Riverwood North Residential Renewal Project

Washington Avenue & Kentucky Road, Riverwood

s.75W AMENDED CONCEPT PLAN APPLICATION
TRAFFIC AND PARKING ASSESSMENT REPORT

1 August 2014

Ref 13461

VARGA TRAFFIC PLANNING Pty Ltd
Transport, Traffic and Parking Consultants

Suite 6, 20 Young Street, Neutral Bay NSW 2089 - PO Box 1868, Neutral Bay NSW 2089
Ph: 9904 3224 Fax: 9904 3228, Email: varga@vtp.net.au

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1. INTRODUCTION

This Transport and Accessibility Study has been prepared on behalf of *Housing NSW* and *Payce Communities Pty Ltd* to accompany a S.75w application to the Department of Planning to modify the previously approved Concept Plan to provide *an additional 34 apartments* as part of the proposed Riverwood North Residential Renewal Project, located in Washington Avenue & Kentucky Road, Riverwood (Figures 1 and 2).

The Concept Plan approval includes the staged construction of a new and revitalised residential area, comprising a mixture of social and privately owned dwellings. The dwellings are in the form of modern, architecturally designed residential flat buildings.

Resident carparking for the proposed development is provided at the base of the respective buildings.

Construction of the Residential Renewal Project is being undertaken in several stages, over a period of several years.

This Transport and Accessibility Study has been prepared with reference to the *NSW Long Term Transport Master Plan,* the *NSW State Plan 2021,* the *NSW Planning Guidelines for Walking and Cycling,* the *Integrated Land Use and Transport Policy Package*, the *NSW Bike Plan* and the RMS's *Guide to Traffic Generating Developments*.

The purpose of this report is to assess the cumulative transport, traffic and parking implications of the additional dwellings, and to that end this report:

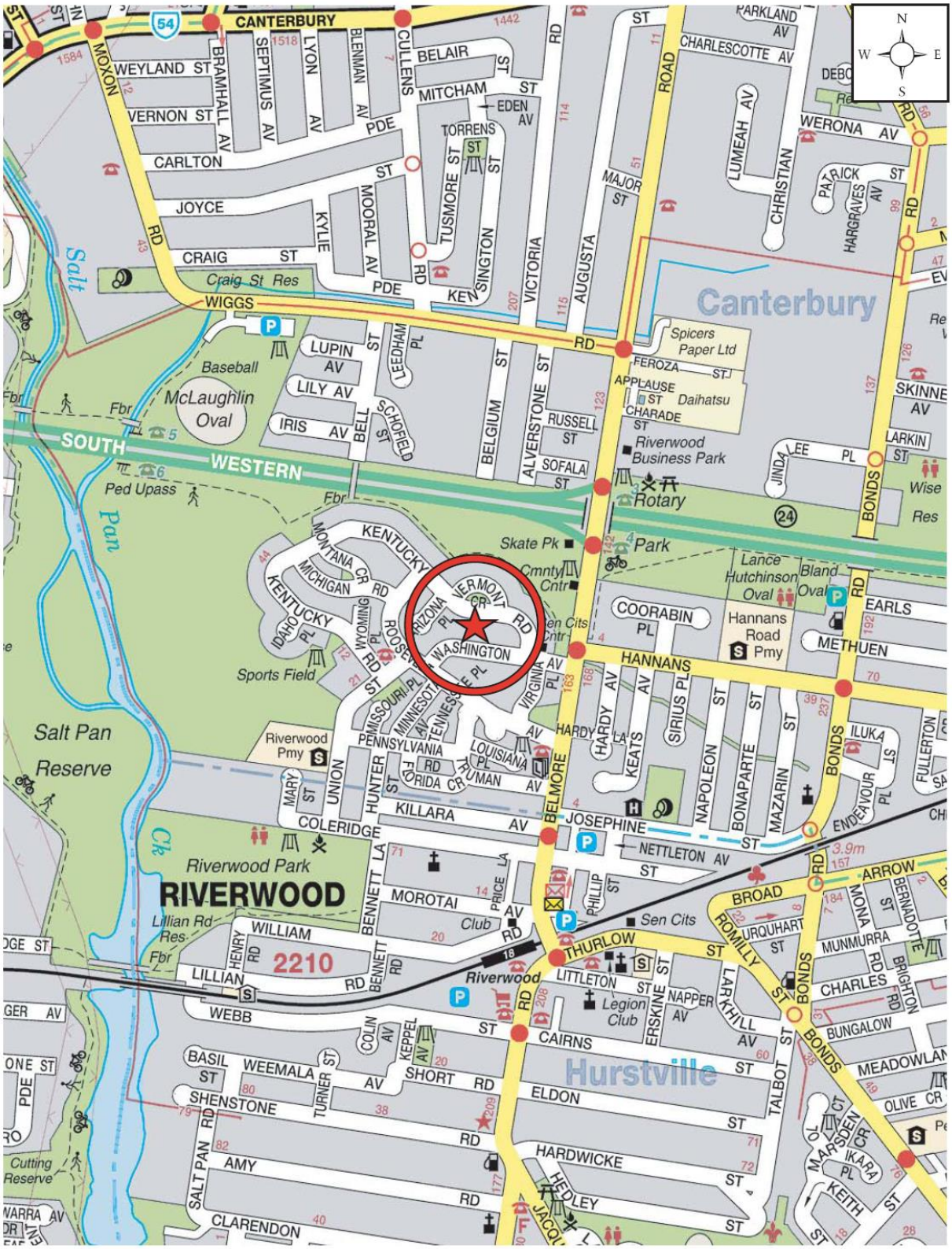
- describes the site and provides details of the development proposal

- reviews the road network in the vicinity of the site, and the traffic conditions on that road network

- identifies the opportunities for public transport, walking and cycling options which will be available to the residents of the proposed development

- assesses the traffic implications of the proposed s.75W modification in terms of road network capacity

- assesses the adequacy and suitability of the off-street carparking facilities proposed on the site.



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LOCATION
FIGURE 1

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SITE

FIGURE 2

2. PROPOSED DEVELOPMENT

Site

The subject site is located on both sides of Kentucky Road (and Vermont Crescent), extending west to Roosevelt Avenue, south to Washington Avenue, and north and east to the Salt Pan Creek Wetlands. The site occupies an area of approximately 3.8ha.

The subject site was previously occupied by 176 social housing dwellings (comprising mostly two and three-storey townhouses or "walk-up" residential flat buildings, as well as several single-storey townhouses) which have now been demolished. The site also includes community areas such as a park and basketball court.

Approved Concept Plan

The approved Concept Plan provides for 723 dwellings comprising 150 social housing units and 573 private owned dwellings.

Construction of the social housing units has been substantially commenced. Construction of some of the private dwellings has also commenced.

