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Megacenta Liverpool

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Homemaker Centre at The Grove Liverpool Planning Proposal

Traffic & Transport Assessment

15-Oct-2015
Prepared for – Gazcorp Pty Ltd – ABN: 41001696073

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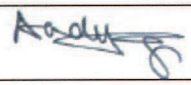
A	08-Dec-2014	Draft Report	Andy Yung	Original Signed
B	18 Dec-2014	Final Report	Andy Yung	Original Signed
C	15-Oct-2015	Revised Final Report	Andy Yung Associate Director	

Table of Contents

1.0 Introduction

AECOM has been engaged by Gazcorp Pty Ltd to undertake a Traffic and Transport Assessment in support of an application for a portion of the Homemaker Centre at The Grove Liverpool to retain the existing B5 zoning and including 'shop' as an additional permitted use on the site with a maximum Gross Floor Area (GFA) of 21,000m^2. The portion of the site that relates to this amendment includes Lot 101 in DP 104316, as well as a small portion of the adjoining Weekend Markets site to the south, specifically the portion of this site on which the Viscount Place roadway is located (Part Lot 23 in DP1190437).

The proposed land uses include the construction of one full line supermarket, one discount supermarket, one discount department store, food outlets and retail specialty stores.

This report will review existing traffic and transport conditions surrounding The Grove Liverpool, as well as provide details on the likely future traffic conditions on the local road network as a result of development of the site. The potential traffic and transport impacts of the amendments of use on the site will be considered. Note that parking requirements and the proposed plan for the site are to be assessed as part of a subsequent Development Application and have not been considered as part of this report.

1.1 Study area

The Homemaker Centre at The Grove Liverpool is a bulky goods retailing outlet located on the corner of Orange Grove Road (Cumberland Highway) and Viscount Place. Immediately adjacent is the Liverpool Markets (proposed and approved as a Factory Outlet Centre), as well as a liquor store and fast food restaurants. Surrounding development includes light industrial land uses to the south, with the site located approximately 1.5 kilometres to the north of the Liverpool Central Business District (CBD).

The Homemaker Centre at The Grove Liverpool has an area of approximately 6 hectares, including the building footprint and a large paved car area (used as a car park) on the eastern side of the site. It is bordered by Orange Grove Road to the west, Cabramatta Creek reserve to the north and east, and the proposed Factory Outlet Centre (FOC) site to the south, as shown in **Figure 1**.

The Homemaker Centre at The Grove Liverpool is currently zoned B5 Business Development, which allows the current bulky goods land use, while the fast food outlets to the west of the site are under a B6 Enterprise corridor zoning.

Figure 1 Study Area

Source: Sixmaps NSW, 2014

1.2 Report structure

The report has been structured as follows:

- **Chapter 2** provides a summary of the existing traffic and transport conditions on-site and on the surrounding road network.
- **Chapter 3** outlines the proposed development as a result of re-zoning.
- **Chapter 3** provides an outline of parking, public transport and active travel requirements
- **Chapter 4** reviews the potential traffic impacts arising as a result of the Planning Proposal
- **Chapter 5** summarises the conclusions and recommendations of the assessment.

2.0 Existing Traffic and Transport Conditions

2.1 Surrounding road network

2.1.1 Motorway network

The M5 Motorway provides access between Sydney's south-west and the Sydney CBD and Sydney Airport, before extending south-west (as the Hume Highway) towards Campbelltown, the Southern Highlands and Canberra. The nearest interchanges to the M5 Motorway from The Grove Liverpool are located at the Hume Highway (for eastbound traffic) and Moorebank Avenue (for all traffic movements).

The M7 Motorway provides a corridor between Sydney's southwest and northwest. Vehicles can access the M7 Motorway via the southern interchange with the M5 Motorway.

2.1.2 Sub-regional road network

The Grove Liverpool has strong connectivity to the sub-regional road network, including the Hume Highway (via Homepride Avenue and Orange Grove Road) as well as direct access to the Cumberland Highway (Orange Grove Road). Both roads are classified as Roads Maritime state roads.

Orange Grove Road (Cumberland Highway) provides a major north-south road link within Sydney's road network. It connects the Hume Highway to the south at Liverpool to the M4 Motorway to the north at Wentworthville. It generally comprises four traffic lanes (i.e. two lanes in each direction) with a wide central median island separating opposing traffic flows in the vicinity of the site.

The Hume Highway is located to the south of the site and provides the primary east-west road link in the area. It typically comprises six traffic lanes with clearway restrictions operating during peak periods.

Cabramatta Road West is located to the north of the site, is classified as a State Road and provides an alternative east-west road link in the area (to the Hume Highway), providing a connection between Elizabeth Drive at Bonnyrigg to the west and Cabramatta to the east).

2.1.3 Local road network

Viscount Place is a local road connecting Orange Grove Road and Homepride Avenue. It is effectively an internal road which runs through The Grove Liverpool in an east-west alignment. It is one lane in each direction and provides the primary access to both the Homemaker Centre and FOC (note it is wider at its western end in the vicinity of the intersection with Orange Grove Road).

Homepride Avenue is effectively an extension of Viscount Place. It is one lane in each direction and connects Viscount Place (the site) to the Hume Highway to the south and the suburb of Warwick Farm to the east.

2.1.4 Surrounding Intersections

Orange Grove Road and Viscount Place

The intersection of Orange Grove Road / Viscount Place is a signalised three arm intersection and provides the primary access to The Grove Liverpool. It has recently been upgraded to allow improved intersection performance during peak periods, with a single left and dual right hand turn bays provided on Orange Grove Road for access into the site, while three lanes are now provided for egress at Viscount Place, with two turning right toward Cabramatta and one turning left toward the Hume Highway.

Homepride Avenue and Hume Highway

The intersection of Homepride Avenue / Hume Highway is a signalised three arm intersection providing secondary access to The Grove Liverpool and is located 50m to the west of the Hume Highway / Macquarie Street intersection. Homepride Avenue has two approach lanes and one departure lane. Hume highway has a channelised right turn into Homepride Avenue and a through lane that converts to a left only lane. The proximity of the two intersections limits right turn bay length at both intersections, while a bridge on Homepride Avenue

across Brickmakers Creek approximately 35m north of the Hume Highway limits the potential for widening Homepride Avenue.

2.1.5 Traffic Volumes

AECOM commissioned Peak hour traffic movements on Thursday 23 and Saturday 25 May 2013 at the following locations:

- Orange Grove Road / Viscount Place
- Hume Highway / Homepride Avenue
- Viscount Place / Homepride Avenue (edge of The Grove Liverpool).

Peak hour traffic volumes at each of the intersections are provided in **Figure 2** and **Figure 3**. Note that there is slightly more traffic at the Hume Highway intersection due to the various access roads between the corner of Viscount Place and Homepride Avenue (traffic not attributed to the site). This shows that the Saturday peak period is the busiest for The Grove Liverpool, with the number of vehicles accessing Viscount Place greater than on Thursday evening. However, overall traffic volumes on the road network are slightly higher during the weekday evening peak.

