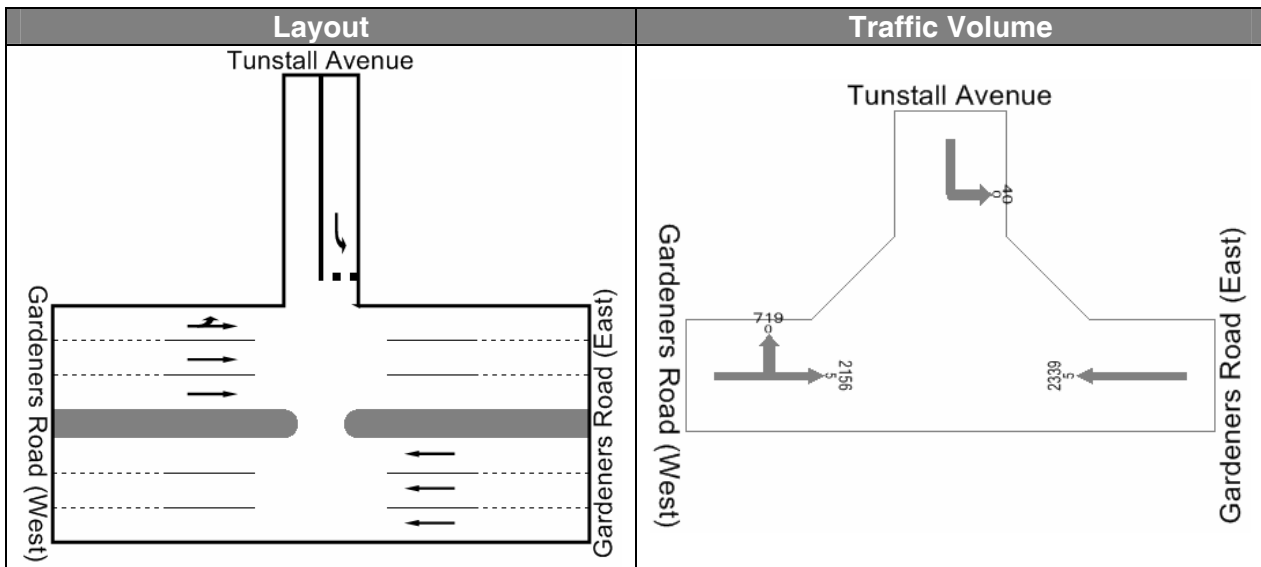
9.1.41 Phase Summary	9.1.42
9.1.43 Phase A	9.1.44 Phase B
Green Time = 31 seconds Phase Time = 37 seconds Phase Split = 53 %	Green Time = 27 seconds Phase Time = 33 seconds Phase Split = 47 %

Normal Movement	Permitted/Opposed
Slip-Lane	Opposed Slip-Lane
Stopped Movement	Continuous
Turn On Red	

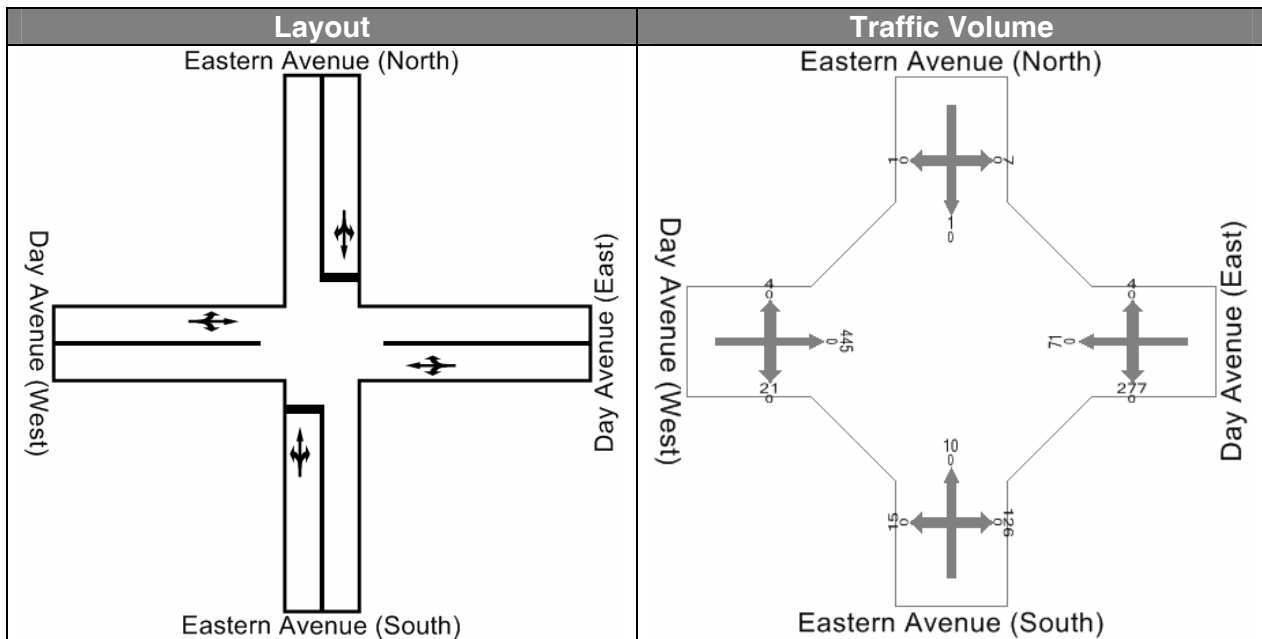
C = 70 seconds

Cycle Time Option: Optimum cycle time (Minimum Delay)