Associated infrastructure upgrades to be provided as part of the project will include landscaping, construction of a new garden square, new street furniture, stormwater management, site works and services, and the retention and upgrade of the existing central park. Improvements to the existing road network will include:

- the establishment of a new "shared zone" with a 10 km/h speed limit and appropriate traffic calming and pavement treatments at the eastern end of Kentucky Road, and

- the construction of two new connecting roads between Kentucky Road and Washington Avenue which will improve through-site connections.

The construction of the new links between Kentucky Road and Washington Avenue will significantly improve the permeability of the neighbourhood for pedestrians and cyclists,

particularly for those residents wishing to walk or cycle to the nearby Riverwood Public School or to Riverwood Railway Station and the local shops.

The subject site is ideally located approximately 650m walk from Riverwood Railway Station and the local shopping centre which comprises a range of shops, restaurants and services such as banks and the post office. In addition, a number of regular bus services traverse the site or travel along Belmore Road, near the eastern perimeter of the site. The site is also located within 400m walking distance from Riverwood Primary School, and 500m walking distance from Hannans Road Primary School.

The site is located immediately adjacent to a shared pedestrian path and cycleway which traverses the Salt Pan Creek Wetlands and provides walking and cycling connections to Bankstown in the north, Padstow in the south and Kingsgrove in the east.

The site is also located immediately adjacent to the Riverwood Community Centre and within close walking distance of the new Riverwood Sport and Recreation Centre which is located on the eastern side of Belmore Road, directly opposite the Community Centre.

Cycling options for the residents of the proposed development will be further enhanced through the provision of bicycle storage facilities throughout the development in accordance with Council and Housing NSW requirements.

Proposed Development

As noted in the foregoing, the approved Concept Plan provides for a total of 723 residential units.

This s.75W application seeks to increase the total number of units to be provided on the site to 757 apartments, an *addition* of 34 units above the *Concept Plan* approval.

The 34 additional residential units which are the subject of this application are to be located in the "Lakeview" Building on Lot 7, 5 Vermont Crescent, Riverwood.

3. TRAFFIC ASSESSMENT

Road Hierarchy

The road hierarchy allocated to the road network in the vicinity of the site by the Roads and Traffic Authority is illustrated on Figure 3.

The M5 Motorway is classified by the RMS as a *State Road* and provides the key east-west road link in the area, linking the City with Campbelltown and beyond. It typically carries two traffic lanes in each direction in the vicinity of the site, with opposing traffic flows separated by a centre median island.

All intersections with the M5 Motorway are grade-separated. The Motorway is located approximately 350m north of the site, and intersects with Belmore Road with two west-facing ramps controlled by traffic signals. Provision has been made to allow for two east-facing ramps on the M5 Motorway to connect with Belmore Road to be constructed in the future.

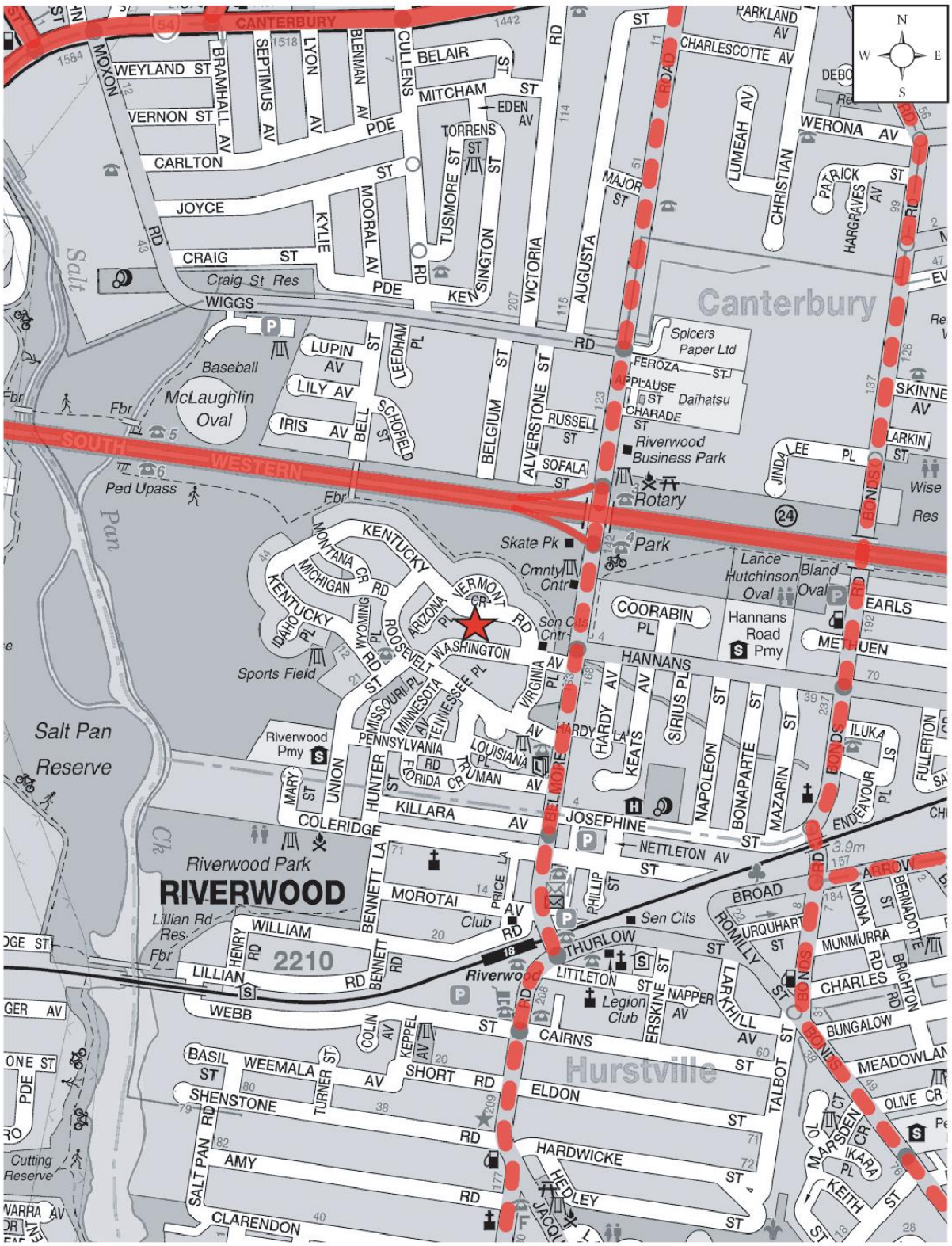
Belmore Road is classified by the RMS as a *Regional Road* and provides the key north-south road link in the Riverwood area, linking Henry Lawson Drive to the south with Canterbury Road to the north. It typically carries one traffic lane in each direction in the vicinity of the site, with additional lanes/parking restrictions provided at key intersections.

Washington Avenue, Kentucky Road and Vermont Crescent are all local, unclassified roads which are primarily used to provide vehicular and pedestrian access to frontage properties. Kerbside parking is generally permitted on both sides of all three roads.

