LOKA CONSULTING ENGINEERS PTY LTD
OFFICE: 14A, 8 AVENUE OF THE AMERICAS, NEWINGTON, NSW 2127
PHONE: 02 8065 9689 FAX: 02 8065 9690
MOBILE: 0404 142 063
EMAIL: info@Lceng.com.au
WEB: www.Lceng.com.au

Job Number: **18NL157– TIR1** Date: **06th July, 2018**

Traffic and Transport Impact Assessment for 23-29 Harvey Avenue, Moorebank, NSW

Prepared by

LOKA CONSULTING ENGINEERS

Nermein Loka

BSC, ME, MIE(AUST), CPEng, NPER,RPEQ, APEC, IPEA

Senior Civil Engineer

Accredited Certifier

Director

Table of Contents

1. Introduction

Loka Consulting Engineers Pty Ltd has been engaged by Pagano Architects to provide Traffic and Transport Impact Assessment Report for the site at 23-29 Harvey Avenue, Moorebank, NSW (refer to Figure 1-1 and Figure 1-2) for development of a residential flat building.

A Traffic and Transport Impact Assessment Report is required for the proposed development to identify the impacts of the proposal on the local street network and mitigation measures required to ameliorate any impacts. This includes:

- A description of the site and details of the development proposal;
- A review of the road network in the vicinity of the site, and traffic conditions on that road network;
- Intersection performance based on traffic counts;
- An assessment of the adequacy and suitability of the quantum of on-street car parking provided on site; and
- Availability of public transport

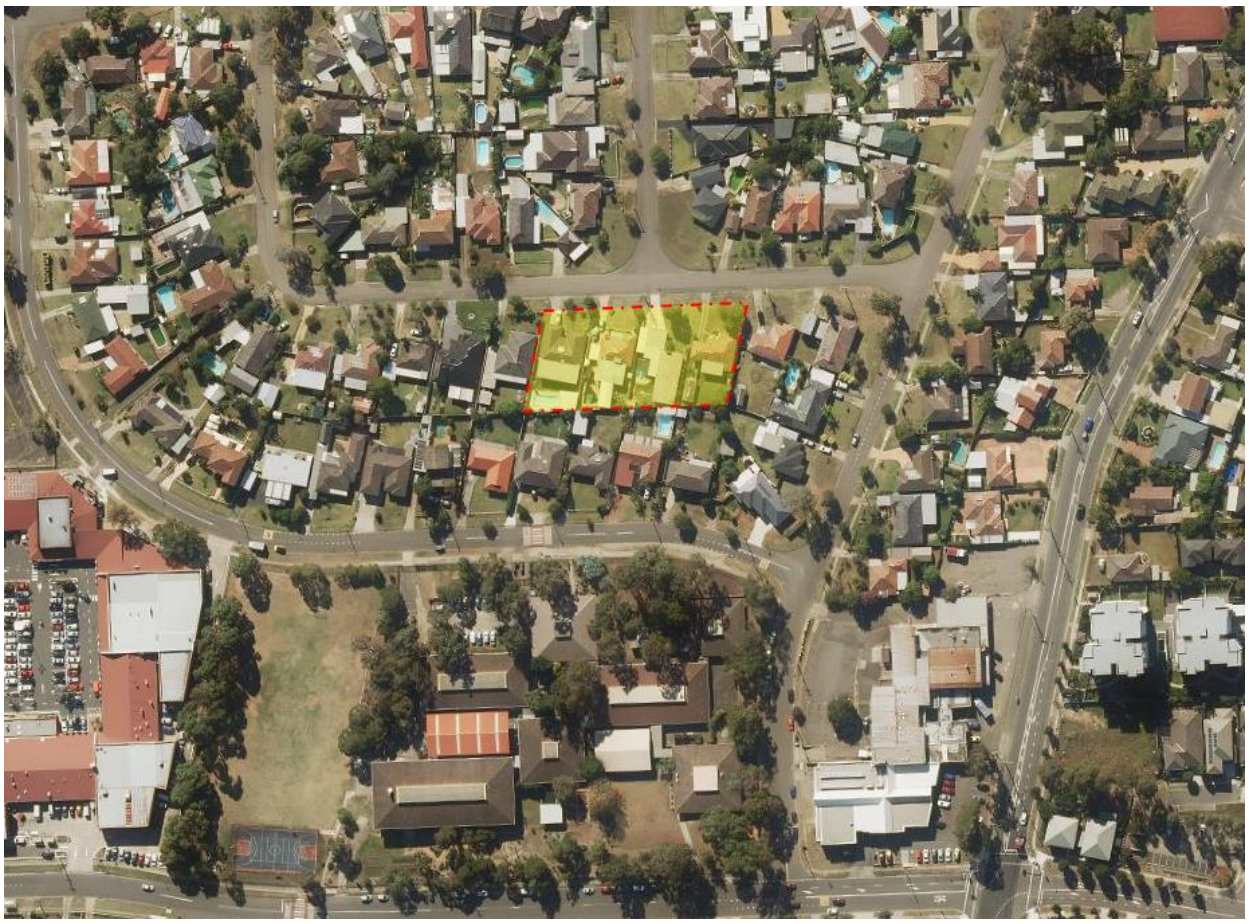


Figure 1-1 Subject Site (Source: Six Map)