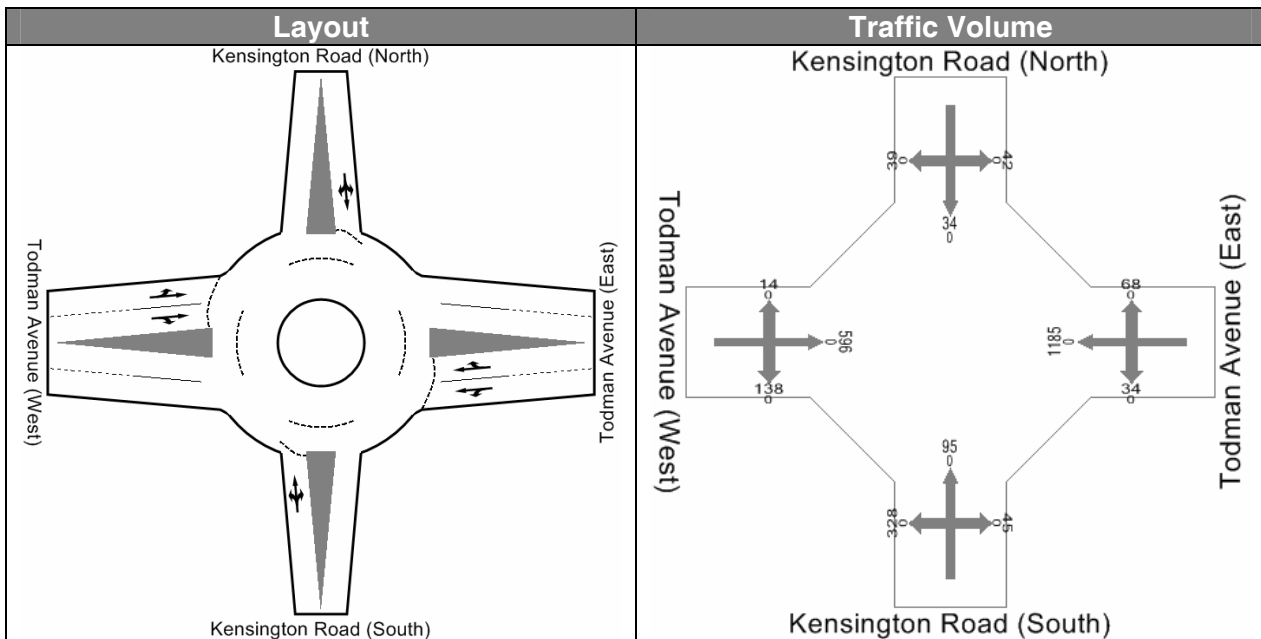
Phase times determined by the program

Location: Gardeners Road and Tunstall Avenue**AM Peak:** 8:00am to 9:00am**Control Type:** Left-in left-out (Give-Way)

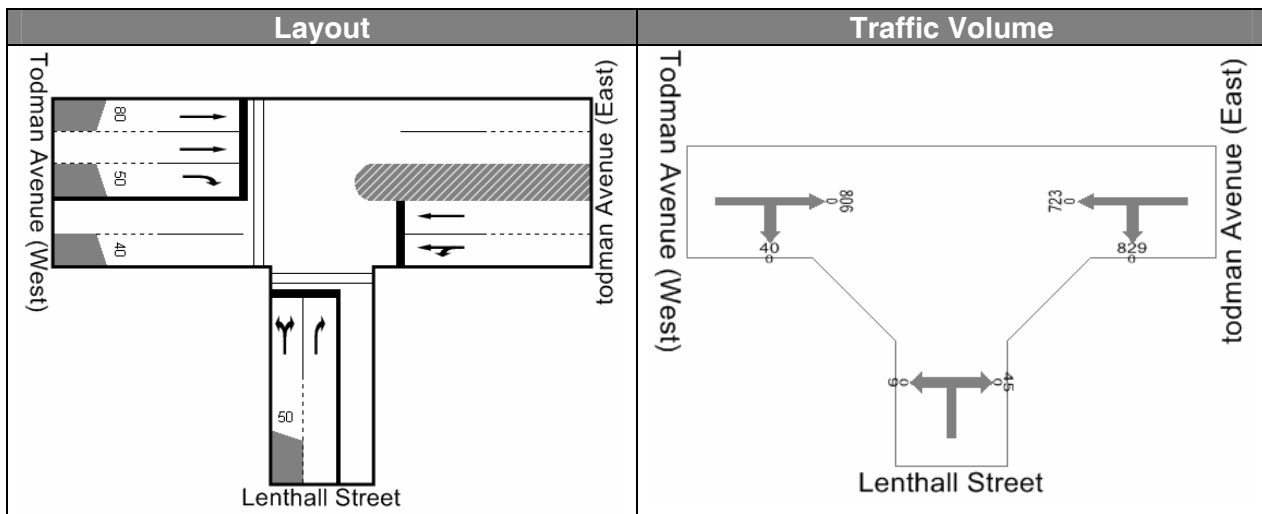
Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gardeners Road (East)										
5	T	2462	5.0	0.435	0.0	LOS A	0	0.00	0.00	60.0
Approach		2462	5.0	0.435	0.0	LOS A		0.00	0.00	60.0
Tunstall Avenue										
7	L	42	0.0	1.000*	479.7	LOS F	47	1.00	1.45	4.2
Approach		42	0.0	1.000	479.7	LOS F	47	1.00	1.45	4.2
Gardeners Road (West)										
10	L	757	0.0	0.536	8.2	LOS A	0	0.00	0.67	49.0
11	T	2269	5.0	0.536	0.0	LOS A	0	0.00	0.00	60.0
Approach		3026	3.7	0.536	2.0	LOS A		0.00	0.17	56.8
All Vehicles		5530	4.3	1.000	4.8	Not Applicable	47	0.01	0.10	53.1