Existing Traffic Controls

The existing traffic controls which apply to the road network in the vicinity of the site are illustrated on Figure 4. Key features of those traffic controls are:

- a 50 km/h SPEED LIMIT which applies to Belmore Road and all other local roads in the area



Key:

State Road

Regional Road

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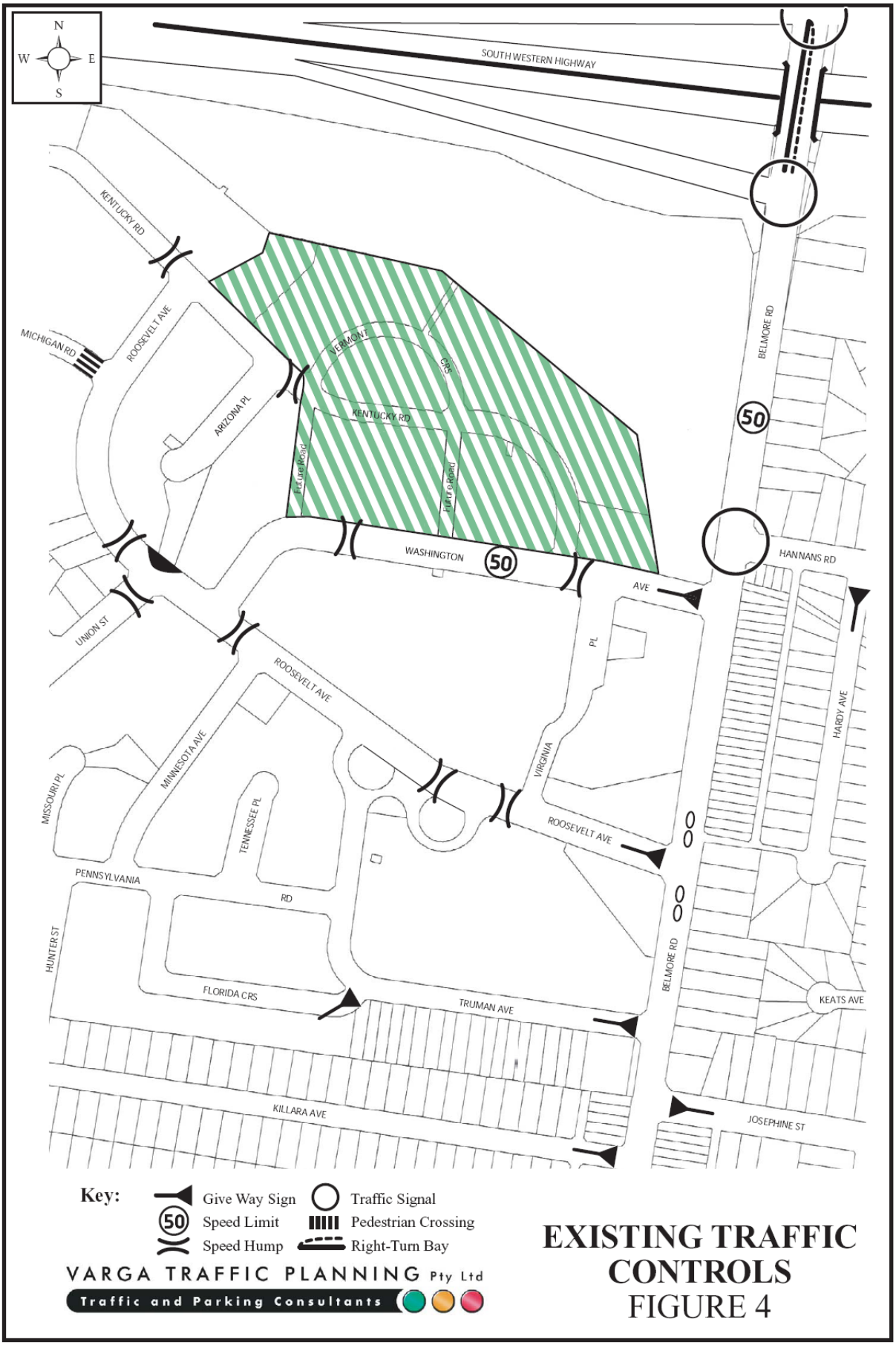
ROAD HIERARCHY

FIGURE 3


N
W
E
S
SOUTH WESTERN HIGHWAY
KENTUCKY RD
MICHIGAN RD
ROOSEVELT AVE
ARIZONA PL
VERMONT
KENTUCKY RD
BELMORE RD
50
WASHINGTON
50
HANNANS RD
AVE
UNION ST
ROOSEVELT AVE
MINNESOTA AVE
MISSOURI PL
TENNESSEE PL
VIRGINIA
PL
HARDY AVE
ROOSEVELT AVE
PENNSYLVANIA
RD
HUNTER ST
FLORIDA CRS
TRUMAN AVE
BELMORE RD
KEATS AVE
KILLARA AVE
JOSEPHINE ST
Key:
Give Way Sign
Traffic Signal
50
Speed Limit
Pedestrian Crossing
Speed Hump
Right-Turn Bay
VARGA TRAFFIC PLANNING Pty Ltd
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EXISTING TRAFFIC CONTROLS
FIGURE 4

- TRAFFIC SIGNALS in Belmore Road where it intersects with Hannans Road and also the M5 Motorway on/off ramps

- a GIVE-WAY SIGN in Washington Avenue at its intersection with Belmore Road

- SPEED HUMPS located at various locations throughout the area including along Washington Avenue and Kentucky Road.

Existing Traffic Conditions

An indication of the existing traffic conditions on the road network in the vicinity of the site is provided by reference to the RMS's *Annual Average Daily Traffic* data. The relevant count stations nearest to the subject site are summarised below, revealing that the annual average daily traffic along this section of Belmore Road is in the order of 16,000-20,000 axle pairs per day (northbound and southbound).

Annual Average Daily Traffic Volumes

(vehicles per day)

Station No.	Location	1996	1999	2002	2005
24075	Belmore Road (north of M5 Motorway)	23,267	21,974	20,779	19,869
41150	Belmore Road (south of Morotai Avenue)	17,516	16,770	16,044	15,524

A more detailed indication of the existing traffic conditions on the road network in the vicinity of the site is provided by peak period traffic surveys undertaken as part of this traffic study. The traffic surveys were undertaken during commuter peak periods (ie. 6:30am - 7:30am and 3:30pm - 6:30pm) on Tuesday, 26 October 2010 at the following intersections:

- Belmore Road & Roosevelt Avenue
- Belmore Road & Washington Avenue
- Belmore Road & Hannans Road
- Washington Road & Virginia Place
- Washington Avenue & Kentucky Road
- Washington Road & Roosevelt Avenue
- Roosevelt Road & Virginia Place

The results of the traffic surveys are reproduced in full in Appendix A and reveal that:

- two-way traffic flows in Belmore Road are typically in the order of 1,400 vehicles per hour (vph) during peak periods

- two-way traffic flows in Washington Avenue are typically less than 200 vph during peak periods

- two-way traffic flows in Kentucky Road are typically in the order of 80 to 90 vph during peak periods

- two-way traffic flows in Roosevelt Avenue are typically in the order of 150 vph during peak periods.