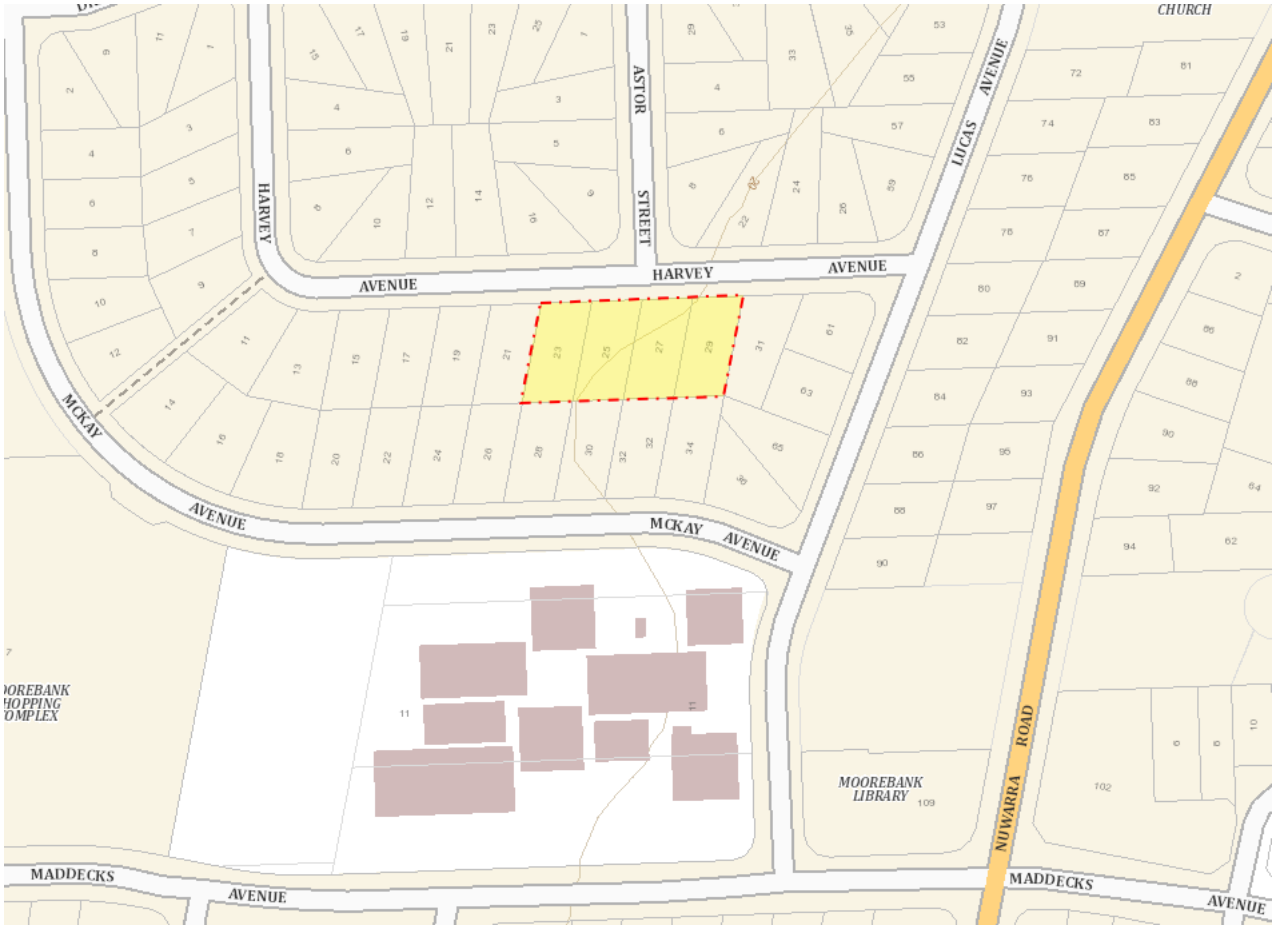


Figure 1-2 Subject Site (Source: Six Map)

2. Existing Conditions

2.1.Existing Development

The current site consists of 4 dwelling house, with a total site area of approximately 2745.2 m^2.

2.2.Existing Road Conditions

The proposed development is bounded by

- 31 Harvey Ave on the East,
- 21 Harvey Ave on the West,
- Harvey Ave on the North, and
- 28-34 McKay Ave on the South.

There are 4 vehicular access to the site, all from Harvey Ave.
To access the site, the driver have to travel along Harvey Ave.

Harvey Avenue

Harvey Avenue is an unclassified local road by NSW Roads & Maritime Services.

Harvey Avenue is approximately 6 metres wide kerbs and gutters on both sides. It provides linkage from Dredge Avenue to Lucas Avenue. It has one travel lane in each direction.

Dredge Avenue

Dredge Avenue is an unclassified local road by NSW Roads & Maritime Services.

Dredge Avenue is approximately 8 metres wide with kerbs and gutters on both sides. It is a cul-de-sac starting from Stockton Avenue. It has one travel lane in each direction.

Astor Street

Astor Street is an unclassified local road by NSW Roads & Maritime Services.

Astor Street is approximately 6 metres wide with kerb and gutter on both sides. It provides linkage from Dredge Avenue to Harvey Avenue. It has one travel lane in each direction.

3. Traffic Flows and Volumes

3.1.Daily Traffic Data

Road and Maritime Service (RMS) collect traffic volume information from roadside traffic collection devices across the NSW network.

From RMS's average daily traffic volume map the nearest traffic counting station is station ID 7149 at 30m West of Henry Lawson Drive, Milperra 2214 located approximately 3.1km East of the subject site.

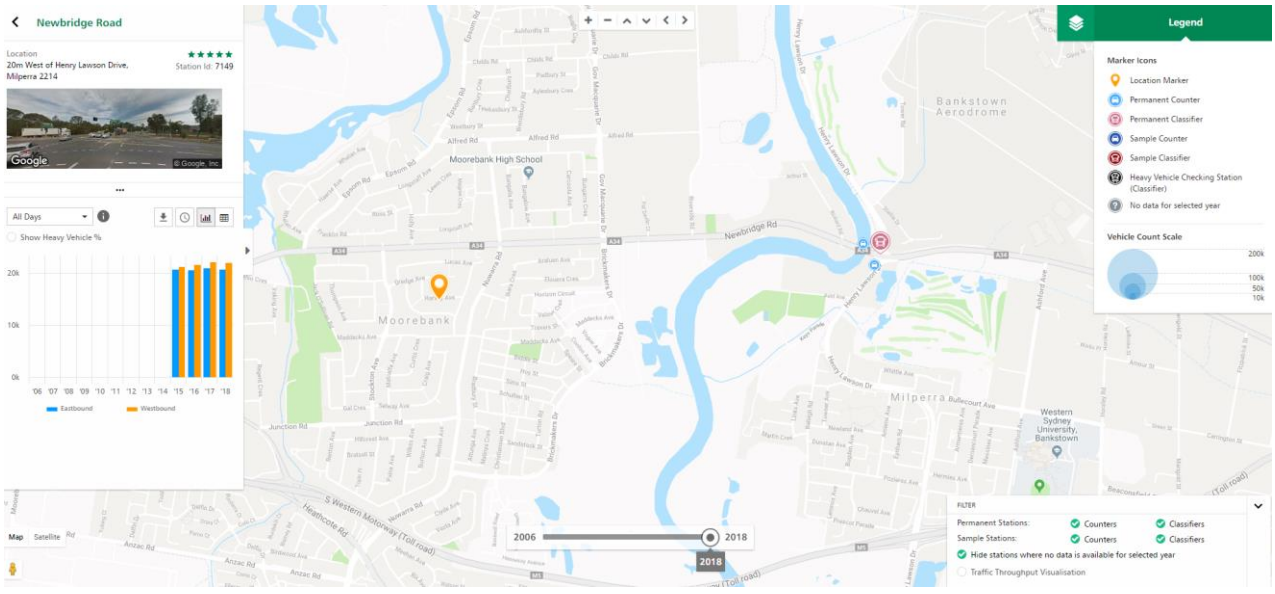


Figure 3-1 Traffic Count Station

From the counts undertaken at Station ID 7149 in 2018 all days total of 22,171 vehicles Westbound and 20,783 vehicles Eastbound were counted on average per day passing across Newbridge Road.

3.2.Traffic Survey

Traffic Counts were undertaken during the morning and afternoon peak periods to gauge the performance of the current road system.

Traffic Survey is performed by BVY Trans Traffic Survey Pty Ltd on Tuesday 3rd of July, 2018 at two (2) locations simultaneously: T-junction at Dredge Avenue and Harvey Avenue, and Astor St and Harvey Avenue in the morning between 7:00am to 9:00am and in the afternoon between 5:00pm to 7:00pm.

Figure 3-2 Locations of Traffic Survey

The full result of the traffic analysis are summarised in Figures below.