Figure 2 **Saturday Peak (12:00-13:00) – Existing Volumes**

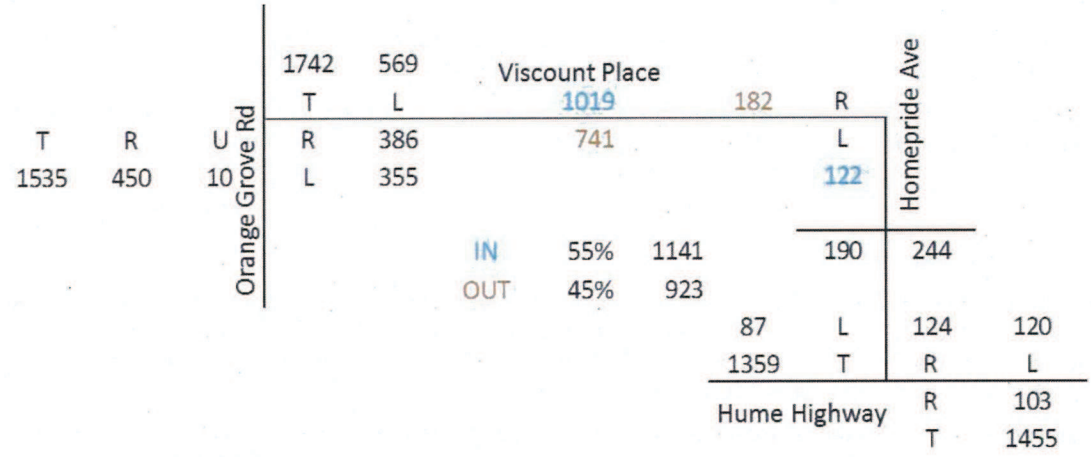
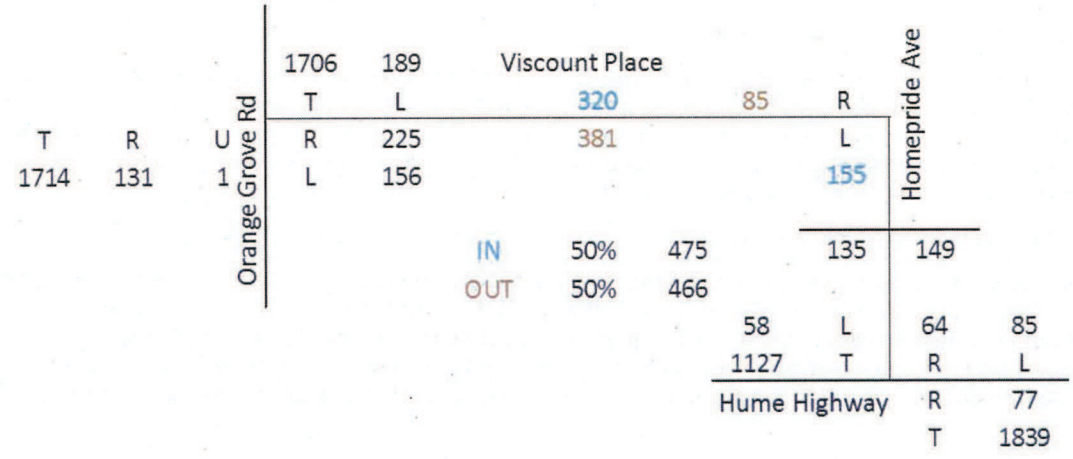


Figure 3 **Thursday Peak (17:00-18:00– Existing Volumes**



2.2 Intersection Operation

The operation of key intersections has been assessed using SIDRA intersection modelling software which calculates intersection performance. SIDRA determines the average delay and provide a measure of the level of service. The criteria for each level of service are outlined in **Table 1**.

Table 1 SIDRA Level of Service (LOS) criteria

Level of Service (LOS)	Average Delay / vehicle (sec/veh)	Traffic Signals
A	< 14	Good Operation
B	15 – 28	Good with acceptable delays and spare capacity
C	29 – 42	Satisfactory
D	43 – 56	Near Capacity
E	57 – 70	At capacity – incidents will cause excessive delays
F	>70	Extra capacity required

A summary of the existing traffic conditions is provided in **Table 2**. Full results of the SIDRA intersection assessment are provided in **Appendix A**.

Table 2 Existing Level of Service (LOS)

Intersection	Peak	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)	Cycle Time (sec)
Orange Grove Road / Viscount Place	Thursday PM	0.69	13	171	A	90
	Saturday Midday	0.92	26	302	B	80
Hume Highway / Homepride Avenue	Thursday PM	0.58	10	122	A	90
	Saturday Midday	0.75	14	174	A	90

On the basis of the above, the signalised intersection of Hume Highway / Homepride Avenue operates satisfactorily with minimal queuing and delays (note that no signal coordination has been assumed for this intersection although its proximity to the intersection of Hume Highway / Macquarie Street is likely to mean that arrivals would be coordinated).

The intersection of Orange Grove Road and Viscount Place operates acceptably on Thursday. On Saturday there is queuing and delays present on some movements, however the overall level of service remains acceptable. This corresponds with site observations where queues were typically observed to dissipate throughout each cycle.

2.3 Public Transport

2.3.1 Travel Mode

Data from the Bureau of Transport Statistics (BTS) Household Travel Survey (HTS) shows that within the Liverpool LGA, public transport use is slightly below the Sydney average, and that walk only trips are considerably lower than the Sydney average. This can be attributed to the peripheral location of Liverpool within metropolitan Sydney and the lower comparative levels of public transport and active travel infrastructure available.

Table 3 Modeshare – Liverpool LGA

Mode of Travel	Liverpool LGA	Sydney
Vehicle Driver	54%	47%
Vehicle Passenger	25%	22%
Train	4%	5%
Bus	5%	6%
Walk	11%	18%
Other	1%	2%

Source: HTS , 2011/12

2.3.2 Rail services

The closest rail station to The Grove Liverpool is Warwick Farm which is approximately 1.8km walking distance from the site. Warwick Farm provides access to the Bankstown Line, Airport Inner West & South Line and the Cumberland Line. These lines provide direct access to key locations across wider Sydney. Liverpool station is slightly further from the site (2.3km), however bus services are available between the station and the site.