Alternate Transport Options

The proposed Residential Renewal Project is fortunate to be located in an area where a variety of alternate transport options are available such as train, bus, cycling and walking, as detailed below.

Train Services

Riverwood Railway Station is located near the corner of Belmore Road and Morotai Avenue, approximately 650m south of the corner of Washington Avenue and Belmore Road. The railway station is approximately 8 to 10 minutes walk from the subject site.

The Railway Station is located on the Airport - East Hills Line, with *Sydney Trains* services operating between Macarthur and the City Circle via Revesby and Wolli Creek, with peak hour services also operating via Sydenham.

Weekday train services operate every 5 to 10 minutes during weekday commuter peak periods, and every 10 to 15 minutes outside peak periods. Weekend services operate every 10 to 20 minutes.

Riverwood Railway Station is located six stops east of Glenfield Railway Station, a major rail interchange with connecting services to the Cumberland Line, the South Line and ultimately the South West Rail Link to Leppington.

To the east Riverwood Railway Station is also located seven stops from Wolli Creek Railway Station, a rail interchange with connecting services to the Eastern Suburbs - Illawarra Line.

Bus Services

Bus services through the Riverwood area are operated by *Punchbowl Bus Company.* Route maps are reproduced in Appendix B and summarised below:

Route No.	Nearest Bus Stop	Operating Between
940	Belmore Rd	Bankstown & Hurstville via Riverwood & Narwee
942	Belmore Rd & Josephine St	Lugarno & Campsie via Riverwood & Belmore
944	Kentucky Rd	Bankstown & Mortdale via Roselands & Riverwood
945	Belmore Rd	Bankstown & Hurstville via Riverwood & Peakhurst
N20	Belmore Rd	Rockdale to Riverwood Night Ride

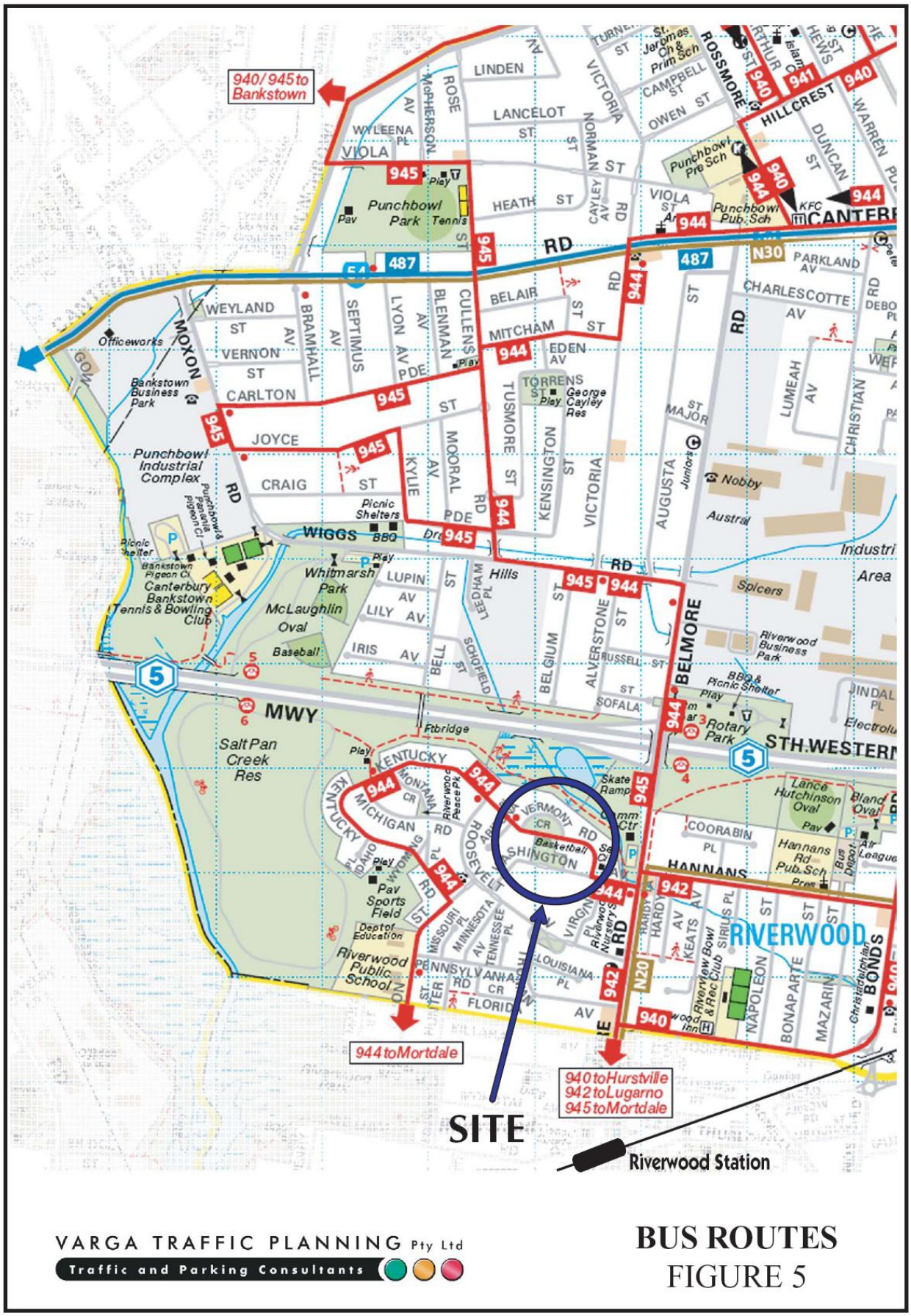
All weekday services operate every 30 minutes, with additional services during commuter peak periods. All weekend services operate every 60 minutes. Bus stops are located at regular intervals along both sides of Kentucky Road and Hannans Road (for Route No. 944) and also Belmore Road (for Route No's 940, 942 and 945).

An extract from Council's Public Transport Guide illustrating the Bus Routes in the vicinity of the Riverwood site is shown on Figure 5.

Bicycle and Pedestrian Routes

There are a number of cycleways and shared pedestrian paths providing convenient access to and from the proposed Residential Renewal Project at Riverwood for those residents who do not wish to drive or use public transport. Studies have shown that in Sydney, over 50% of trips are less than 5km; such trips are ideally suited to walking or cycling.

The nearby shared pedestrian and cycleway path which is located adjacent to Salt Pan Creek Wetlands continues approximately 4km north to Bankstown, 2km south to Padstow and 7km east to Kingsgrove.