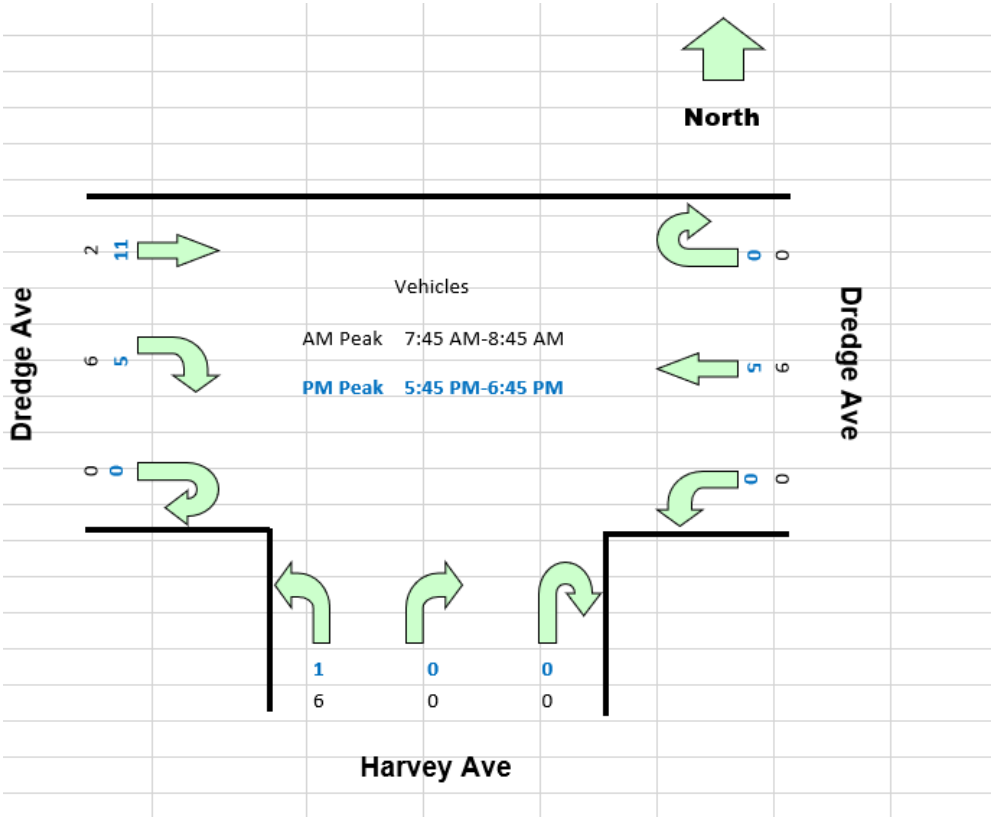


Figure 3-3 Traffic Survey at Dredge Ave and Harvey Ave T-junction

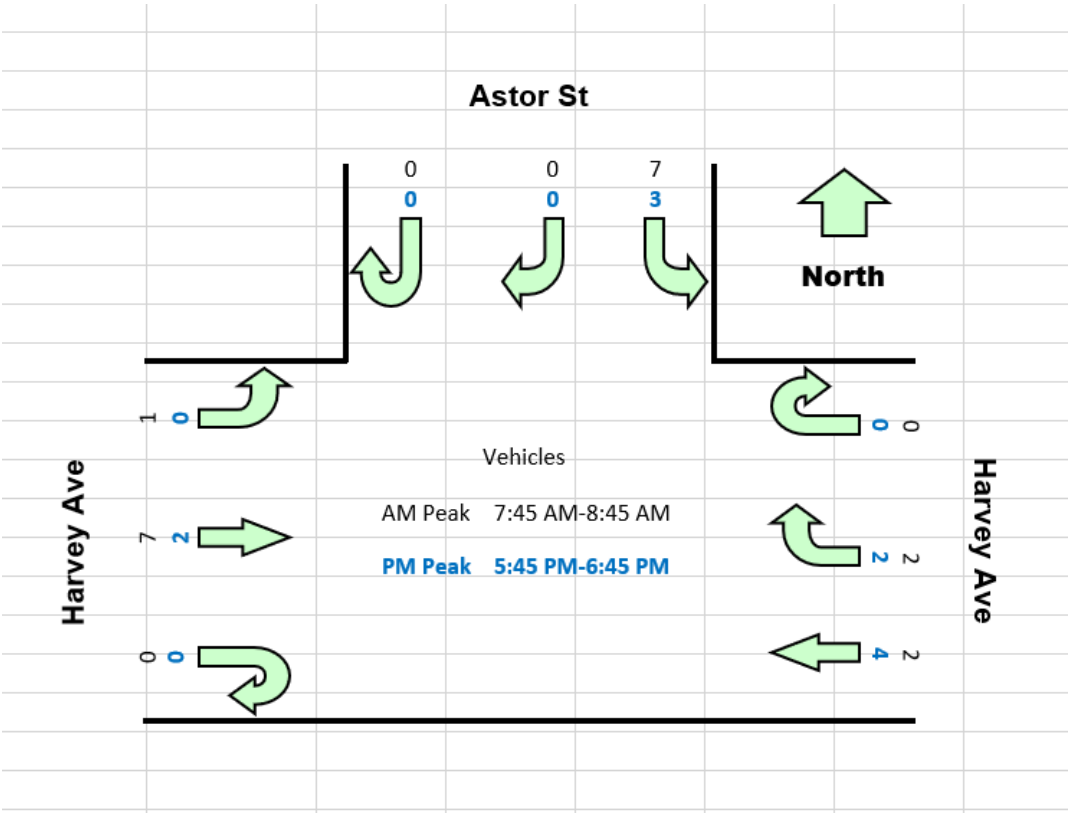


Figure 3-4 Traffic Survey at Harvey Ave and Astor St T-junction

3.3.Existing Road Service Level

It is proposed that Harvey Ave, Dredge Ave, and Astor St will be most affected by the proposed development.

The capacity of the urban road is generally determines by the capacity of intersections. Table 4.3 and 4.4 of the RMS's 'Guide to Traffic Generating Developments' provide guidance on mid-block capacities for urban roads and likely levels of service. The tables are reproduced below.

Type of Road	**One-Way Mid-block Lane Capacity (pcu/hr)**	
Median or inner lane	Divided Road	1000
	Undivided Road	900
Outer or kerb lane	With Adjacent Parking Lane	900
	Clearway Conditions	900
	Occasional Parked Cars	600
4 lane undivided	Occasional Parked Cars	1500
	Clearway Conditions	1800
4 lane divided	Clearway Conditions	1900

Level of Service (per direction)	**One Lane (veh/hr)**	**Two Lanes (veh/hr)**
A	200	900
B	380	1400
C	600	1800
D	900	2200
E	1400	2800

Harvey Avenue

Based on the traffic analysis and roadside environment (occasional parked cars), it is considered that Harvey Avenue operates within the mid-block capacity for an urban road with interrupted flow. Harvey Avenue is currently functioning at a level of service **A** in peak hour conditions (at maximum **8 vehicles in one lane at peak hour**).

The RMS guide states a service level A, '*This, the top level is a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.'*

Dredge Avenue

Based on the traffic analysis and roadside environment (occasional parked cars), it is considered that Dredge Avenue operates within the mid-block capacity for an urban road with interrupted flow. Dredge Avenue is currently functioning at a level of service **A** in peak hour hour conditions (at maximum **16 vehicles in one lane at peak hour**).

The RMS guide states a service level A, '*This, the top level is a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.'*

Astor Street

Based on the traffic analysis and roadside environment (clearway conditions), it is considered that Astor Street operates within the mid-block capacity for an urban road with interrupted flow. Astor Street is currently functioning at a level of service **A** in peak hour hour conditions (at maximum **7 vehicles in one lane at peak hour**).

The RMS guide states a service level A, '*This, the top level is a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.'*

3.4.Intersection Assessment

The existing intersection operating performance of the two (2) surveyed intersections for the weekday morning and afternoon peak hours were assessed using the SIDRA software package (version 5.1) to determine the Degree of Saturation (DS), Average Delay (AVD in seconds) and Level of Service (LoS) at each intersection.

SIDRA program provides Level of Service Criteria Table as below.

LoS	Traffic Signal / Roundabout	Give Way / Stop Sign / T-Junction control
A	Good operation	Good operation
B	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	Satisfactory	Satisfactory, but accident study required
D	Operating near capacity	Near capacity & accident study required
E	At capacity, at signals incidents will cause excessive delays.	At capacity, requires other control mode
F	Unsatisfactory and requires additional capacity, Roundabouts require other control mode	At capacity, requires other control mode

The Average Vehicle Delay (AVD) provides a measure of the operational performance of an intersection as indicated below, which relates AVD to LOS. The AVD's should be taken as a guide only as longer delays could be tolerated in some locations (i.e. inner city conditions) and on some roads (i.e. minor side street intersecting with a major arterial route). For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (sign control) the critical movement for level of service assessment should be that movement with the highest average delay.

LoS	Average Delay per Vehicles (seconds/vehicle)
A	Less than 14
B	15 to 28
C	29 to 45-49
D	43 to 56
E	57 to 70
F	>70

The degree of saturation (DS) is another measure of the operational performance of individual intersections. For intersections controlled by traffic signals, both queue length and delay increase rapidly as DS approaches 1. It is usual to attempt to keep DS to less than 0.9. Degrees of Saturation in the order of 0.7 generally represent satisfactory intersection operation. When DS exceed 0.9 queues can be anticipated.