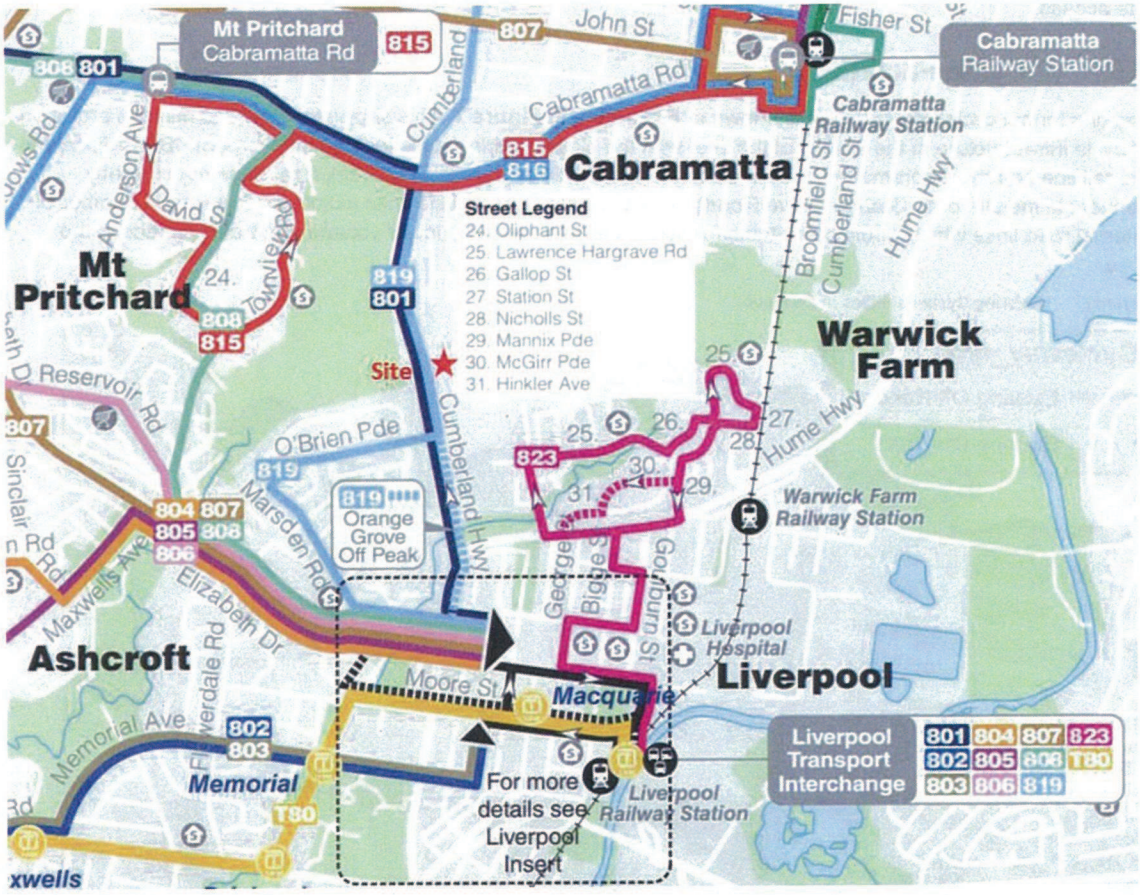
Figure 4 Rail Lines

Source: Sydney Trains, 2014

2.3.3 Bus routes and services

Bus stops are located on each side of Orange Grove Road, approximately 60m south of Viscount Place. The bus services operating from these stops are the 801 and 819. These are accessed via a signalised pedestrian crossing on Orange Grove Road (Cumberland Highway). The site is also just over 400m from the 823 service. A map of local bus routes is shown in **Figure 5** while **Table 4** summarises bus service provision.

Figure 5 Bus Routes



Source: TfNSW, 2014

Table 4 Bus service provision (adjacent to the site)

Route #	Route Description	Frequency On / Off Peak
801	Badgerys Creek to Liverpool via Kemps Creek, Cecil Park & Bonnyrigg	30 min Peak / hourly off peak
819	Liverpool to Orange Grove, Prairiewood and return	Peak Only (weekdays) and hourly during the day on weekends
823	Liverpool to Warwick Farm and return	30 min Peak / hourly off peak

Source: TfNSW, 2014

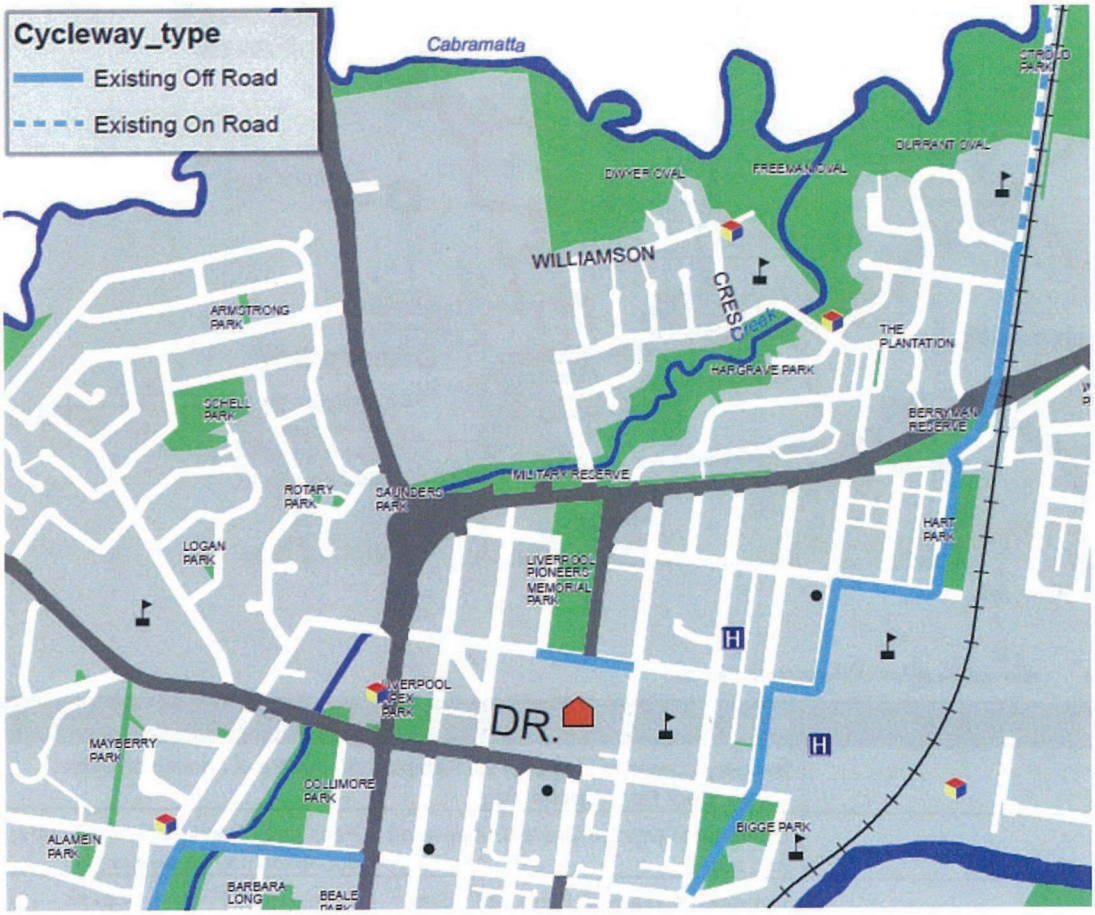
2.4 Pedestrian Facilities

The existing site has good pedestrian connectivity to the broader network via a 1.2m wide footway on the eastern side of Orange Grove Road and signalised pedestrian crossings on both Viscount Place and Orange Grove Road. Signalised pedestrian crossings are also provided further south at the intersection of Orange Grove Road / O'Brien Parade and Orange Grove Road / Hume Highway. A footpath exists along the eastern side of Homepride Avenue, however this is poorly maintained in places and terminates approximately 150m south of the secondary site access.