Location: Eastern Avenue and Day Avenue**AM Peak:** 8:00am to 9:00am**Control Type:** Priority (Stop Sign)

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Eastern Avenue (South)										
1	L	16	0.0	0.533	27.8	LOS B	25	0.77	1.05	34.8
2	T	11	0.0	0.524	27.4	LOS B	25	0.77	1.13	35.0
3	R	133	0.0	0.526	27.6	LOS B	25	0.77	1.13	34.8
Approach		160	0.0	0.526	27.6	LOS B	25	0.77	1.12	34.8
Day Avenue (East)										
4	L	292	0.0	0.200	11.2	LOS A	17	1.00	0.00	44.8
5	T	75	0.0	0.201	3.0	LOS A	17	1.00	0.00	48.6
6	R	4	0.0	0.200	11.4	LOS A	17	1.00	0.90	45.0
Approach		371	0.0	0.200	9.5	LOS A	17	1.00	0.01	45.5
Eastern Avenue (North)										
7	L	7	0.0	0.017	15.3	LOS B	1	0.54	0.87	43.2
8	T	1	0.0	0.017	14.8	LOS B	1	0.54	0.97	43.5
9	R	1	0.0	0.017	15.0	LOS B	1	0.54	0.86	43.2
Approach		9	0.0	0.017	15.2	LOS B	1	0.54	0.88	43.2
Day Avenue (West)										
10	L	4	0.0	0.267	10.5	LOS A	21	0.58	0.28	46.5
11	T	468	0.0	0.265	2.3	LOS A	21	0.58	0.00	52.7
12	R	22	0.0	0.265	10.8	LOS A	21	0.58	0.78	46.2
Approach		494	0.0	0.265	2.8	LOS A	21	0.58	0.04	52.4
All Vehicles		1034	0.0	0.533	9.1	Not Applicable	25	0.76	0.20	46.2

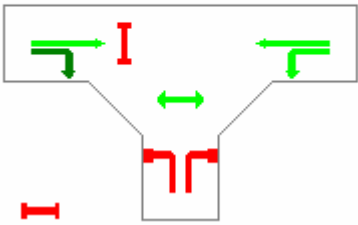
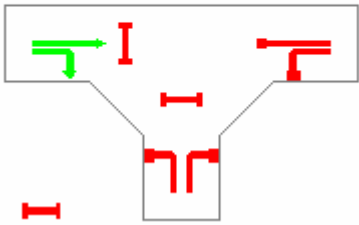
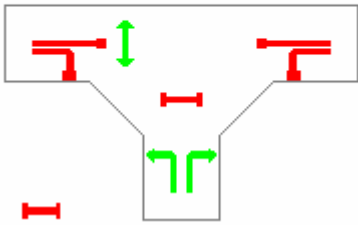
Location: Todman Avenue and Kensington Road**AM Peak:** 8:00am to 9:00am**Control Type:** Roundabout**Movement Summary**

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Kensington Road (South)										
1	L	345	0.0	1.003	58.6	LOS E	156	1.00	1.99	22.9
2	T	100	0.0	1.000	57.8	LOS E	156	1.00	1.99	23.2
3	R	47	0.0	1.000	62.2	LOS E	156	1.00	1.99	22.5
Approach		492	0.0	1.003	58.8	LOS E	156	1.00	1.99	22.9
Todman Avenue (East)										
4	L	36	0.0	0.571	9.3	LOS A	36	0.53	0.69	47.0
5	T	1247	0.0	0.576	8.1	LOS A	36	0.54	0.64	47.7
6	R	72	0.0	0.576	12.4	LOS A	36	0.54	0.73	44.5
Approach		1355	0.0	0.576	8.3	LOS A	36	0.54	0.65	47.5
Kensington Road (North)										
7	L	44	0.0	0.180	10.5	LOS A	6	0.60	0.85	46.5
8	T	36	0.0	0.180	9.7	LOS A	6	0.60	0.82	47.3
9	R	41	0.0	0.180	14.0	LOS A	6	0.60	0.83	43.6
Approach		121	0.0	0.180	11.5	LOS A	6	0.60	0.83	45.7
Todman Avenue (West)										
10	L	15	0.0	0.349	8.9	LOS A	18	0.45	0.67	47.4
11	T	627	0.0	0.348	7.7	LOS A	18	0.45	0.61	48.2
12	R	145	0.0	0.348	12.0	LOS A	18	0.45	0.71	44.8
Approach		787	0.0	0.348	8.5	LOS A	18	0.45	0.63	47.5
All Vehicles		2755	0.0	1.003	17.5	LOS B	156	0.60	0.89	39.8

Location: Todman Avenue and Lenthall Street**AM Peak:** 8:00am to 9:00am**Control Type:** Signalised