The full SIDRA outputs are presented in the Appendix for the existing conditions as well as proposed conditions.

3.5.Public Transport, Pedestrians and Cyclists

The area is well connected to public transport, with bus stations located in close proximity to the site.

1. It takes 5 minutes walking (400m) from the site to 230 Newbridge Rd bus stop (refer to figure 2-1).
2. It takes 5 minutes walking (400m) from the site to Nuwarra Public School, Maddecks Ave bus stop (refer to figure 2-2).

Table 3-1 shows the bus line name; routes and the time between two successive trips. Refer to Transport NSW for accurate details.

Bus stop	Line Name	Route	Weekday interval	Weekday hours	Weekend interval	Weekend hours
1	903	Liverpool to Chipping Norton (Loop Service)	60min	06:20 – 19:05	120min	09:17 – 17:17
	M90	Burwood to Liverpool	15min	05:06 – 22:51	20min	07:32 – 20:00
2	902	Holsworthy to Liverpool via Moorebank	30min	05:35 – 20:52	60min	15:30 – 18:30
	902X	Sandy Point to Holsworth via Voyager Point	90min	07:22 – 8:00		

Table 3-1 Bus line, route, and time

Bus Network map is attached in Appendix B.

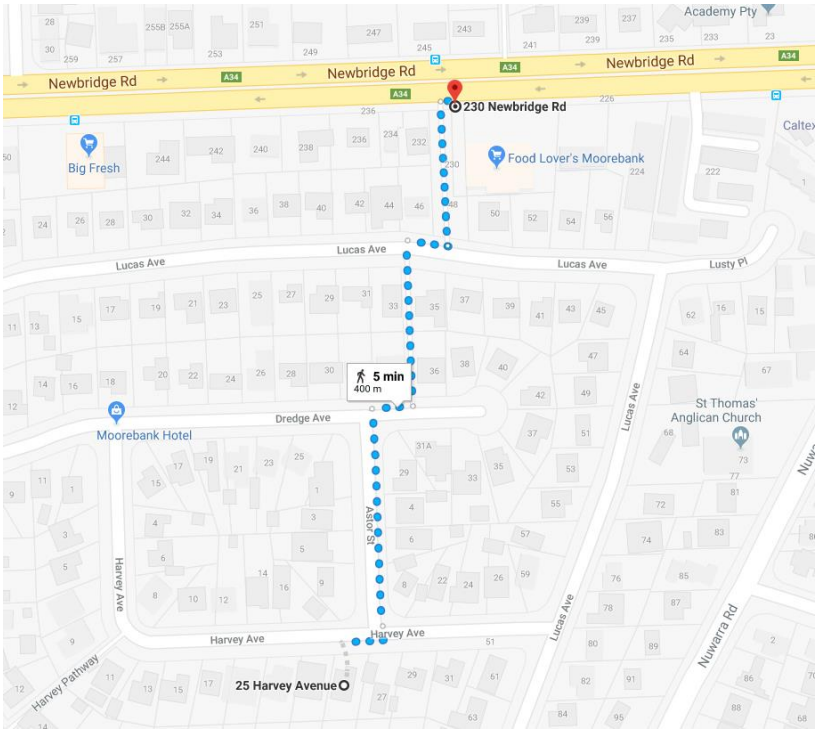


Figure 3-3 Subject Site to nearest bus stop

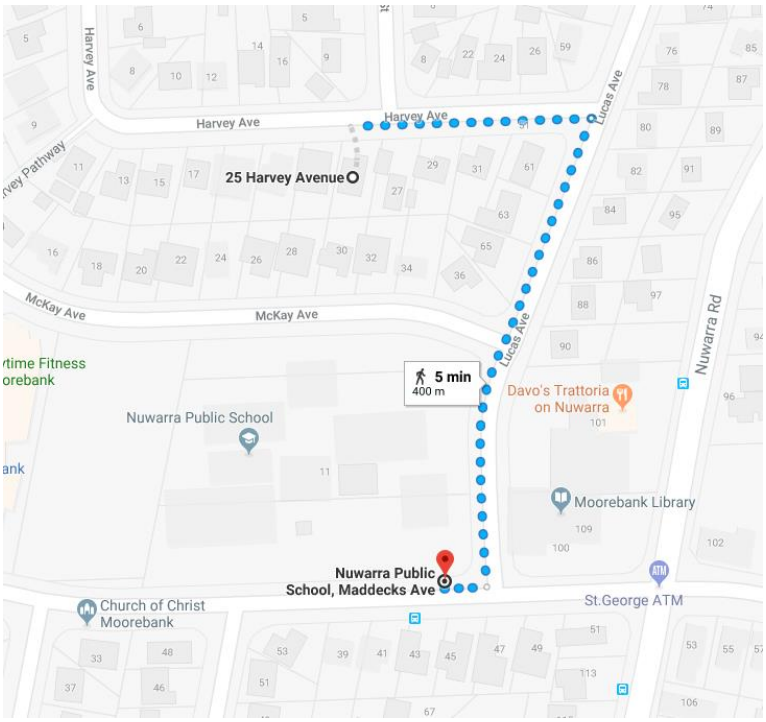


Figure 3-4 Subject Site to nearest bus stop

The site is accessible to bus transportation, shops and restaurants. This would decrease the need for staff, residents and their visitors of the proposed development to use private transportation to and from their various activities.

4. Proposed Development

4.1.Development Description

The proposed development will facilitate the construction of a residential flat building with a site area of approximately 3553 m^2.

The development consists of 2 basement levels, 1 ground level and 5 upper levels. The 2 basement levels will be used primarily as car parking with entry from Harvey Ave. Ground level and 5 upper levels will be used for residence. Total units proposed is 58.

4.2.Access

The proposed entry/exit to the car parking area is only available on Harvey Avenue. By walking and bicycling, residents have two accesses to the building which are both on Harvey Avenue.

5. Traffic Generation

An indication of the traffic generation potential of the development proposal is provided in accordance with Roads and Maritime Services (RMS) publication 'Guide to Traffic Generating Developments – Updated traffic surveys (August 2013)'.

RMS guidelines are based on an extensive survey of a wide range of land uses. The subject site is identified as High density residential flat building.

High Density Residential Flat Building

Metropolitan Sub-Regional Centres

Daily vehicle trips = not available.
Peak hour vehicle trips = 0.29 trips per unit.

For the subject site, there are 58 units in total. Therefore, there is a traffic generation potential of maximum 17 vehicles generated per hour during week peak hour. This value should be discounted by the expected existing volume of traffic, to determine the net increase (or decrease) in future expected traffic.

Based on RMS guidelines, the existing site is identified as 4 dwelling houses. Hence, the following is expected:

Dwelling house rates

Daily vehicle trips = 9 per dwelling
Weekday peak hour vehicle trips = 0.85 per dwelling

For the existing site, there is a total traffic generation potential of approximately 4 vehicles per hour during peak hour periods. This is shown in Table 5-1 below.

Traffic Generation Potential	Land Use	Vehicle Trips Peak Hour
Future	Residential Flats	17
Existing	Dwelling house	4
Net increase		**+13**

Table 5-1 Project Net Increase in Peak Hour Traffic Generation Potential

According to the Table above, it is likely that the proposed development will result in a change in the traffic generation by approximately **13 additional** vehicle trips during weekday peak hours.