2.5 Cycle Facilities

Existing formal cycle infrastructure is shown in **Figure 6** and **Figure 7**. This shows that there is minimal provision of cycle infrastructure in the vicinity of the site, with the closest cycle routes located in Liverpool CBD, adjacent to the rail line and the Cabramatta Creek Trail on the north side of Cabramatta Creek (that does not currently connect to the site or to Orange Grove Road). As well as the formal cycle links indicated, there are a number of internal road links which would be suitable for cyclists to use given the lower volume and traffic speeds in the area.

Figure 6 Existing Cycle Facilities in Liverpool



Source: Liverpool City Council, 2010

Figure 7 Existing Cycle Facilities in Fairfield

Source: Fairfield City Council, 2014

3.0 Proposed Development

3.1 Land Use

It is proposed that the redevelopment of the Homemaker Centre at The Grove Liverpool would include:

- Retention of 29,000 Gross Leasable Floor Area (GLFA) of the existing 30,000 GLFA for bulky goods retail
- Shifting the bulky goods retail component to the east of the site
- An additional 17,000 GLFA of new retail including:
  - One full line supermarket
  - One discount supermarket
  - Fast trade retail
  - One discount department store
  - Food outlets
  - Retail specialty stores.

It is assumed for the purposes of this study that floor areas for the proposed redevelopment are consistent with those estimated in **Table 5**. The proposed reduction in the area of bulky goods and the floor areas associated with the redevelopment of the separate FOC site are also shown.

Table 5 Future Floor Area and Land Use Schedule

Land Use	GLFA (sq.m)	Change (sq.m)
Discount Department Store	5,500	5,500
Major Supermarket	4,000	4,000
Minor Supermarket	1,500	1,500
Other Retail Premises	3,800	3,800
Mini Major Retail Store	1,250	1,250
Mini Major Retail Store	950	950
Total Retail	**17,000**	**17,000**
Bulky Goods	**29,000**	**-1,000**
Markets	Replaced by FOC	-10,668
Factory Outlet Centre	10,400	10,400

Source: Gazcorp, 2014

3.2 Vehicle Access

The two primary access points will remain at the intersections of Viscount Place / Orange Grove Road and Homepride Avenue / Hume Highway. No additional accesses are proposed. In terms of the internal road network, it is anticipated that changes to the layout of Viscount Place are likely to be required to facilitate access to the future redeveloped site. The nature and extent of these changes will be reviewed as part of a subsequent development application.

3.3 Bus Services

In order to determine if the current bus service provision will adequately cater for the additional development on site, the public transport service levels for a selection of similar local centres within the Liverpool LGA have been assessed. A summary of the bus services available in the vicinity of each of the sites is outlined below. Of the centres within Liverpool, Carnes Hill and Casula have large discount department's stores and were therefore excluded from direct comparison to the Homemaker Centre at The Grove Liverpool.

Table 6 Miller bus service provision

Route #	Route description	Frequency On / Off Peak
802	Liverpool to Parramatta via Cartwright, Miller, Bonnyrigg, Fairfield, Merrylands	30 min all day – hourly after 20:30
803	Liverpool to Miller via Cartwright and return	Non-Peak Only 30 Mins
804	Liverpool to Parramatta via Hinchinbrook, Bonnyrigg, Greenfield Park, Fairfield, Merrylands	15 min Peak / 30 Mins off peak
S10	Heckenberg to Miller Shops via Busby	4 services between AM and PM peak only

Table 7 Chipping Norton bus service provision

Route #	Route description	Frequency On / Off Peak
903	Liverpool to Chipping Norton - Liverpool	30 mins PM peak / Hourly off peak

Table 8 Valley Plaza bus service provision

Route #	Route description	Frequency On / Off Peak
804	Liverpool to Parramatta via Hinchinbrook, Bonnyrigg, Greenfield Park, Fairfield, Merrylands	15 min Peak / 30 Mins off peak
805	Cabramatta to Liverpool via St Johns Park, Bonnyrigg, Green Valley, Heckenberg & Ashcroft	15 min Peak / 30 Mins off peak

Table 9 Moorebank Plaza bus service provision

Route #	Route description	Frequency On / Off Peak
902	Holsworthy to Liverpool Via Moorebank	30 mins PM peak / Hourly off peak

Table 10 Wattle Grove Plaza bus service provision

Route #	Route description	Frequency On / Off Peak
901	Liverpool to Holsworthy Via Wattle Grove	30 mins PM peak / Hourly off peak

Table 11 Warwick Farm bus service provision

Route #	Route description	Frequency On / Off Peak
904	Fairfield to Liverpool via Warwick Farm	30 mins PM peak / Hourly off peak

Miller and Valley Plaza have more bus routes and a higher frequency of services in comparison to the Orange Grove site. However, Chipping Norton, Wattle Grove, Moorebank plaza and Warwick Farm have only one service with a similar 30 minute peak and hourly off peak frequency (the off peak frequency also occurs on weekends in most cases). As such, it can be concluded that the bus service provision at the site is consistent with the majority of other similar centres within the Liverpool LGA.

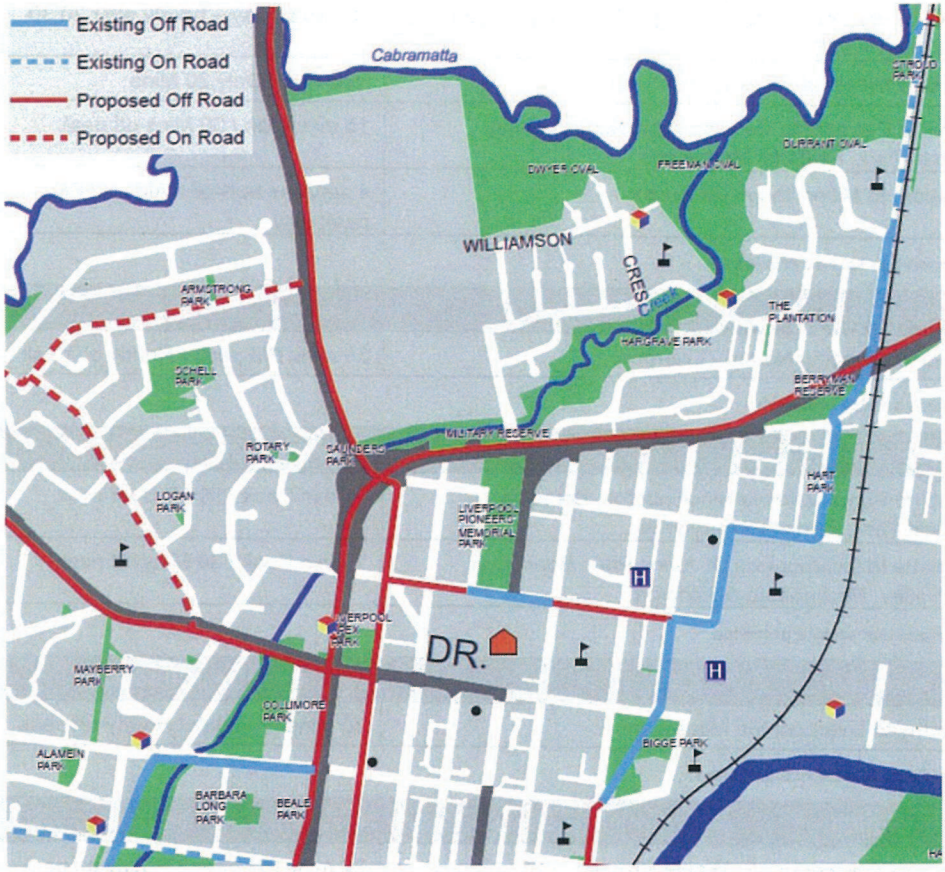
Further discussion with bus operators and Transport for NSW may be required to determine the potential for improving public transport accessibility to the site. The nature of the site (with bulky goods and supermarkets) ensures that the site will continue to be predominantly accessed by private vehicles, limiting the opportunities for mode-shift. However, increasing the number of visitors accessing the site by public transport will help to minimise

the number of visitors arriving by private vehicles and help to reduce the traffic impacts of the proposed development.