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BUS ROUTES
FIGURE 5

An extract from Council's Cycleway Plan illustrating the shared cycle paths and cycle routes located in the vicinity of the site is illustrated on Figure 6.

The proposed development will enhance the options available to residents for walking and cycling through the provision of 2 new links between Kentucky Road and Washington Avenue. The improved permeability for pedestrians and cyclists that will be provided by these links will provide more direct links for residents when walking or cycling to nearby facilities such as the local primary school, local shops and railway station.

The new links will also provide improved permeability for other residents living to the south of the site who may wish to access the shared pedestrian and cycleway paths traversing the Salt Pan Creek Wetlands or the nearby sports and recreation facilities using the network of local roads, without the need to travel along the busy Belmore Road.

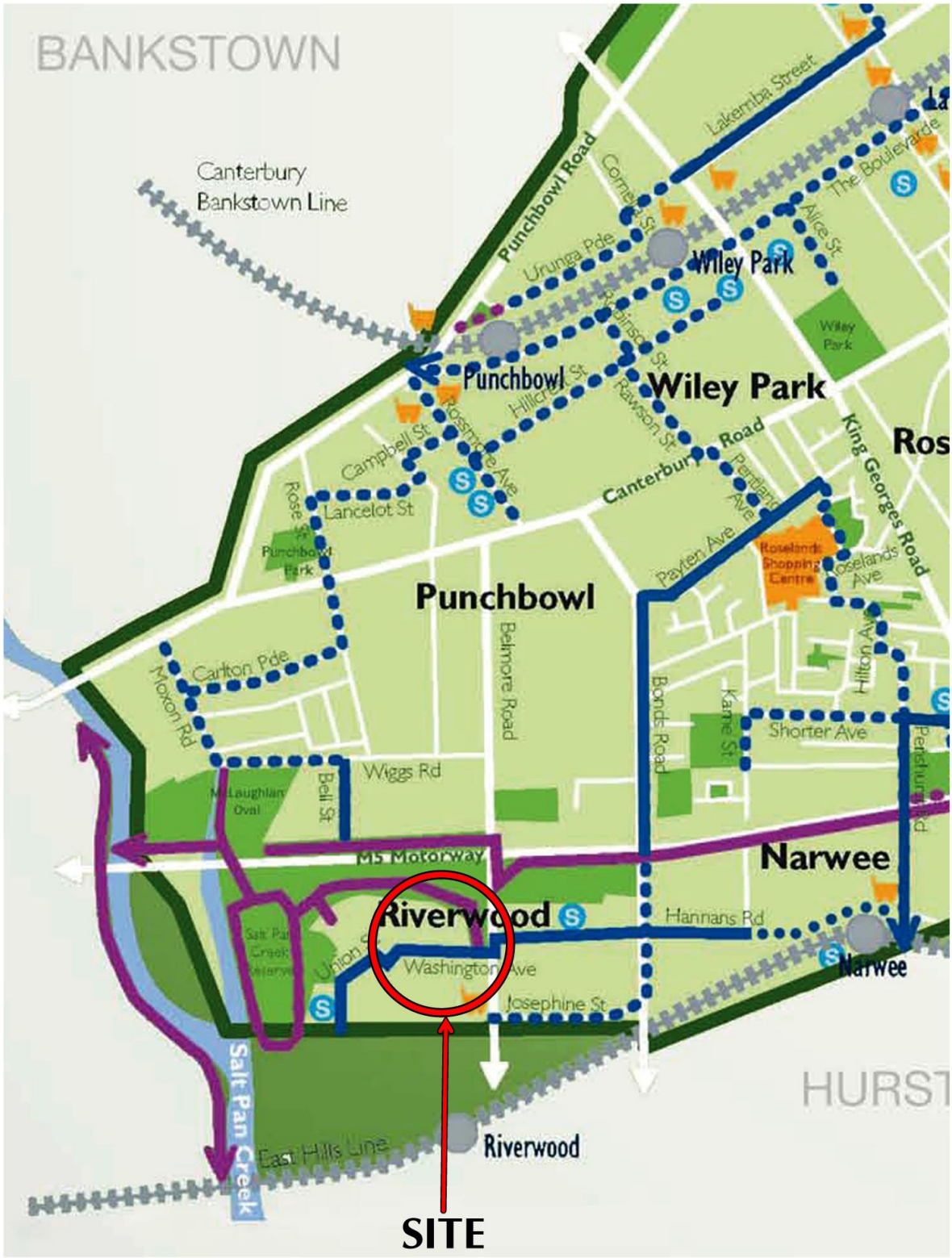
Projected Traffic Generation

An indication of the traffic generation potential of the development proposal is provided by reference to the Roads and Traffic Authority's publication *Guide to Traffic Generating Developments, Section 3 - Landuse Traffic Generation (October 2002).*

The RMS *Guidelines* are based on extensive surveys of a wide range of land uses and nominates the following traffic generation rates which are applicable to the development proposal:

High Density Residential Flat Buildings
0.29 "peak hour" vehicle trips/dwelling
2.9 "daily" vehicle trips/dwelling (estimated)

Definition:
A *high density residential flat building* refers to a building containing 20 or more dwellings. This does not include aged or disabled persons' housing. *High density residential flat buildings* are usually more than five levels, have basement level car parking and are located in close proximity to public transport services. The building may contain a component of commercial use.



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COUNCIL'S CYCLEWAY PLAN
FIGURE 6