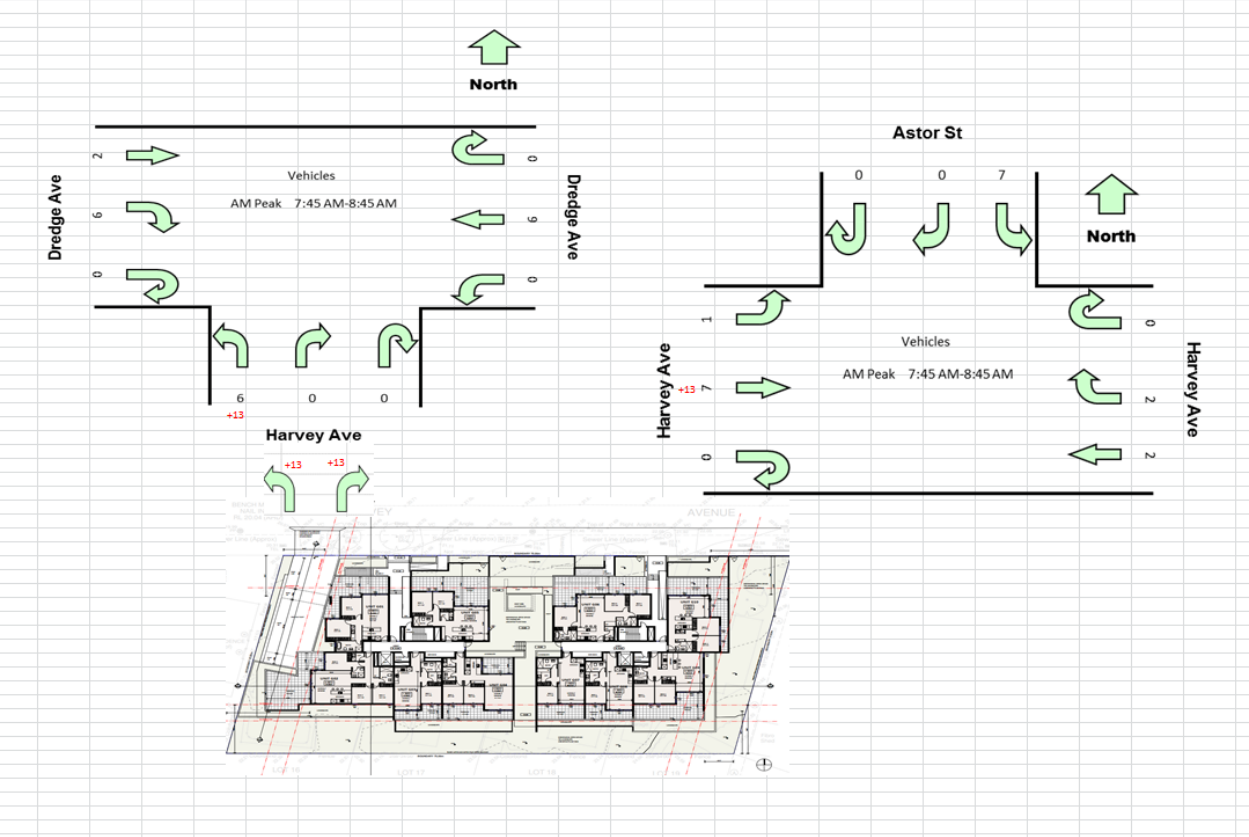


Figure 5-1 Proposed Traffic Generated by the propose development after construction at morning peak hour

Figure 5-2 Proposed Traffic Generate by the development after construction at evening peak hour

The proposed traffic generation of 13 additional vehicle trips is applied to both left and right entry/exit of the development to conservatively determine the impact of the additional traffic to the surrounding intersection and road network.

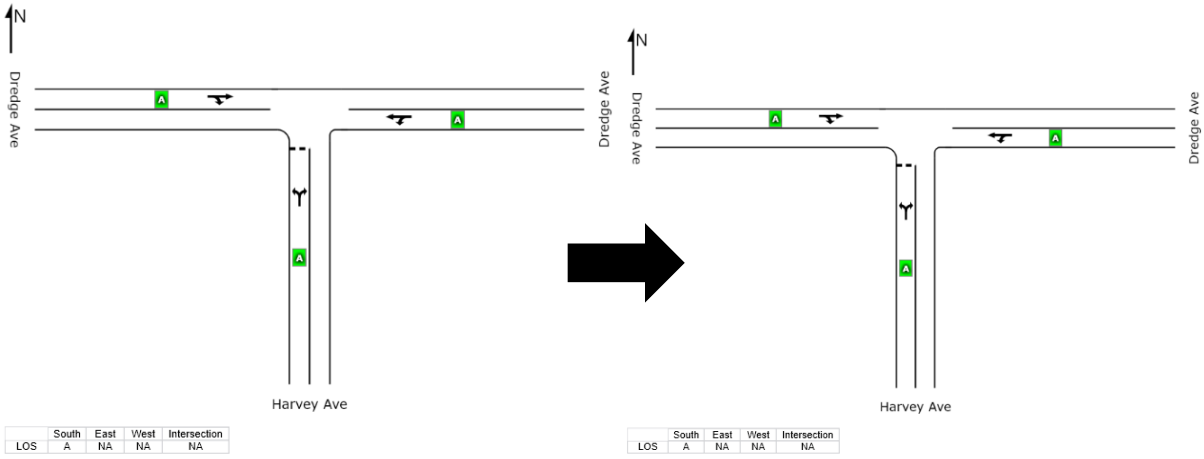
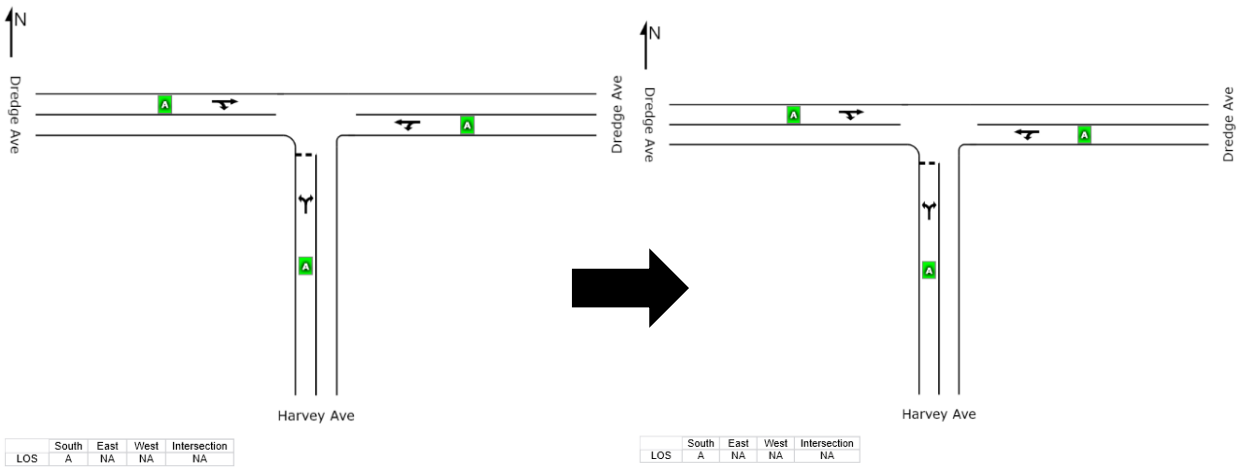


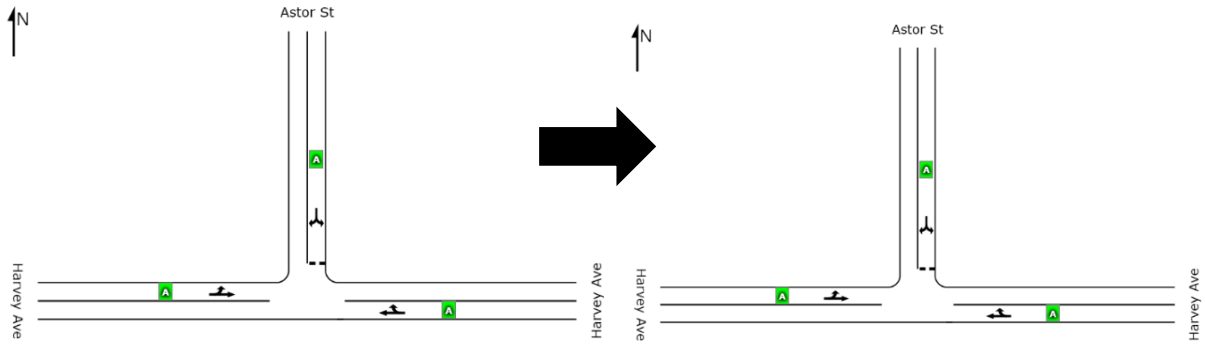
Figure 5-1: Level of Service pre and post construction at Dredge Ave-Harvey Ave in the morning