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lenthall Street										
1	L	6	0.0	0.142	73.1	LOS F	16	0.93	0.72	19.9
3	R	47	0.0	0.142	73.4	LOS F	20	0.93	0.73	19.8
Approach		53	0.0	0.142	73.4	LOS F	20	0.93	0.72	19.8
Todman Avenue (East)										
4	L	873	0.0	0.647	19.3	LOS B	223	0.56	0.82	39.2
5	T	761	0.0	0.537	9.6	LOS A	172	0.49	0.45	47.4
Approach		1634	0.0	0.647	14.8	LOS B	223	0.53	0.65	42.6
Todman Avenue (West)										
11	T	848	0.0	0.357	3.9	LOS A	87	0.28	0.25	54.2
12	R	42	0.0	0.221	28.1	LOS B	18	0.60	0.76	33.8
Approach		890	0.0	0.357	5.1	LOS A	87	0.30	0.27	52.7
All Vehicles		2577	0.0	0.647	12.6	LOS A	223	0.46	0.52	44.5

Pedestrian Movement						
Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	7.4	LOS A	0	0.31	0.31
P7	53	69.1	LOS F	0	0.96	0.96
All Peds	106	38.2	LOS C	0	0.64	0.64

9.1.45 Phase Summary	9.1.46	9.1.47
9.1.48 Phase A	9.1.49 Phase B	9.1.50 Phase C
		
Green Time = 109 seconds Phase Time = 115 seconds Phase Split = 77 %	Green Time = 6 seconds Phase Time = 12 seconds Phase Split = 8 %	Green Time = 17 seconds Phase Time = 23 seconds Phase Split = 15 %

C = 150 seconds

Cycle Time Option: Optimum cycle time (Minimum Delay)

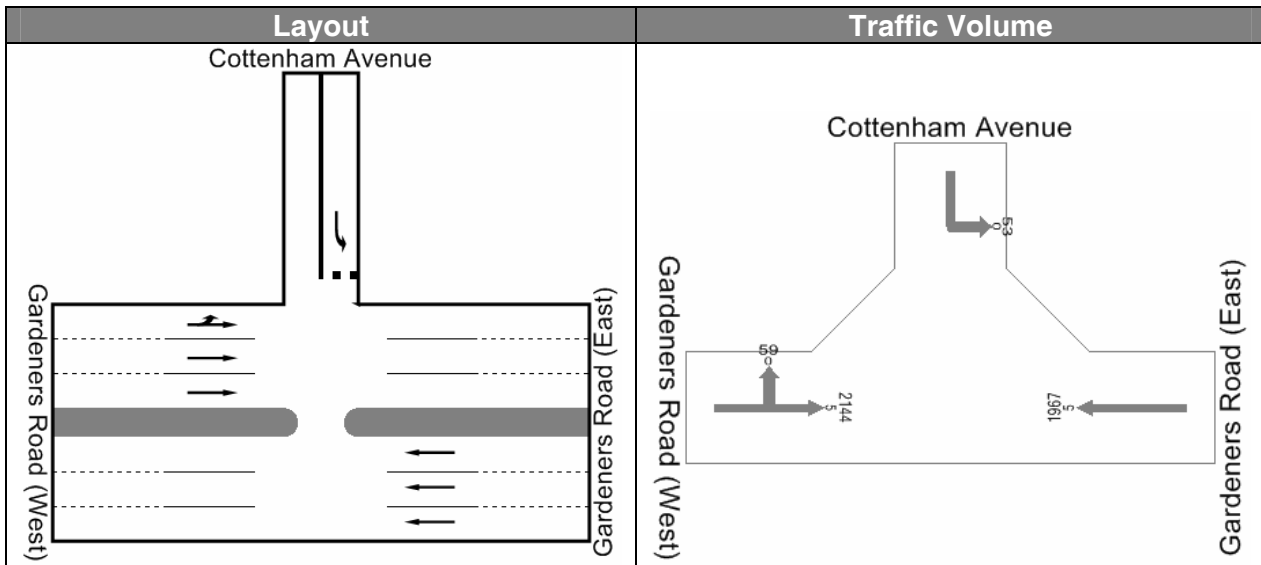
Phase times determined by the program

PM Results

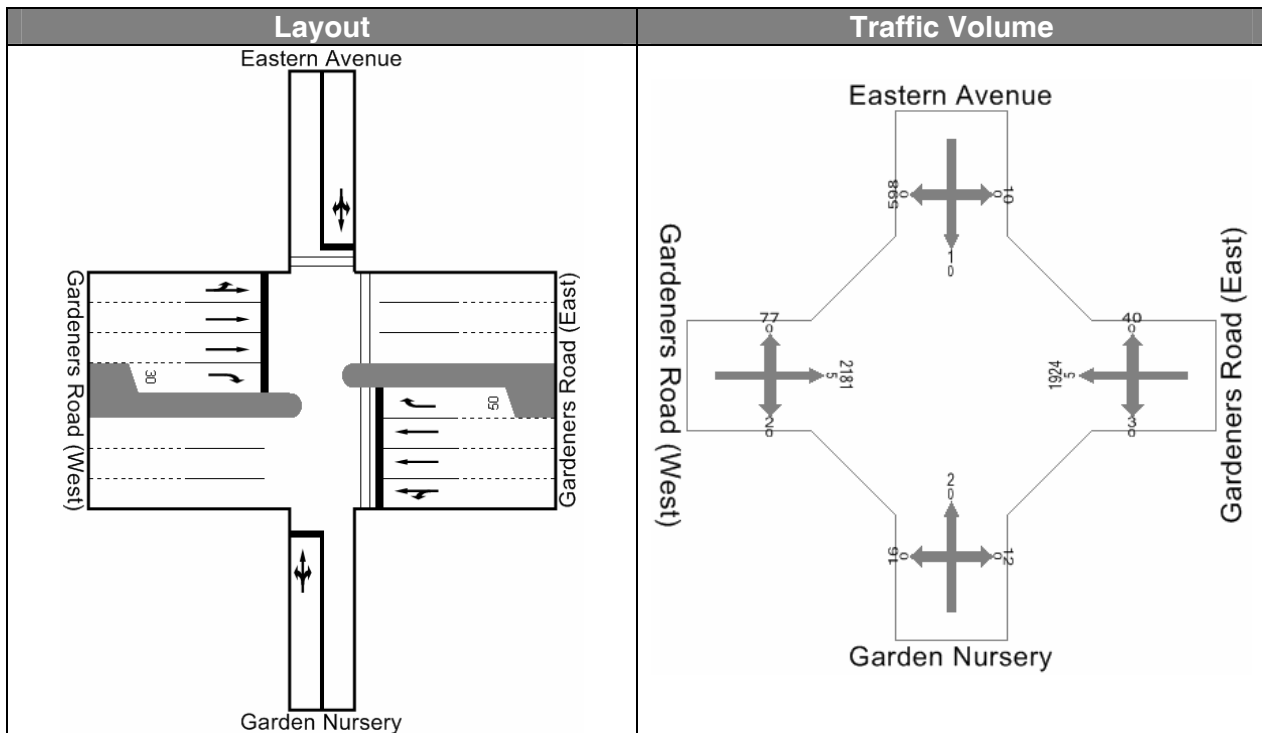
Location: Gardeners Road and Cottenham Avenue