Medium Density Residential Flat Buildings

0.4 – 0.5 "peak hour" vehicle trips / 1 & 2 bedroom dwelling

4.0 – 5.0 "daily" vehicle trips / 1 & 2 bedroom dwelling

0.5 – 0.65 "peak hour" vehicle trips / 3 bedroom dwelling

5.0 – 6.5 "daily" vehicle trips / 3 bedroom dwelling

Housing for Aged and Disabled Persons

0.1 - 0.2 "peak hour" vehicle trips/dwelling

1 - 2 "daily" vehicle trips/dwelling

Factors

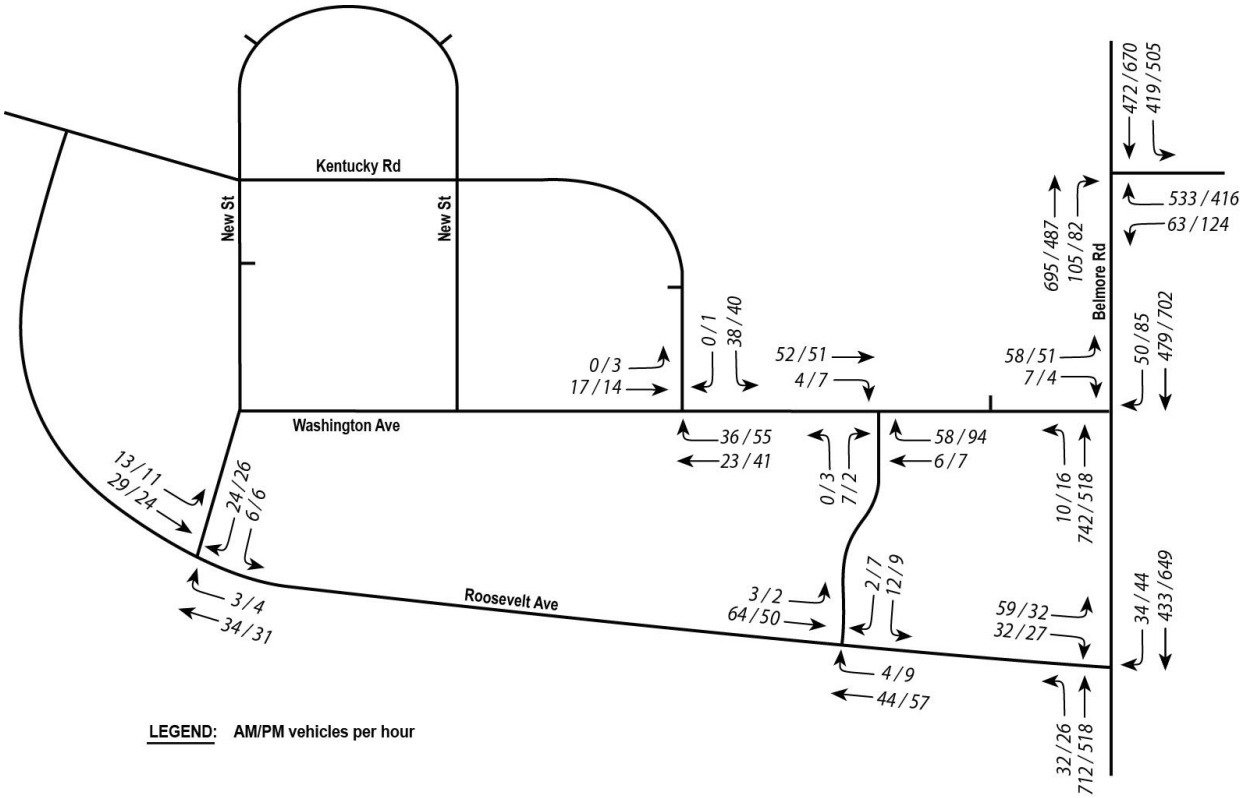
These figures at the lower end of the above rates are based on research conducted by the Authority. This research concentrates on *subsidised* developments (often run by religious organisations). Generation rates or *resident funded* developments are often greater, as indicated at the higher end of the range.

Application of the above traffic generation rates for "high density" residential developments to the proposed 34 additional dwellings yields a projected increase in the traffic generation potential of the site of an additional 10 vehicles per hour (vph) during commuter peak periods, or an additional 98 vehicles per day when compared with the previously approved Concept Plan.

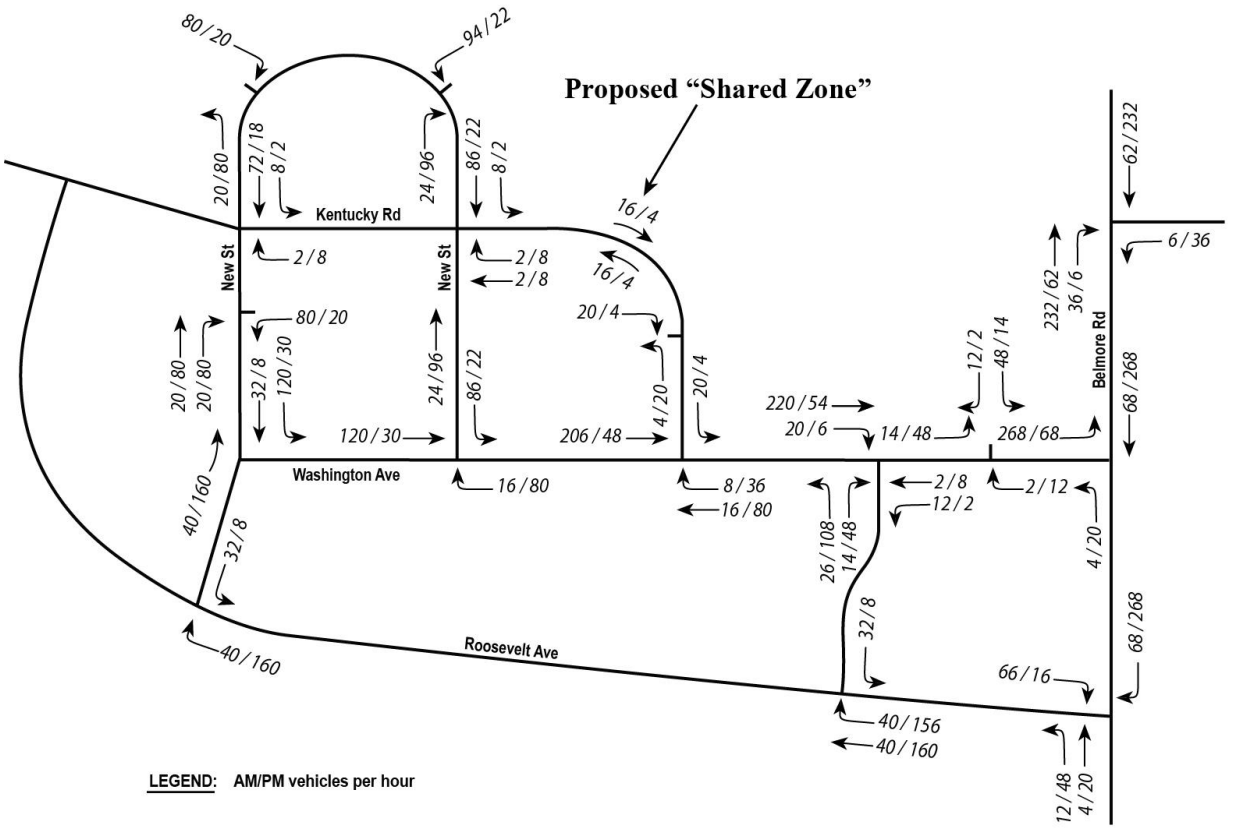
However, for the purposes of this report, and to provide a more "rigorous" traffic assessment, it has been assumed that the private dwellings component of the development proposal will comprise "medium density" dwellings rather than "high density" dwellings. Application of the higher traffic generation rates nominated in the RMS *Guidelines* for "medium density" dwellings to the proposed 34 additional dwellings yields a projected increase of an additional 17 vph during commuter peak periods (or an additional 170 vehicles per day) when compared with the previously approved Concept Plan.

The cumulative traffic flows expected to be generated by the amended Concept Plan have been assigned to the surrounding road network as illustrated on Figure 7.

It is pertinent to note that the traffic assignment takes into account the prohibition on right-turn movements at the Belmore Road/Washington Avenue intersection required by the previous Concept Plan approval.