	South	East	West	Intersection
LOS	A	NA	NA	NA

	South	East	West	Intersection
LOS	A	NA	NA	NA

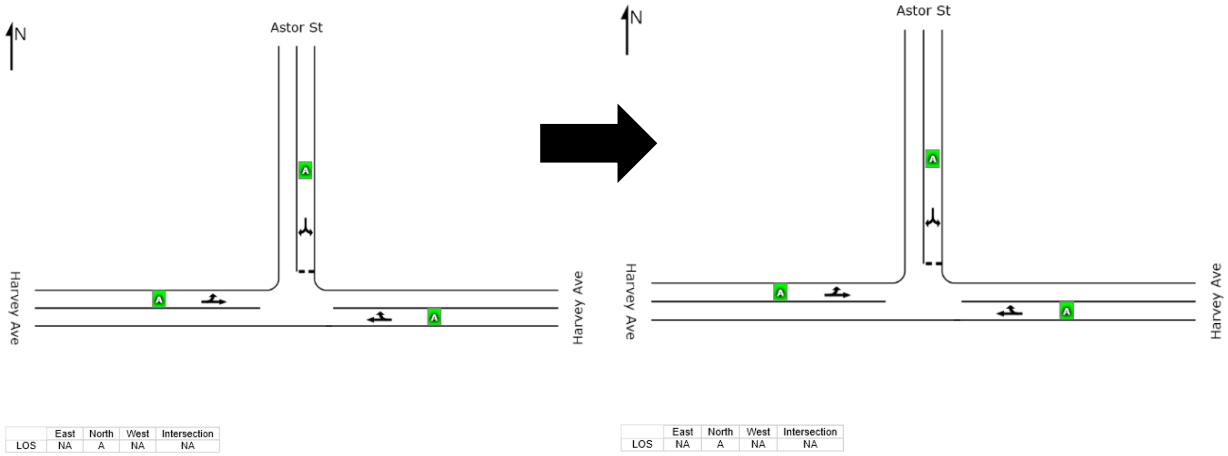
Figure 5-2: Level of Service pre and post construction at Dredge Ave-Harvey Ave in the evening



	East	North	West	Intersection
LOS	NA	A	NA	NA

	East	North	West	Intersection
LOS	NA	A	NA	NA

Figure 5-3: Level of Service pre and post construction at Harvey Ave-Astor St in the morning



	East	North	West	Intersection
LOS	NA	A	NA	NA

	East	North	West	Intersection
LOS	NA	A	NA	NA

Figure 5-4: Level of Service pre and post construction at Harvey Ave-Astor St in the evening

For the proposed development, in general, Traffic Generation by the development does not affect the Level of Service on the intersections: Dredge Avenue-Harvey Avenue and Harvey Avenue-Astor Street. The level of service remains at A for both pre and post construction. Detailed results from SIDRA are attached in Appendix A.

6. Conclusion

This Traffic and Transport Impact Assessment Report has been prepared in accordance with the requirement of the RMS 'Guide to Traffic Generating Developments'.

Although there's a minor increase in net traffic of 13 vehicle trips in the morning and in the evening generated by the development, the Level of Service at Dredge Avenue, Harvey Avenue and Astor Avenue will remain unchanged. The traffic generated by the development does not have any major impact to the surrounding traffic network.

The site is well located to public bus transportation and shopping areas. This would minimise the need for residents and their visitors and council/commercial staff and their customers of the proposed development to drive their own vehicles to and from their various activities.

The Traffic and Parking Impact Assessment concludes that the propose residential development is suitable for the subject location in relation to the impact of traffic, car parking provision, vehicle and pedestrian access and safety considerations.

APPENDIX A

Table A-2: Traffic Movement Performance

MOVEMENT SUMMARY

Site: Dredge Ave - Harvey Ave Morning Pre-development

Dredge Ave-Harvey Ave
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Harvey Ave											
1	L	6	0.0	0.005	6.4	LOS A	0.0	0.1	0.05	0.58	43.1
3	R	1	0.0	0.005	6.6	LOS A	0.0	0.1	0.05	0.63	43.0
Approach		7	0.0	0.005	6.5	LOS A	0.0	0.1	0.05	0.59	43.1
East: Dredge Ave											
4	L	1	0.0	0.005	6.4	LOS A	0.0	0.0	0.00	0.88	43.3
5	T	9	0.0	0.005	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		11	0.0	0.005	0.6	NA	0.0	0.0	0.00	0.09	49.2
West: Dredge Ave											
11	T	2	0.0	0.008	0.1	LOS A	0.0	0.3	0.08	0.00	48.8
12	R	6	0.0	0.008	6.7	LOS A	0.0	0.3	0.08	0.66	42.9
Approach		8	0.0	0.008	5.1	NA	0.0	0.3	0.08	0.49	44.2
All Vehicles		26	0.0	0.008	3.7	NA	0.0	0.3	0.04	0.36	45.8

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

Table A-2: Traffic Movement Performance

MOVEMENT SUMMARY

Site: Dredge Ave - Harvey Ave Morning Post-development

Dredge Ave-Harvey Ave
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Harvey Ave											
1	L	20	0.0	0.015	6.4	LOS A	0.1	0.4	0.05	0.59	43.1
3	R	1	0.0	0.015	6.6	LOS A	0.1	0.4	0.05	0.63	43.0
Approach		21	0.0	0.015	6.5	LOS A	0.1	0.4	0.05	0.59	43.1
East: Dredge Ave											
4	L	1	0.0	0.005	6.4	LOS A	0.0	0.0	0.00	0.88	43.3
5	T	9	0.0	0.005	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		11	0.0	0.005	0.6	NA	0.0	0.0	0.00	0.09	49.2
West: Dredge Ave											
11	T	2	0.0	0.008	0.2	LOS A	0.0	0.3	0.10	0.00	48.5
12	R	6	0.0	0.008	6.8	LOS A	0.0	0.3	0.10	0.65	42.9
Approach		8	0.0	0.008	5.1	NA	0.0	0.3	0.10	0.49	44.1
All Vehicles		40	0.0	0.015	4.6	NA	0.1	0.4	0.05	0.44	44.8

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

Table A-3: Traffic Movement Performance

MOVEMENT SUMMARY

Site: Dredge Ave - Harvey Ave Evening Pre-development

Dredge Ave-Harvey Ave
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Harvey Ave											
1	L	1	0.0	0.001	6.5	LOS A	0.0	0.0	0.04	0.58	43.2
3	R	1	0.0	0.001	6.6	LOS A	0.0	0.0	0.04	0.63	43.0
Approach		2	0.0	0.001	6.6	LOS A	0.0	0.0	0.04	0.60	43.1
East: Dredge Ave											
4	L	1	0.0	0.003	6.4	LOS A	0.0	0.0	0.00	0.85	43.3
5	T	5	0.0	0.003	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		6	0.0	0.003	1.1	NA	0.0	0.0	0.00	0.14	48.7
West: Dredge Ave											
11	T	12	0.0	0.012	0.1	LOS A	0.1	0.5	0.06	0.00	49.2
12	R	5	0.0	0.012	6.7	LOS A	0.1	0.5	0.06	0.80	43.0
Approach		17	0.0	0.012	2.1	NA	0.1	0.5	0.06	0.25	47.1
All Vehicles		25	0.0	0.012	2.2	NA	0.1	0.5	0.04	0.25	47.1