3.4 Cycle Facilities

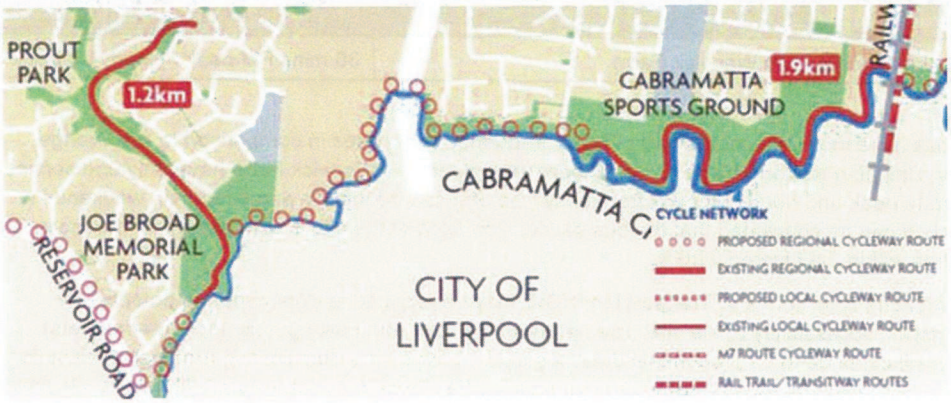
A comprehensive network of cycle infrastructure is proposed in the vicinity of the site including an off-road cycle route along Orange Grove Road as shown in **Figure 8** and an extension of the Cabramatta Creek Trail connecting to Orange Grove Road as shown in **Figure 9**. These routes will act to encourage cyclists to ride to the site and help to incite mode-shift away from private cars.

Figure 8 Proposed Cycle Facilities in Liverpool



Source: Liverpool City Council, 2010

Figure 9 Proposed Cycle Facilities in Fairfield



Source: Fairfield City Council, 2014

4.0 Traffic Impact Assessment

4.1 Introduction

This section outlines the trip generation and distribution and the intersection analysis work undertaken to assess the impact of the changes in land use to the external road network.

The Thursday evening peak contains the busiest traffic conditions associated with a retail development, as return journey work trips combine with late night shopping retail trips, and is therefore considered a worst case scenario. The Saturday midday peak has also been assessed as that typically represents the peak generation time for a retail development.

4.2 Trip Generation

Traffic generation estimates for the proposed development have been sourced from the Roads Maritime *Guide to Traffic Generating Developments (2002)* and updated traffic surveys included as part of the Roads Maritime Technical Direction *TDT 2013/04a*.

Estimates of peak hour and daily traffic volumes resulting from the proposal are set out in **Table 12**.

Table 12 Traffic Generation Estimates

Land Use	Thursday Peak Hour Generation Rate (vph)	Saturday Peak Hour Generation Rate (vph)	Source
Supermarket	155 trips / 1000 m2 GLFA	147 trips / 1000 m2 GLFA	Roads Maritime
Mini Major	51 trips / 1000 m2 GLFA	13 trips / 1000 m2 GLFA	Roads Maritime
Discount Department Store	51 trips / 1000 m2 GLFA	13 trips / 1000 m2 GLFA	Roads Maritime
Speciality Shops	46 trips / 1000 m2 GLFA	107 trips / 1000 m2 GLFA	Roads Maritime
Markets	-	4 trips / stall	Roads Maritime

Source: Roads Maritime Guide to Traffic Generating Developments and Technical Direction TDT 2013/04a

For the purposes of this assessment, the traffic generated by the existing market and the proposed FOC have been sourced from the *Conversion of Weekend Markets to Factory Outlet Centre Traffic and Parking Assessment Report (2011)* undertaken by Dobinson & Associates Pty Ltd. This shows that as a result of the FOC development there will be a net increase of 407 vehicle trips on Thursday and a net decrease of 82 vehicle trips on Saturday (note that this disparity is a result of the Market not being open on weekdays).

An important characteristic of the traffic generation of the above uses is the different types of trips which may occur. These different trip types correspond to:

- 'Primary Trips'
- 'Link-diverted trips'
- 'Non-link-diverted trips'.

Primary trips and link-diverted trips involve a vehicle either making a special trip or a modification of the route to an existing trip. Non-link-diverted trips, on the other hand, correspond to those trips which do not involve a diversion from the route that would otherwise have been taken, or in other words are trips generated by passing traffic. The important distinction here is that only primary trips and link-diverted trips impact upon the external road network. Non-link-diverted trips are already present on the adjacent road network, and although these trips need to be considered in the design of access driveways, turning lanes and so on, they do not constitute additional traffic.

On a site such as The Grove Liverpool (with multiple land uses), it can be expected that a number of visitors will seek to access more than one of the retail options available as part of a single trip. In order to ensure that these shared-purpose trips are reflected in traffic generation estimates, a reduction to the number of trips generated should be applied. The study by Dobinson & Associates Pty Ltd *Conversion of Weekend Markets to Factory Outlet Centre Traffic and Parking Assessment Report (2011)* applied a 10% reduction for joint use facilities on site. The same 10% reduction has been applied to this study.

Table 13 sets out the resultant vehicle generation for both the Thursday Evening and Saturday peak hour periods. The Table indicates that a maximum of 1,658 additional vehicle movements could be generated by the site during the Thursday PM traffic peak, with 1,145 additional vehicle movements generated during the Saturday peak.

Table 13 Additional Traffic Generation Estimates

Land Use Description	Thursday Peak Hour Movements (trips)	Saturday Peak Hour Movements (trips)
Proposed Retail		
Supermarkets*	767	727
Mini Major*	101	26
Discount Department Store*	252	64
Speciality Shops*	157	366
Sub Total	**1,278**	**1,184**
FOC*	**407**	**822**
Markets (reduction)	**-**	**-822**
Bulky Goods (reduction)	**-27**	**-39**
Total	**1,658**	**1,145**

* 10% reduction applied to number of trips

** Source: Dobinson Associates Limited, 2011

4.3 Distribution and Assignment

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

- Configuration of the arterial road network in the immediate vicinity of the site
- Existing operation of intersections providing access between the local and arterial road network
- Distribution of households in the vicinity of the site
- Configuration of access points to the site.