PM Peak: 17:00pm to 18:00pm

Control Type: Left-in left-out (Give-way)



Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gardeners Road (East)										
5	T	2071	5.0	0.366	0.0	LOS A	0	0.00	0.00	60.0
Approach		2071	5.0	0.366	0.0	LOS A		0.00	0.00	60.0
Cottenham Avenue										
7	L	56	0.0	1.000*	278.0	LOS F	49	1.00	1.50	6.8
Approach		56	0.0	1.000	278.0	LOS F	49	1.00	1.50	6.8
Gardeners Road (West)										
10	L	62	0.0	0.411	8.2	LOS A	0	0.00	0.67	49.0
11	T	2257	5.0	0.409	0.0	LOS A	0	0.00	0.00	60.0
Approach		2319	4.9	0.409	0.2	LOS A		0.00	0.02	59.6
All Vehicles		4446	4.9	1.000	3.6	Not Applicable	49	0.01	0.03	54.5

Location: Gardeners Road and Eastern Avenue**PM Peak:** 16:30pm to 17:30pm**Control Type:** Signalised

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Garden Nursery										
1	L	17	0.0	0.033	19.0	LOS B	10	0.46	0.70	35.4
2	T	2	0.0	0.033	11.8	LOS A	10	0.46	0.33	40.0
3	R	13	0.0	0.033	17.1	LOS B	8	0.44	0.66	36.6
Approach		32	0.0	0.033	17.8	LOS B	10	0.45	0.66	36.1
Gardeners Road (East)										
4	L	3	0.0	0.903	51.3	LOS D	303	0.98	0.98	24.8
5	T	2025	5.0	0.862	43.1	LOS D	303	0.98	0.97	27.5
6	R	42	0.0	0.689	83.0	LOS F	29	1.00	0.77	18.3
Approach		2070	4.9	0.862	43.9	LOS D	303	0.98	0.96	27.2
Eastern Avenue										
7	L	11	0.0	0.931	59.7	LOS E	321	1.00	1.12	21.3
8	T	1	0.0	1.016	52.5	LOS D	321	1.00	1.12	23.0
9	R	629	0.0	0.913	53.9	LOS D	279	0.84	1.06	22.6
Approach		641	0.0	0.914	54.0	LOS D	279	0.84	1.06	22.6
Gardeners Road (West)										
10	L	81	0.0	1.010	105.7	LOS F	537	1.00	1.38	15.3
11	T	2296	5.0	1.011	97.5	LOS F	540	1.00	1.38	16.3
12	R	2	0.0	0.030	69.4	LOS E	1	0.93	0.64	20.6
Approach		2379	4.8	1.011	97.8	LOS F	540	1.00	1.38	16.3
All Vehicles										
		5122	4.2	1.016	70.0	LOS E	540	0.97	1.16	20.4

Pedestrian Movements						
Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	53	27.1	LOS C	0	0.65	0.65
P5	53	24.0	LOS C	0	0.61	0.61
All Peds	106	25.6	LOS B	0	0.63	0.63