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

Table A-4: Traffic Movement Performance

MOVEMENT SUMMARY

Site: Dredge Ave - Harvey Ave Evening Post-development

Dredge Ave-Harvey Ave
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Harvey Ave											
1	L	1	0.0	0.001	6.5	LOS A	0.0	0.0	0.03	0.58	43.2
3	R	1	0.0	0.001	6.7	LOS A	0.0	0.0	0.03	0.63	43.0
Approach		2	0.0	0.001	6.6	LOS A	0.0	0.0	0.03	0.61	43.1
East: Dredge Ave											
4	L	1	0.0	0.003	6.4	LOS A	0.0	0.0	0.00	0.85	43.3
5	T	5	0.0	0.003	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		6	0.0	0.003	1.1	NA	0.0	0.0	0.00	0.14	48.7
West: Dredge Ave											
11	T	12	0.0	0.027	0.1	LOS A	0.1	0.9	0.05	0.00	49.2
12	R	19	0.0	0.027	6.7	LOS A	0.1	0.9	0.05	0.70	43.0
Approach		31	0.0	0.027	4.2	NA	0.1	0.9	0.05	0.43	45.1
All Vehicles		39	0.0	0.027	3.8	NA	0.1	0.9	0.04	0.40	45.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

Table A-5: Traffic Movement Performance

MOVEMENT SUMMARY

Site: Harvey Ave-Astor St Morning Pre-development

Harvey Ave - Astor St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Harvey Ave											
5	T	2	0.0	0.003	0.1	LOS A	0.0	0.1	0.07	0.00	48.9
6	R	2	0.0	0.003	8.5	LOS A	0.0	0.1	0.07	0.76	48.5
Approach		4	0.0	0.003	4.3	NA	0.0	0.1	0.07	0.38	48.7
North: Astor St											
7	L	7	0.0	0.007	8.2	LOS A	0.0	0.2	0.05	0.64	48.7
9	R	1	0.0	0.007	8.4	LOS A	0.0	0.2	0.05	0.69	48.5
Approach		8	0.0	0.007	8.2	LOS A	0.0	0.2	0.05	0.65	48.7
West: Harvey Ave											
10	L	1	0.0	0.004	8.2	LOS A	0.0	0.0	0.00	0.87	49.0
11	T	7	0.0	0.004	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		8	0.0	0.004	1.0	NA	0.0	0.0	0.00	0.11	49.9
All Vehicles		21	0.0	0.007	4.6	NA	0.0	0.2	0.03	0.38	49.2

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

Table A-6: Traffic Movement Performance

MOVEMENT SUMMARY

Site: Harvey Ave-Astor St Morning Post-development

Harvey Ave - Astor St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Harvey Ave											
5	T	2	0.0	0.004	0.2	LOS A	0.0	0.1	0.12	0.00	48.3
6	R	2	0.0	0.004	8.6	LOS A	0.0	0.1	0.12	0.74	48.4
Approach		4	0.0	0.004	4.4	NA	0.0	0.1	0.12	0.37	48.3
North: Astor St											
7	L	7	0.0	0.007	8.3	LOS A	0.0	0.2	0.08	0.63	48.6
9	R	1	0.0	0.007	8.5	LOS A	0.0	0.2	0.08	0.68	48.4
Approach		8	0.0	0.007	8.3	LOS A	0.0	0.2	0.08	0.63	48.6
West: Harvey Ave											
10	L	1	0.0	0.011	8.2	LOS A	0.0	0.0	0.00	0.89	49.0
11	T	21	0.0	0.011	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		22	0.0	0.011	0.4	NA	0.0	0.0	0.00	0.04	49.9
All Vehicles		35	0.0	0.011	2.8	NA	0.0	0.2	0.03	0.23	49.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

Table A-7: Traffic Movement Performance

MOVEMENT SUMMARY

Site: Harvey Ave-Astor St Evening Pre-development

Harvey Ave - Astor St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Harvey Ave											
5	T	4	0.0	0.005	0.0	LOS A	0.0	0.2	0.05	0.00	49.4
6	R	2	0.0	0.005	8.4	LOS A	0.0	0.2	0.05	0.82	48.6
Approach		6	0.0	0.005	2.8	NA	0.0	0.2	0.05	0.27	49.1
North: Astor St											
7	L	3	0.0	0.004	8.2	LOS A	0.0	0.1	0.02	0.65	48.8
9	R	1	0.0	0.004	8.4	LOS A	0.0	0.1	0.02	0.70	48.6
Approach		4	0.0	0.004	8.3	LOS A	0.0	0.1	0.02	0.66	48.8
West: Harvey Ave											
10	L	1	0.0	0.002	8.2	LOS A	0.0	0.0	0.00	0.81	49.0
11	T	2	0.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		3	0.0	0.002	2.7	NA	0.0	0.0	0.00	0.27	49.6
All Vehicles		14	0.0	0.005	4.5	NA	0.0	0.2	0.03	0.39	49.1

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

Table A-8: Traffic Movement Performance

MOVEMENT SUMMARY

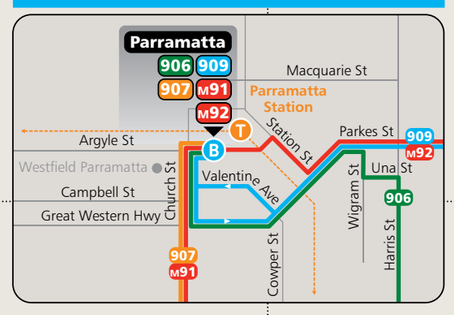
Site: Harvey Ave-Astor St Evening Post-development

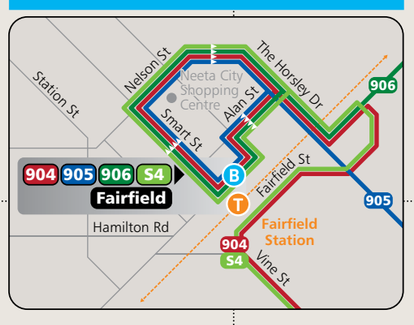
Harvey Ave - Astor St
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Harvey Ave											
5	T	18	0.0	0.012	0.0	LOS A	0.1	0.6	0.05	0.00	49.3
6	R	2	0.0	0.012	8.4	LOS A	0.1	0.6	0.05	0.90	48.6
Approach		20	0.0	0.012	0.9	NA	0.1	0.6	0.05	0.09	49.2
North: Astor St											
7	L	3	0.0	0.004	8.2	LOS A	0.0	0.1	0.02	0.65	48.9
9	R	1	0.0	0.004	8.4	LOS A	0.0	0.1	0.02	0.70	48.6
Approach		4	0.0	0.004	8.3	LOS A	0.0	0.1	0.02	0.66	48.8
West: Harvey Ave											
10	L	1	0.0	0.002	8.2	LOS A	0.0	0.0	0.00	0.81	49.0
11	T	2	0.0	0.002	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		3	0.0	0.002	2.7	NA	0.0	0.0	0.00	0.27	49.6
All Vehicles		27	0.0	0.012	2.3	NA	0.1	0.6	0.04	0.20	49.2

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.





B Parramatta, Bankstown and Liverpool bus network map

Transport Buses

* The lines on the map show the routes of buses departing Liverpool. For buses arriving in Liverpool, please refer to individual timetables.