For the purposes of estimating vehicle movements and with consideration of the above, it has been assumed that up to an additional 10% of the total proportion of exiting vehicles may utilise the Homepride Avenue / Hume Highway intersection (rather than Orange Grove Road / Viscount Place – which experiences high demand) during the Thursday PM peak.

During the Saturday midday peak, when on-site traffic demand is at its highest, it has been assumed that up to an additional 20% of the total proportion of exiting vehicles may utilise the Homepride Avenue / Hume Highway intersection (rather than Orange Grove Road / Viscount Place – which experiences high demand).

These distributions were based largely on the traffic surveys obtained as part of this study, with a slightly higher percentage of future traffic assigned to the Hume highway, as the majority of the new development is happening to the east of the site and closer to the Homepride Avenue access.

In addition to the new traffic generated by the site the background growth on the network has also been assumed at 1% per annum.

Based on the above, **Figure 10** and **Figure 11** have been prepared to show the estimated increase in turning movements in the vicinity of the site following completion of the proposed development.

Figure 10 Saturday Peak – Additional Traffic

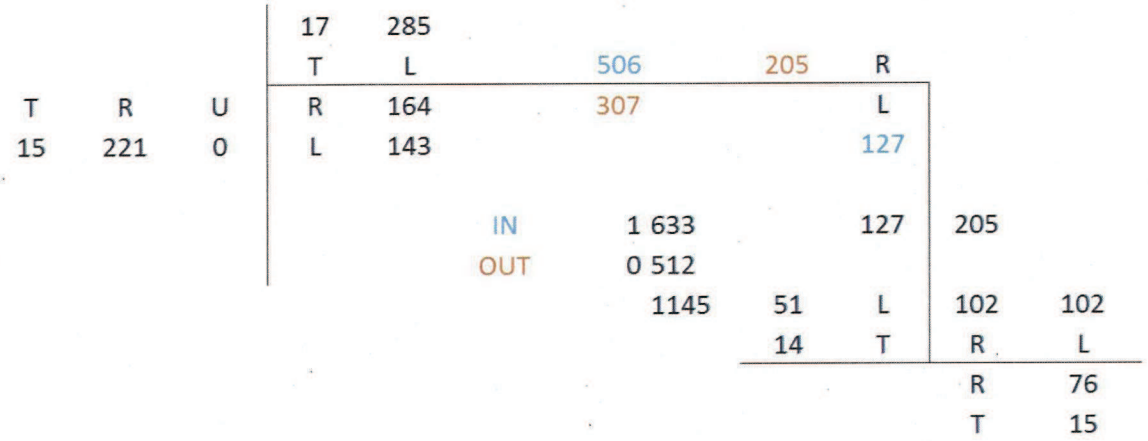
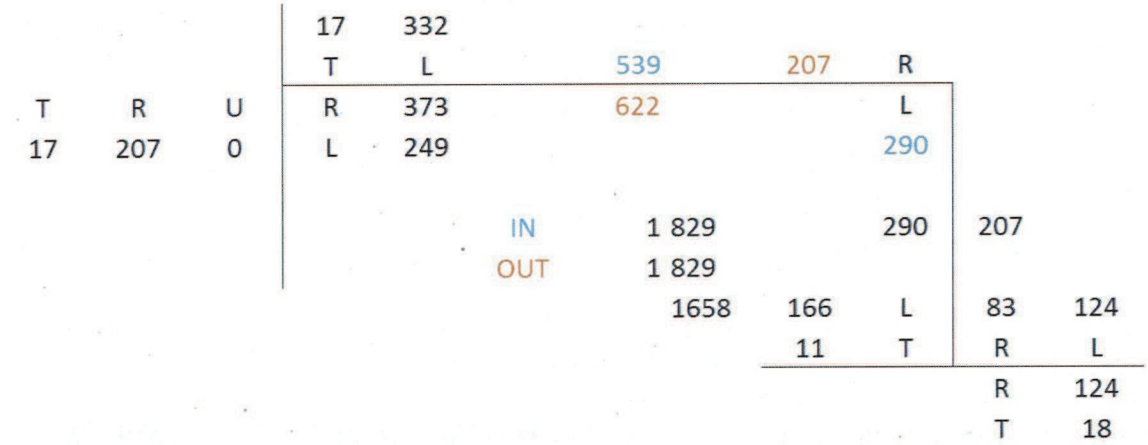


Figure 11 Thursday Peak – Additional Traffic



4.4 Intersection Performance

The impact of the additional traffic generated by the proposed development on access intersections has been assessed using SIDRA to determine the likely upgrade requirements at each location.

4.4.1 Orange Grove / Viscount Place

The additional traffic generated by the proposed development resulted in increased delays and queuing. As such, the following works are proposed on the existing road infrastructure to minimise any adverse effects on road safety and operational efficiency:

- Converting the central exit lane on Viscount Place to a shared left out / right out centre lane
- A change to the existing short left out lane to a long lane
- Changing the existing right turn lane into a short lane
- The addition of a left-in slip for southbound traffic.

The corresponding SIDRA layout is outlined in **Figure 12**.

Figure 12 Proposed SIDRA Layout

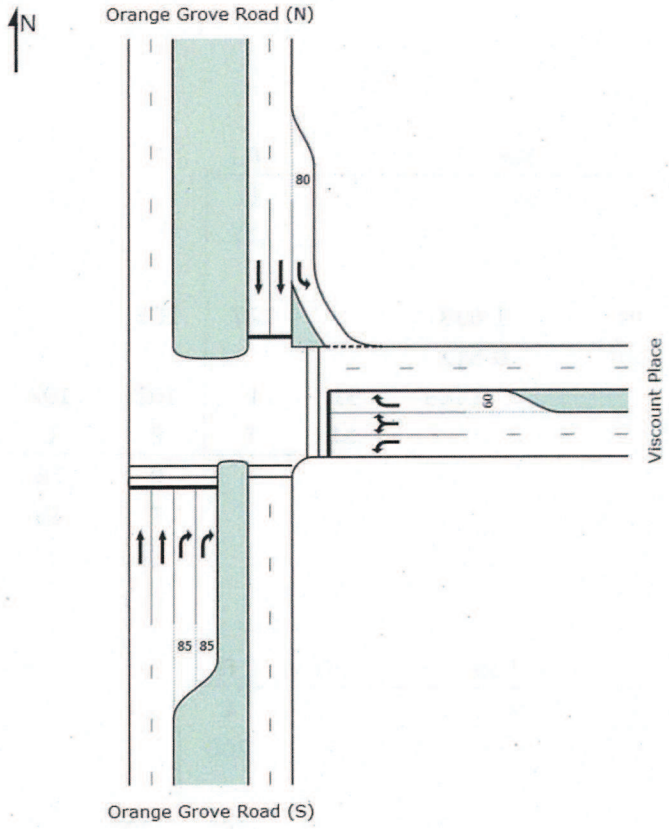


Figure 13 Sketch of Possible Layout

Table 14 presents a summary of the anticipated future operation of the intersection following development of the site and intersection upgrade specified in **Figure 12**. Full results are provided at Appendix A.