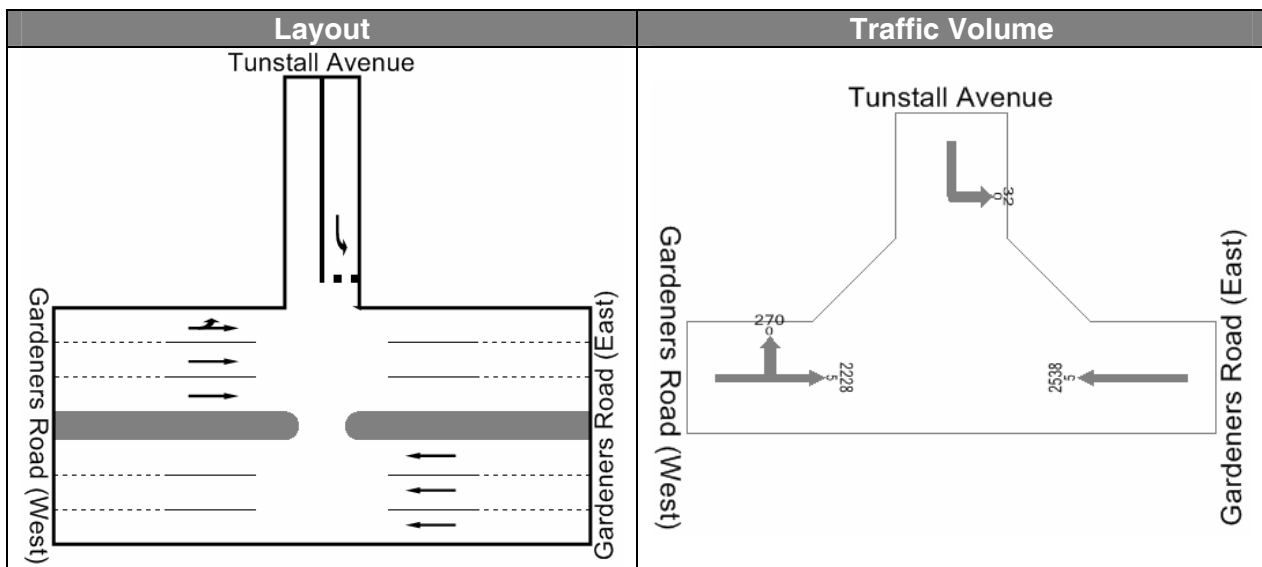
9.1.51 Phase Summary	9.1.52
9.1.53 Phase A	9.1.54 Phase B
Green Time = 54 seconds Phase Time = 60 seconds Phase Split = 46 %	Green Time = 64 seconds Phase Time = 70 seconds Phase Split = 54 %

Normal Movement	Permitted/Opposed
Slip-Lane	Opposed Slip-Lane
Stopped Movement	Continuous
Turn On Red	

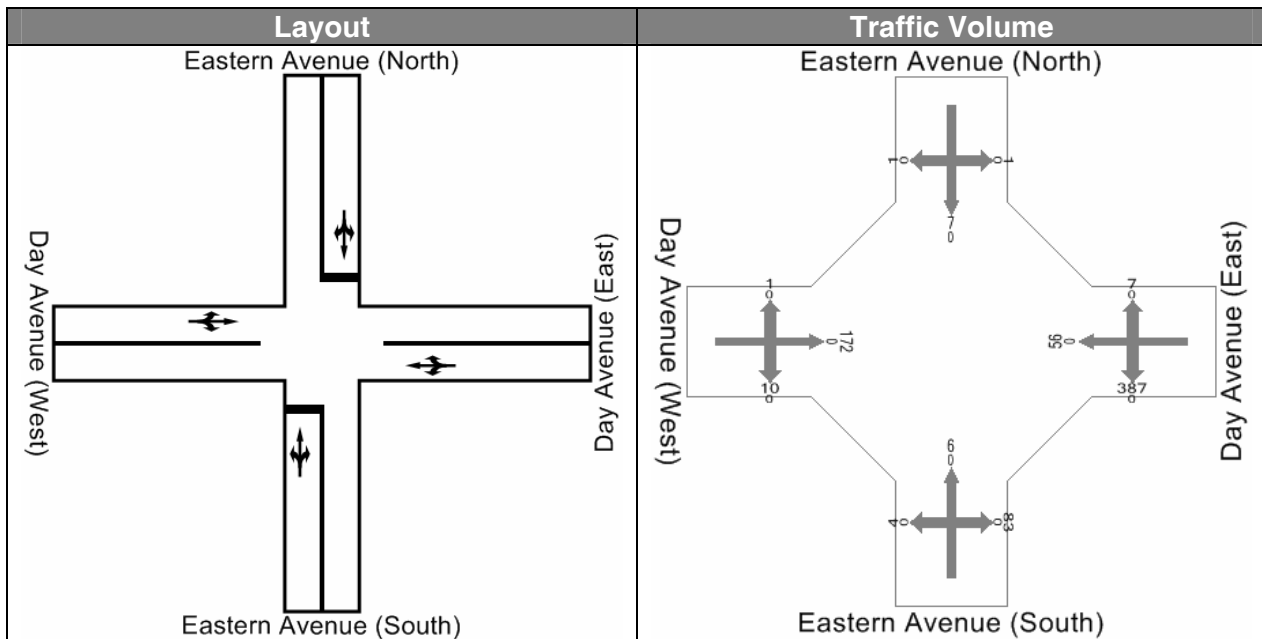
C = 130 seconds

Cycle Time Option: Optimum cycle time (Minimum Delay)