Key

- Bus route
- 903 Bus route number
- Occasional journey
- B Bus terminus
- T Train line/station

Effective from 29 June 2015

It's easy to plan your trip

On the web
transportnsw.info

Questions and feedback
Phone 131 500
TTY 1800 637 500

Sydney Trains Network

Sydney train lines

T1 *North Shore, Northern & Western Line*
North Shore
Northern
Epping
Western
Richmond

T3 *Bankstown Line*
Liverpool
Lidcombe
City

T5 *Cumberland Line*
Leppington
Richmond

T7 *Olympic Park Line*
Olympic Park
Lidcombe

T2 *Inner West & Leppington Line*
Inner West
Leppington
City

T4 *Eastern Suburbs & Illawarra Line*
Eastern Suburbs
Illawarra
Cronulla

T6 *Carlingford Line*
Carlingford
Clyde

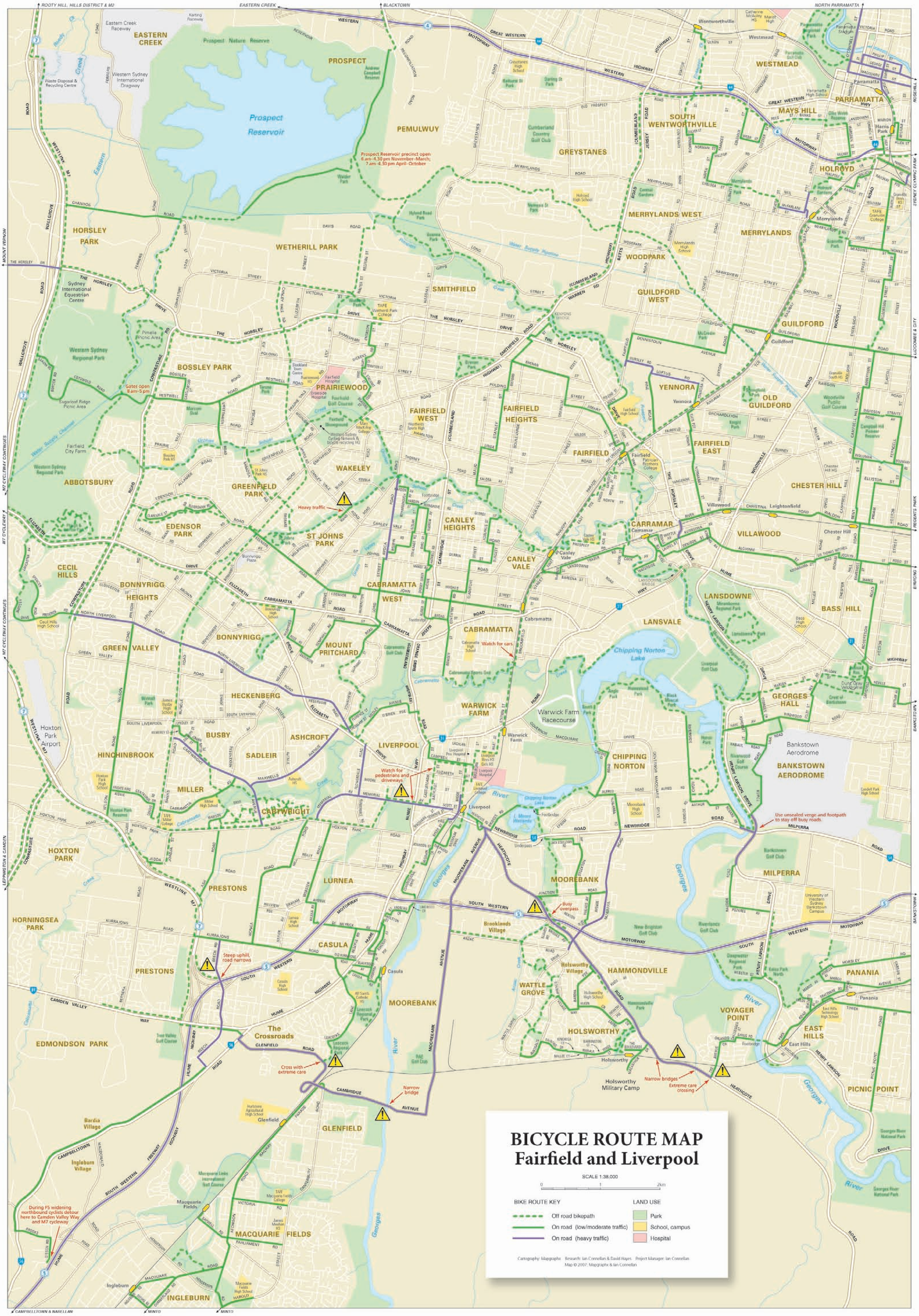
T8 *Airport & South Line*
Airport
South
City

Stop · Interchange · Interchange · End of line

NORTH

Check timetables and trip planners for train services and connections

Visit **transportnsw.info**


BICYCLE ROUTE MAP
Fairfield and Liverpool
SCALE 1:38,000
0 1 2km
BIKE ROUTE KEY
Off road bikepath
On road (low/moderate traffic)
On road (heavy traffic)
LAND USE
Park
School, campus
Hospital
Cartography: Mapgraphx Research: Ian Connellan & David Hayes Project Manager: Ian Connellan
Map © 2007: Mapgraphx & Ian Connellan
Prospect Reservoir precinct open 6 am–4.30 pm November–March; 7 am–4.30 pm April–October
Gates open 8 am–5 pm
Heavy traffic
Watch for cars
Watch for pedestrians and driveways
Use unsealed verge and footpath to stay off busy roads
Busy overpass
Steep uphill, road narrows
Cross with extreme care
Narrow bridge
Narrow bridges
Extreme care crossing
During F5 widening northbound cyclists detour here to Camden Valley Way and M7 cycleway
PARRAMATTA
WESTMEAD
MAYS HILL
HOLROYD
MERRYLANDS
MERRYLANDS WEST
SOUTH WENTWORTHVILLE
GREYSTANES
PEMULWUY
PROSPECT
EASTERN CREEK
HORSLEY PARK
WETHERILL PARK
SMITHFIELD
WOODPARK
GUILDFORD WEST
GUILDFORD
OLD GUILDFORD
YENNORA
FAIRFIELD EAST
FAIRFIELD
FAIRFIELD HEIGHTS
FAIRFIELD WEST
CHESTER HILL
VILLAWOOD
CARRAMAR
CANLEY VALE
CANLEY HEIGHTS
CABRAMATTA WEST
CABRAMATTA
LANSDOWNE
LANSVALE
BASS HILL
GEORGES HALL
BANKSTOWN AERODROME
CHIPPING NORTON
WARWICK FARM
LIVERPOOL
MOOREBANK
MILPERRA
PANANIA
EAST HILLS
PICNIC POINT
VOYAGER POINT
HAMMONDVILLE
WATTLE GROVE
HOLSWORTHY
Holsworthy Military Camp
BOSSLEY PARK
PRAIRIEWOOD
WAKELEY
GREENFIELD PARK
ST JOHNS PARK
EDENSOR PARK
ABBOTSBURY
CECIL HILLS
BONNYRIGG HEIGHTS
BONNYRIGG
MOUNT PRITCHARD
GREEN VALLEY
HECKENBERG
BUSBY
ASHCROFT
SADLEIR
HINCHINBROOK
MILLER
CARTWRIGHT
HOXTON PARK
PRESTONS
LURNEA
CASULA
HORNINGSEA PARK
EDMONDSON PARK
The Crossroads
GLENFIELD
MACQUARIE FIELDS
INGLEBURN
Prospect Reservoir
Chipping Norton Lake
Warwick Farm Racecourse
Bankstown Aerodrome
Hoxton Park Airport
Georges River
ROOTY HILL, HILLS DISTRICT & M2
EASTERN CREEK
BLACKTOWN
NORTH PARRAMATTA
MOUNT VERNON
M7 CYCLEWAY
M7 CYCLEWAY CONTINUES
LEPPINGTON & CAMDEN
CAMPBELLTOWN & NARELLAN
MINTO
ROSEHILL
SYDNEY OLYMPIC PARK
LIDCOMBE & CITY
REGENTS PARK
BIRRONG
BANKSTOWN