Table 14 Future Operating Level of Service (LOS) Orange Grove Road / Viscount Place

Intersection	Peak	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)	Cycle Time (sec)
Orange Grove Road / Viscount Place	Thursday PM	0.91	27	289	B	85
	Saturday Midday	0.98	42	499	C	100

On the basis of the above, the signalised intersection of Orange Grove Road and Viscount Place operates satisfactorily with the proposed change to intersection configuration. Favourable signal coordination has been assumed for this intersection (approaching from the south) due the proximity of the Orange Grove Road / O'Brian Parade intersection just over 250m away.

4.4.2 Homepride Parade / Hume Highway

Table 15 presents a summary of the anticipated future operation of the intersection following development of the site. Full results are provided at Appendix A.

Table 15 Existing Level of Service (LOS) Hume Highway / Homepride Avenue

Intersection	Peak	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)	Cycle Time (sec)
Hume Highway / Homepride Avenue	Thursday PM	0.83	17	181	B	90
	Saturday Midday	0.89	23	244	B	90

Based on the results shown above, the additional traffic generated by the proposed development could not be expected to compromise the safety or function of the assessed intersections.

5.0 Summary and Conclusions

The results of this assessment indicate that the amendment of part of the Homemaker Centre at The Grove Liverpool to accommodate additional retail development is unlikely to present a significant impact to the local transport network.

5.1 Vehicle Access

The site has strong connectivity to the sub-regional road network, including the Hume Highway (via Homepride Avenue and Orange Grove Road) as well as direct access to the Cumberland Highway (Orange Grove Road). Both roads are classified as Roads Maritime state roads.

The two primary access points will remain at the intersections of Viscount Place / Orange Grove Road and Homepride Avenue / Hume Highway. No additional accesses are proposed. In terms of the internal road network, it is anticipated that changes to the layout of Viscount Place are likely to be required to facilitate access to the proposed redeveloped Homemaker Centre at The Grove Liverpool. The nature and extent of changes to improve the transport network, along with parking requirements, can be reviewed at the Development Application Stage.

5.2 Public Transport

Chipping Norton, Wattle Grove, Moorebank plaza and Warwick Farm have only one service with a similar 30 minute peak and hourly off peak frequency (the off peak frequency also occurs on weekends in most cases). As such, it can be concluded that the bus service provision at the site is consistent with the majority of other similar centres within the Liverpool LGA.

Further discussion with bus operators and Transport for NSW may be required to determine the potential for improving public transport accessibility to the site. Increasing the number of visitors accessing the site by public transport will help to minimise the number of visitors arriving by private vehicles and help to reduce the traffic impacts of the proposed development.

5.3 Traffic Impacts

As a result of the proposed future development, a maximum of 1,658 additional vehicle movements could be generated by the site during the Thursday PM traffic peak, with 1,145 additional vehicle movements generated during the Saturday peak.

In order to accommodate this additional traffic, minor changes to the intersection configuration of Orange Grove Road / Viscount Place are required. With these changes, the intersection should operate with acceptable queuing and delays once the proposed development is constructed. The intersection of Hume Highway / Homepride Avenue should continue to operate satisfactorily.

Appendix A

SIDRA Outputs

SIDRA RESULTS

Homepride Avenue / Hume Highway (Existing)

MOVEMENT SUMMARY

Site: 2013 Sat - Existing

Hume Highway / Homepride Avenue
Signals - Fixed Time Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Hume Highway (E)											
5	T	1465	3.3	0.344	4.2	LOS A	7.2	52.2	0.37	0.33	52.1
6	R	103	1.9	0.633	54.1	LOS D	4.7	33.5	1.00	0.81	24.1
Approach		1568	3.3	0.633	7.5	LOS A	7.2	52.2	0.41	0.36	48.4
North: Homepride Avenue (N)											
7	L	120	3.3	0.245	14.1	LOS A	2.1	15.1	0.48	0.75	43.2
9	R	124	1.6	0.547	49.9	LOS D	5.4	38.1	0.99	0.79	25.4
Approach		244	2.5	0.547	32.3	LOS C	5.4	38.1	0.74	0.77	31.8
West: Hume Highway (E)											
10	L	87	4.6	0.065	9.2	LOS A	0.5	3.5	0.20	0.69	47.9
11	T	1359	2.1	0.600	12.6	LOS A	18.8	134.1	0.69	0.62	42.5
Approach		1446	2.3	0.600	12.4	LOS A	18.8	134.1	0.66	0.62	42.8
All Vehicles		3258	2.8	0.633	11.5	LOS A	18.8	134.1	0.54	0.51	44.1

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

MOVEMENT SUMMARY

Site: 2013 Thurs PM Peak

Hume Highway / Homepride Avenue
Signals - Fixed Time Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Hume Highway (E)											
5	T	1839	3.3	0.419	3.8	LOS A	9.1	65.6	0.37	0.34	52.6
6	R	77	1.9	0.473	52.7	LOS D	3.4	24.3	0.99	0.76	24.5
Approach		1916	3.3	0.473	5.8	LOS A	9.1	65.6	0.40	0.35	50.3
North: Homepride Avenue (N)											
7	L	85	3.3	0.176	11.5	LOS A	1.0	7.5	0.36	0.72	45.6
9	R	64	1.6	0.345	50.7	LOS D	2.8	19.6	0.97	0.75	25.1
Approach		149	2.6	0.345	28.4	LOS B	2.8	19.6	0.62	0.74	33.7
West: Hume Highway (E)											
10	L	58	4.6	0.042	9.1	LOS A	0.3	2.0	0.18	0.69	48.1
11	T	1127	2.1	0.479	10.3	LOS A	13.5	96.0	0.59	0.53	44.8
Approach		1185	2.3	0.479	10.2	LOS A	13.5	96.0	0.57	0.54	44.9
All Vehicles		3250	2.9	0.479	8.4	LOS A	13.5	96.0	0.47	0.44	47.2

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

Homepride Avenue / Hume Highway (Future)

MOVEMENT SUMMARY

Site: Sat - Future

Hume Highway / Homepride Avenue
Signals - Fixed Time Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Hume Highway (E)											
5	T	1470	3.0	0.355	1.0	LOS A	1.6	11.5	0.08	0.07	57.9
6	R	179	2.0	0.892	47.6	LOS D	6.9	49.0	0.85	0.88	26.0
Approach		1649	2.9	0.892	6.1	LOS A	6.9	49.0	0.16	0.16	51.1
North: Homepride Avenue (N)											
7	L	222	3.0	0.317	18.0	LOS B	4.9	35.1	0.60	0.78	40.1
9	R	226	1.0	0.840	55.8	LOS D	11.0	77.7	1.00	0.96	23.8
Approach		448	2.0	0.840	37.0	LOS C	11.0	77.7	0.80	0.87	29.7
West: Hume Highway (E)											
10	L	138	4.0	0.120	9.5	LOS A	1.0	6.9	0.24	0.71	47.5
11	T	1373	2.0	0.892	39.0	LOS C	34.3	244.4	1.00	1.07	27.7
Approach		1511	2.2	0.892	36.3	LOS C	34.3	244.4	0.93	1.04	28.8
All Vehicles		3608	2.5	0.892	22.6	LOS B	34.3	244.4	0.56	0.62	36.1