EXISTING TRAFFIC VOLUMES



TRAFFIC ASSIGNMENT

FIGURE 7

Traffic Implications - Road Network Capacity

The traffic implications of development proposals primarily concern the effects that any *additional* traffic flows may have on the operational performance of the nearby road network. Those effects can be assessed using the SIDRA program which is widely used by the RMS and many LGA's for this purpose. Criteria for evaluating the results of SIDRA analysis are reproduced in the following pages.

The results of the SIDRA analysis of the Belmore Road & Washington Avenue intersection are summarised on Table 3.1 below, revealing that:

- the Belmore Road & Washington Avenue intersection currently operates at *Level of Service "A"* under the existing traffic demands with total average vehicle delays in the order of 2 seconds/vehicle

- under the projected future traffic demands expected to be generated by the 34 additional apartments the Belmore Road & Washington Avenue intersection will continue to operate at *Level of Service "A",* with increases in average vehicle delays of 0.1 seconds/vehicle.

The results of the SIDRA analysis of the Belmore Road & Roosevelt Avenue intersection are summarised on Table 3.2 below, revealing that:

- the Belmore Road & Roosevelt Avenue intersection currently operates at *Level of Service "A"* under the existing traffic demands with total average vehicle delays in the order of 4 seconds/vehicle

- under the projected future traffic demands expected to be generated by the 34 additional apartments, the Belmore Road & Roosevelt Avenue intersection will continue to operate at *Level of Service "A",* with increases in average vehicle delays of 0.5 seconds/vehicle.

The results of the SIDRA analysis of the Belmore Road & Hannans Road intersection are summarised on Table 3.3 below, revealing that:

- the Belmore Road & Hannans Road intersection currently operates at *Level of Service "B"* under the existing traffic demands with total average vehicle delays in the order of 24 - 27 seconds/vehicle

- under the projected future traffic demands expected to be generated by the 34 additional apartments, the Belmore Road & Hannans Road intersection will continue to operate at *Level of Service "B",* with increases in average vehicle delays of 0.1 seconds/vehicle.

In the circumstances, it is clear that the proposed development will not have any unacceptable traffic implications in terms of road network capacity.

In addition, the Belmore Road/Roosevelt Avenue intersection was assessed against the warrants for traffic signals as specified in the RMS *Traffic Signal Design* guide. That review found that:

- the projected future traffic volumes do not meet the pedestrian or vehicle volume warrants for each of 4 x 1-hour periods on an average day, and

- the number of accidents occurring at this intersection (and at the Washington Avenue intersection) does not meet the warrants for traffic signals, *even* if it is assumed that *all* of the accidents were correctable.

The assessment found that the installation of traffic signals was therefore not warranted at the Belmore Road/Roosevelt Avenue intersection.

Conclusion – Traffic Analysis

In summary, the foregoing analysis has found that:

- the cumulative development potential of the proposed development will not have any unacceptable traffic implications in terms of road network capacity

- the proposed development will not have any adverse impacts on the performance of nearby intersections, and will *not* require upgrading or road improvement works.

TABLE 3.1 - RESULTS OF SIDRA ANALYSIS OF BELMORE ROAD & WASHINGTON AVENUE						
Key Indicators	**Existing Traffic Demand**		**Amended Concept Plan Traffic Demand**		**Plus 17 vph**	
	AM	**PM**	**AM**	**PM**	**AM**	**PM**
Level of Service	A	A	A	A	A	A
Degree of Saturation	0.193	0.229	0.595	0.296	0.606	0.297
Total Average Vehicle Delay (secs/veh)	1.7	1.7	4.1	2.1	4.2	2.1
	BEL_WASX		BEL_WASQ		BEL_WASR	

TABLE 3.2 - RESULTS OF SIDRA ANALYSIS OF BELMORE ROAD & ROOSEVELT AVENUE						
Key Indicators	**Existing Traffic Demand**		**Amended Concept Plan Traffic Demand**		**Plus 17 vph**	
	AM	**PM**	**AM**	**PM**	**AM**	**PM**
Level of Service	A	A	A	A	A	A
Degree of Saturation	0.365	0.383	0.735	0.699	0.753	0.707
Total Average Vehicle Delay (secs/veh)	3.5	3.6	7.8	10.2	8.1	10.5
	BEL_ROOX		BEL_ROOP		BEL_ROOR	

TABLE 3.3 - RESULTS OF SIDRA ANALYSIS OF BELMORE ROAD & HANNANS ROAD						
Key Indicators	**Existing Traffic Demand**		**Amended Concept Plan Traffic Demand**		**Plus 17 vph**	
	AM	**PM**	**AM**	**PM**	**AM**	**PM**
Level of Service	B	B	C	B	C	B
Degree of Saturation	0.652	0.670	0.736	0.755	0.736	0.758
Total Average Vehicle Delay (secs/veh)	27.0	23.5	29.0	24.9	29.1	25.0
	BEL_HANX		BEL_HANP		BEL_HANR	

Criteria for Interpreting Results of SIDRA Analysis

1. Level of Service (LOS)

LOS	Traffic Signals and Roundabouts	Give Way and Stop Signs
'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 and accident study required.
'E'	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode.	At capacity and requires other control mode.
'F'	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires other control mode.

2. Average Vehicle Delay (AVD)

The AVD provides a measure of the operational performance of an intersection as indicated on the table below which relates AVD to LOS. The AVD's listed in the table should be taken as a guide only as longer delays could be tolerated in some locations (ie inner city conditions) and on some roads (ie minor side street intersecting with a major arterial route).

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	less than 14	Good operation.	Good operation.
B	15 to 28	Good with acceptable delays and spare capacity.	Acceptable delays and spare capacity.
C	29 to 42	Satisfactory.	Satisfactory but accident study required.
D	43 to 56	Operating near capacity.	Near capacity and accident study required.
E	57 to 70	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode.	At capacity and requires other control mode.

3. Degree of Saturation (DS)

The DS is another measure of the operational performance of individual intersections.

For intersections controlled by traffic signals[1] both queue length and delay increase rapidly as DS approaches 1, and it is usual to attempt to keep DS to less than 0.9. Values of DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceeds 0.9 queues can be anticipated.

For intersections controlled by a roundabout or GIVE WAY or STOP signs, satisfactory intersection operation is indicated by a DS of 0.8 or less.

[1] *The values of DS for intersections under traffic signal control are only valid for cycle length of 120 secs.*

4. TRANSPORT PLANNING

NSW 2021

NSW 2021 is a 10-year plan to guide the State's policy and budget decision making. It sets a number of goals to inform the NSW Government's strategic business plan, including the following transport-related goals:

- reduce travel times by improving the efficiency of the road network during peak times on Sydney's road corridors, and minimising public transport waiting times for customers

- grow patronage on public transport by making it a more attractive choice

- improve customer experience with transport services, and

- improve road safety.