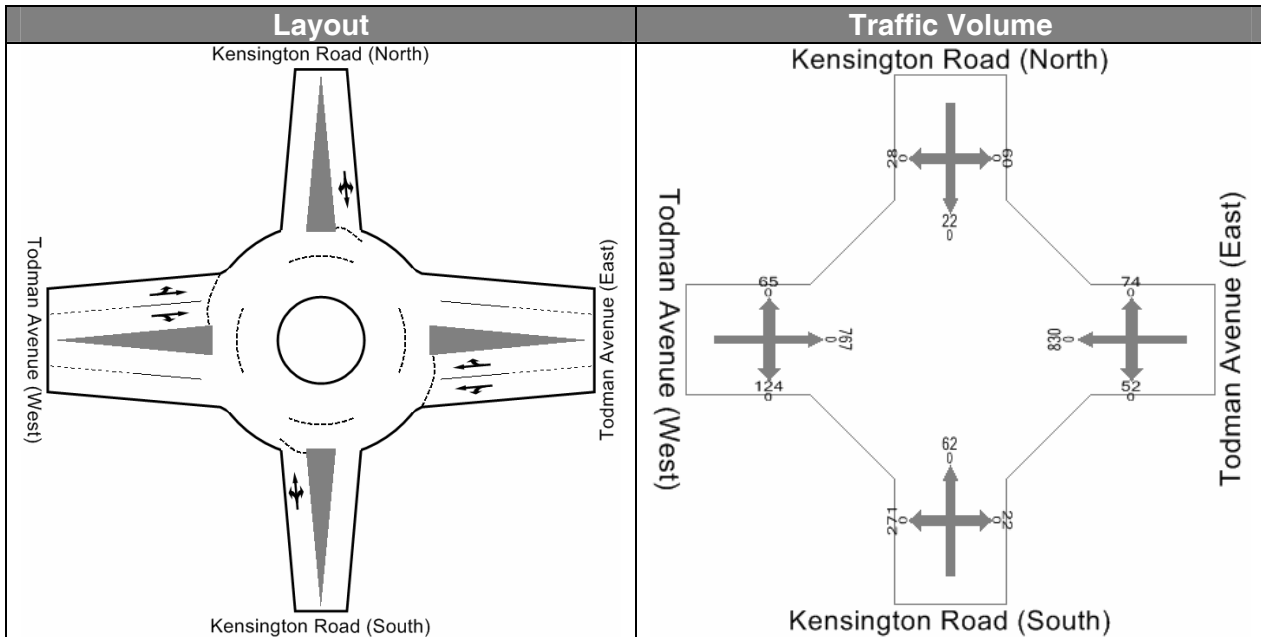
Phase times determined by the program

Location: Gardeners Road and Tunstall Avenue**PM Peak:** 16:30pm to 17:30pm**Control Type:** Left-in left-out (Give-Way)

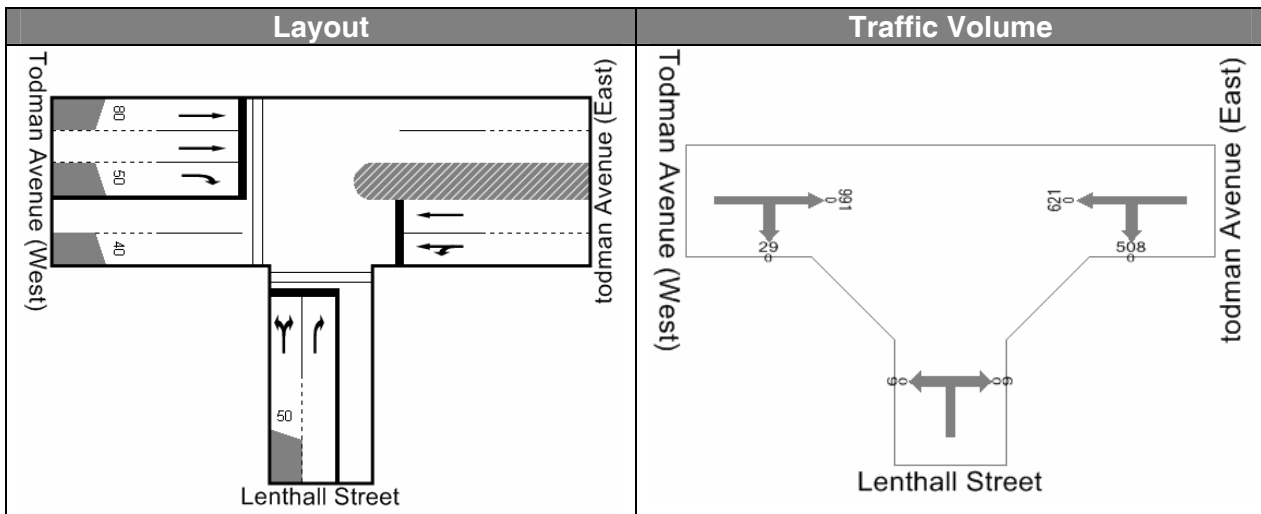
Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gardeners Road (East)										
5	T	2672	5.0	0.472	0.0	LOS A	0	0.00	0.00	60.0
Approach		2672	5.0	0.472	0.0	LOS A		0.00	0.00	60.0
Tunstall Avenue										
7	L	34	0.0	1.000*	383.8	LOS F	39	1.00	1.29	5.2
Approach		34	0.0	1.000	383.8	LOS F	39	1.00	1.29	5.2
Gardeners Road (West)										
10	L	284	0.0	0.465	8.2	LOS A	0	0.00	0.67	49.0
11	T	2345	5.0	0.465	0.0	LOS A	0	0.00	0.00	60.0
Approach		2629	4.5	0.465	0.9	LOS A		0.00	0.07	58.6
All Vehicles		5335	4.7	1.000	2.9	Not Applicable	39	0.01	0.04	55.6

Location: Eastern Avenue and Day Avenue**PM Peak:** 16:30pm to 17:30pm**Control Type:** Priority (Stop Sign)