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

MOVEMENT SUMMARY

Site: Thurs PM Peak Future

Hume Highway / Homepride Avenue
Signals - Fixed Time Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Hume Highway (E)											
5	T	1857	3.0	0.422	0.9	LOS A	2.2	16.0	0.09	0.08	58.0
6	R	201	1.0	0.829	43.8	LOS D	6.9	49.0	0.79	0.90	27.2
Approach		2058	2.8	0.829	5.1	LOS A	6.9	49.0	0.16	0.16	52.2
North: Homepride Avenue (N)											
7	L	209	3.0	0.344	15.3	LOS B	3.8	27.6	0.52	0.76	42.2
9	R	147	1.0	0.789	56.2	LOS D	7.0	49.6	1.00	0.91	23.6
Approach		356	2.2	0.789	32.2	LOS C	7.0	49.6	0.72	0.82	31.8
West: Hume Highway (E)											
10	L	224	4.0	0.206	9.7	LOS A	1.7	12.6	0.26	0.72	47.4
11	T	1138	2.0	0.831	34.0	LOS C	25.5	181.4	0.98	0.97	29.6
Approach		1362	2.3	0.831	30.0	LOS C	25.5	181.4	0.86	0.93	31.5
All Vehicles		3776	2.6	0.831	16.6	LOS B	25.5	181.4	0.47	0.50	40.3

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

SIDRA Standard Delay Model used.

Orange Grove Road / Viscount Place (Existing)

MOVEMENT SUMMARY

Site: 2013 Thursday PM Peak

Orange Grove Road and Viscount Place 2013 Weekday PM Peak
Signals - Fixed Time Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Orange Grove Road (S)											
2	T	1714	3.0	0.576	4.3	LOS A	14.9	107.2	0.44	0.40	59.2
3	R	131	0.0	0.529	55.9	LOS D	3.0	21.1	1.00	0.76	24.1
Approach		1845	2.8	0.576	7.9	LOS A	14.9	107.2	0.48	0.43	54.1
East: Viscount Place											
4	L	156	0.0	0.550	40.3	LOS C	5.9	41.5	0.89	0.79	27.3
6	R	225	0.0	0.681	53.8	LOS D	5.2	36.4	1.00	0.85	23.7
Approach		381	0.0	0.681	48.3	LOS D	5.9	41.5	0.96	0.82	25.1
North: Orange Grove Road (N)											
7	L	189	0.0	0.189	10.8	LOS A	1.8	12.6	0.24	0.72	50.4
8	T	1706	3.0	0.692	11.0	LOS A	23.8	171.0	0.70	0.64	49.4
Approach		1895	2.7	0.692	10.9	LOS A	23.8	171.0	0.65	0.65	49.5
All Vehicles		4121	2.5	0.692	13.0	LOS A	23.8	171.0	0.60	0.57	47.1

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

MOVEMENT SUMMARY

Site: 2013 Saturday Peak

Orange Grove Road and Viscount Place 2013 Saturday Peak
Signals - Fixed Time Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Orange Grove Road (S)											
2	T	1535	3.0	0.553	1.1	LOS A	3.1	22.5	0.11	0.10	66.8
3	R	460	0.0	0.826	49.5	LOS D	9.6	67.5	1.00	0.92	26.0
Approach		1995	2.3	0.826	12.3	LOS A	9.6	67.5	0.32	0.29	50.2
East: Viscount Place											
4	L	355	0.0	0.917	36.5	LOS C	12.6	81.6	0.88	0.89	28.6
6	R	386	0.0	0.831	51.0	LOS D	8.4	54.9	1.00	1.00	24.4
Approach		741	0.0	0.917	44.1	LOS D	12.6	81.6	0.94	0.95	26.2
North: Orange Grove Road (N)											
7	L	569	0.0	0.660	14.9	LOS B	9.5	66.6	0.52	0.79	45.9
8	T	1742	3.0	0.911	36.3	LOS C	42.1	302.3	0.99	1.12	31.6
Approach		2311	2.3	0.911	31.0	LOS C	42.1	302.3	0.88	1.04	34.0
All Vehicles		5047	1.9	0.917	25.5	LOS B	42.1	302.3	0.66	0.73	37.1

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

Orange Grove Road / Viscount Place (Future)

MOVEMENT SUMMARY

Site: Thursday PM Peak Ultimate Future

Orange Grove Road and Viscount Place Ultimate Weekday PM Peak
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Orange Grove Road (S)											
2	T	1731	3.0	0.663	8.4	LOS A	20.6	148.2	0.63	0.58	52.6
3	R	338	0.0	0.859	57.8	LOS E	8.0	56.3	1.00	0.98	23.6
Approach		2069	2.5	0.859	16.4	LOS B	20.6	148.2	0.69	0.64	44.5
East: Viscount Place											
4	L	405	0.0	0.618	32.4	LOS C	14.0	98.3	0.88	0.84	30.1
6	R	598	0.0	0.912	56.3	LOS D	15.5	108.7	1.00	1.07	23.1
Approach		1003	0.0	0.912	46.7	LOS D	15.5	108.7	0.95	0.98	25.5
North: Orange Grove Road (N)											
7	L	521	0.0	0.453	9.9	LOS A	4.6	32.5	0.33	0.70	51.2
8	T	1723	3.0	0.890	32.1	LOS C	40.2	288.5	0.97	1.04	33.5
Approach		2244	2.3	0.890	27.0	LOS B	40.2	288.5	0.82	0.96	36.2
All Vehicles		5316	1.9	0.912	26.6	LOS B	40.2	288.5	0.80	0.84	35.9

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

MOVEMENT SUMMARY

Site: Saturday Peak Ultimate - Scenario Testing

Orange Grove Road and Viscount Place Ultimate Saturday Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Orange Grove Road (S)											
2	T	1550	3.0	0.563	1.4	LOS A	4.0	28.7	0.12	0.11	66.2
3	R	671	0.0	0.951	68.3	LOS E	19.8	138.7	1.00	1.00	21.1
Approach		2221	2.1	0.951	21.6	LOS B	19.8	138.7	0.38	0.38	41.4
East: Viscount Place											
4	L	498	0.0	0.654	28.1	LOS B	19.6	127.3	0.87	0.81	21.7
6	R	550	0.0	0.925	66.1	LOS E	16.9	109.9	1.00	1.07	21.1
Approach		1048	0.0	0.925	48.1	LOS D	19.6	127.3	0.94	0.95	21.3
North: Orange Grove Road (N)											
7	L	854	0.0	0.976	15.3	LOS B	18.7	130.6	0.59	0.79	45.5
8	T	1759	3.0	0.978	77.7	LOS F	69.5	498.7	1.00	1.38	20.2
Approach		2613	2.0	0.978	57.3	LOS E	69.5	498.7	0.87	1.19	24.3
All Vehicles		5882	1.7	0.978	42.2	LOS C	69.5	498.7	0.70	0.84	28.3

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