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Eastern Avenue (South)										
1	L	4	0.0	0.211	16.8	LOS B	8	0.59	0.86	42.0
2	T	6	0.0	0.214	16.3	LOS B	8	0.59	0.99	42.3
3	R	87	0.0	0.215	16.6	LOS B	8	0.59	0.93	42.0
Approach		97	0.0	0.215	16.6	LOS B	8	0.59	0.93	42.0
Day Avenue (East)										
4	L	407	0.0	0.255	9.2	LOS A	17	0.84	0.11	45.4
5	T	59	0.0	0.255	1.0	LOS A	17	0.84	0.00	50.1
6	R	7	0.0	0.259	9.4	LOS A	17	0.84	0.64	45.5
Approach		473	0.0	0.255	8.1	LOS A	17	0.84	0.10	46.0
Eastern Avenue (North)										
7	L	1	0.0	0.022	17.5	LOS B	1	0.56	0.74	41.3
8	T	7	0.0	0.022	17.1	LOS B	1	0.56	0.94	41.6
9	R	1	0.0	0.022	17.3	LOS B	1	0.56	0.76	41.3
Approach		9	0.0	0.022	17.2	LOS B	1	0.56	0.89	41.5
Day Avenue (West)										
10	L	1	0.0	0.111	10.8	LOS A	8	0.56	0.29	46.3
11	T	181	0.0	0.106	2.6	LOS A	8	0.56	0.00	53.0
12	R	11	0.0	0.106	11.0	LOS A	8	0.56	0.78	45.9
Approach		193	0.0	0.106	3.1	LOS A	8	0.56	0.05	52.5
All Vehicles		772	0.0	0.259	8.0	Not Applicable	17	0.74	0.20	46.8

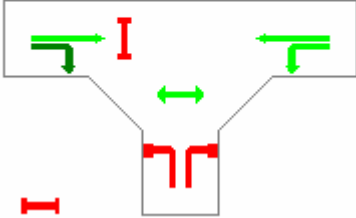
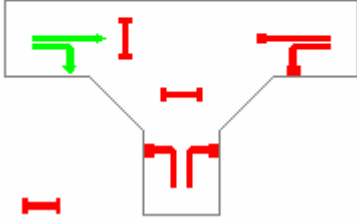
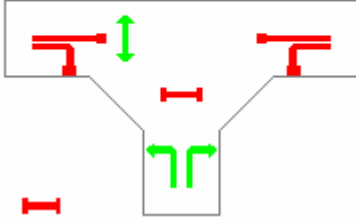
Location: Todman Avenue and Kensington Road**PM Peak:** 16:30pm to 17:30pm**Control Type:** Roundabout

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Kensington Road (South)										
1	L	285	0.0	0.597	14.2	LOS A	32	0.77	1.00	43.1
2	T	65	0.0	0.596	13.4	LOS A	32	0.77	0.99	43.8
3	R	23	0.0	0.605	17.7	LOS B	32	0.77	1.03	40.7
Approach		373	0.0	0.598	14.2	LOS A	32	0.77	1.00	43.1
Todman Avenue (East)										
4	L	55	0.0	0.417	8.8	LOS A	22	0.40	0.65	47.6
5	T	874	0.0	0.417	7.5	LOS A	22	0.40	0.60	48.5
6	R	78	0.0	0.417	11.9	LOS A	22	0.41	0.70	45.0
Approach		1007	0.0	0.417	8.0	LOS A	22	0.40	0.61	48.1
Kensington Road (North)										
7	L	63	0.0	0.182	10.9	LOS A	7	0.62	0.86	46.1
8	T	23	0.0	0.183	10.2	LOS A	7	0.62	0.83	46.9
9	R	29	0.0	0.182	14.5	LOS A	7	0.62	0.85	43.2
Approach		115	0.0	0.182	11.7	LOS A	7	0.62	0.85	45.4
Todman Avenue (West)										
10	L	68	0.0	0.412	8.7	LOS A	22	0.39	0.65	47.6
11	T	807	0.0	0.412	7.4	LOS A	22	0.40	0.59	48.5
12	R	131	0.0	0.412	11.8	LOS A	22	0.40	0.70	45.0
Approach		1006	0.0	0.412	8.1	LOS A	22	0.40	0.60	47.9
All Vehicles		2501	0.0	0.605	9.1	LOS A	32	0.47	0.68	47.1

Location: Todman Avenue and Lenthall Street**PM Peak:** 17:00pm to 18:00pm**Control Type:** Signalised

Movement Summary										
Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Lenthall Street										
1	L	6	0.0	0.037	71.8	LOS F	4	0.91	0.66	20.1
3	R	6	0.0	0.029	72.0	LOS F	4	0.91	0.67	20.1
Approach		12	0.0	0.037	71.9	LOS F	4	0.91	0.67	20.1
Todman Avenue (East)										
4	L	535	0.0	0.396	16.4	LOS B	111	0.42	0.77	41.3
5	T	654	0.0	0.462	8.8	LOS A	139	0.45	0.41	48.3
Approach		1189	0.0	0.462	12.2	LOS A	139	0.43	0.57	44.9
Todman Avenue (West)										
11	T	1043	0.0	0.439	4.5	LOS A	111	0.33	0.29	53.3
12	R	31	0.0	0.143	17.9	LOS B	9	0.42	0.72	40.2
Approach		1074	0.0	0.439	4.9	LOS A	111	0.33	0.31	52.8
All Vehicles										
		2275	0.0	0.462	9.1	LOS A	139	0.39	0.45	48.0

Pedestrian Movements						
Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	7.4	LOS A	0	0.31	0.31
P7	53	69.1	LOS F	0	0.96	0.96
All Peds	106	38.2	LOS C	0	0.64	0.64

9.1.55 Phase Summary	9.1.56	9.1.57
9.1.58 Phase A	9.1.59 Phase B	9.1.60 Phase C
		
Green Time = 109 seconds Phase Time = 115 seconds Phase Split = 77 %	Green Time = 6 seconds Phase Time = 12 seconds Phase Split = 8 %	Green Time = 17 seconds Phase Time = 23 seconds Phase Split = 15 %

C = 150 seconds

Cycle Time Option: Optimum cycle time (Minimum Delay)

Phase times determined by the program