NSW Long-Term Transport Master Plan

The *NSW Long-Term Transport Master-Plan* provides an integrated transport strategy which brings together landuse planning with transport planning, and integrates it with planning for freight and passenger movements, as well as other modes of transports. It includes actions for road, rail, bus, ferry, light rail, cycling and walking. Initiatives identified by the *NSW Long-Term Transport Master-Plan* which will improve the transport options available to Riverwood residents will include:

- expansion of the integrated public transport ticketing system

- modernisation of the public transport fleets, including the introduction of new Warratah train and the refurbishment of the Tangara train

- widening of the M5 between Camden Valley Way and King Georges Road

- planning for the WestConnex road link which includes duplication of the M5 East Motorway

- construction of the South-West Rail Link which will provide additional flexibility for train services on the East Hills Line

- increased the capacity of the East Hills Line to cater for an additional 9,600 passengers per hour in peak periods, and

- further investigations into the Liverpool to Port Botany growth corridor.

Planning Guidelines for Walking and Cycling

The *Planning Guidelines for Walking and Cycling* identify a number of city-scale design principles that can assist the creation of walkable and cyclable cities and neighbourhoods. These principles emphasise urban renewal and the creation of compact, mixed use, accessible centres around public transport stops. At the neighbourhood scale, design principles can be reinforced through the creation of local and accessible centres and neighbourhoods with connected street patterns and road design which aim to reinforce local walking and cycling networks.

In particular, the guidelines note that increased population density is an important element in creating a walkable and cyclable city. A compact development brings activities close together, making them more accessible by foot or by bicycle, without the need to use a car. Increased population density also enhances the viability of public transport services.

The Riverwood Residential Renewal Project is consistent with those objectives in that it seeks to provide increased population density in close proximity to existing public transport services which are accessible by walking or cycling. In addition, the provision of a number of new internal road links will improve the permeability of the neighbourhood for pedestrians and cyclists.

The Riverwood North Residential Renewal Project provides a number of opportunities to provide improved connections for walking and cycling using both the existing and proposed

new road links to connect the existing shared pedestrian path and cycleway which traverses Salt Pan Creek Wetlands to the north of the site with the schools, shops and public transport services located to the south of the site.

Integrated Land Use and Transport Policy

The *Integrated Land Use and Transport Policy* encourages increased housing densities within an acceptable walking distance - 400 to 1,000m of major public transport land such as railway stations and high frequency bus routes to help moderate the demand for private car travel and to reduce the growth of VKT (Vehicle Kilometres Travelled).

The proposed development is consistent with those objectives in that it will result in increased population densities in an area which already has good access to public transport services as well as options for walking and cycling.

NSW Bike Plan

The *NSW Bike Plan* promotes cycling-friendly development decisions and notes that cycling is strongly influenced by the shape of our neighbourhoods. It encourages cycling-friendly developments concentrated in existing centres. Planning ahead to locate residential areas, community activities (such as schools, shops and services) close together, and next to cycleways, makes it more likely that a bicycle will be used to travel from one to the other.

The Riverwood North Residential Renewal Project is ideally placed in this regard in that it is located immediately adjacent to an established shared pedestrian/bicycle path, and is located approximately 650m from Riverwood Railway Station, shops and services such as banks, post office and the like. Careful planning of the proposed development will enable the Residential Renewal Project to further capitalise on its location by providing improve permeability through the neighbourhood, as well as improved pedestrian and bicycle pathways along the existing roads located within the neighbourhood.

Implementation of a Location Specific Sustainable Travel Plan

The proposed development provides the opportunity to provide a site specific sustainable travel plan which seeks to reduce dependence on private car travel. Key features of the sustainable travel plan could include (but are not limited to):

1. Establish high quality and efficient pedestrian and cycle links to existing routes to encourage travel by these modes
2. incorporate fibre/internet to the home for premises in an early state
3. community education to support public transport initiatives
4. provide a "How to Find Us" website facility with links to bus and train timetables etc
5. provide a "Handover Pack" to all new residents that identifies existing walking, cycling and public transport options available

5. CONCLUSION

This Transport and Accessibility Study has been prepared for *Housing NSW* and *Payce Communities Pty Ltd* to accompany a Concept Plan application to the Department of Planning for the proposed Riverwood North Residential Renewal Project which is located in Washington Avenue and Kentucky Road, Riverwood.

The Concept Plan approval includes the staged construction of a new and revitalised residential area comprising a mixture of social and privately owned dwellings.

An additional 34 dwellings are proposed, increasing the total number of dwellings from 723 dwellings to 757 dwellings.

The foregoing assessment has found that:

- the site is ideally located in close proximity to a range of walking, cycling and public transport options

- the site is also located in easy walking/cycling distance of a range of shops and services, including banks, post office and primary schools

- two new road links proposed within the site will improve permeability for pedestrians and cyclists

- the site is also located immediately adjacent to a shared pedestrian and bicycle path with links to Bankstown, Padstow and Kingsgrove

- the proposed 34 additional apartments will not have any unacceptable traffic implications in terms of road network capacity, and does not generate a need for any upgrades or road improvements, and

- the parking facilities incorporated in the development proposal will satisfactorily accommodate the needs of the proposed development

- the proposed development is consistent with the aims and objectives of the *NSW Long-Term Transport Master-Plan*, the *NSW State Plan 2021*, the *NSW Planning Guidelines for Walking and Cycling*, the *Integrated Land Use and Transport Policy Package* and the *NSW Bike Plan*.

APPENDIX A

TRAFFIC SURVEY DATA

R.O.A.R. DATA

Reliable, Original & Authentic Results

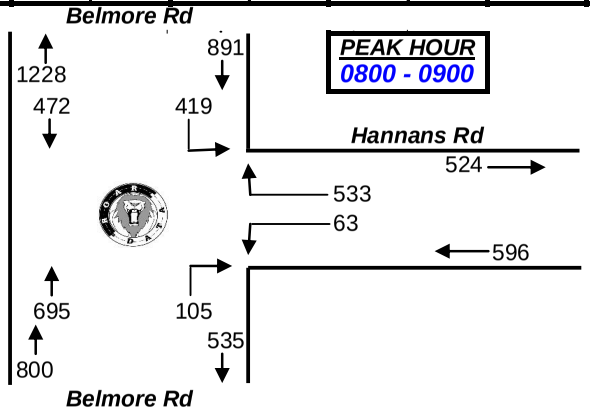
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : Varga Traffic Planning
Job No/Name : 3344 RIVERWOOD Intersection Counts
Day/Date : Tuesday / 26th October 2010

All Vehicles

Time Per	NORTH Belmore Rd T	NORTH Belmore Rd L	EAST Hannans Rd R	EAST Hannans Rd L	SOUTH Belmore Rd R	SOUTH Belmore Rd T	TOTAL
0630 - 0645	81	91	86	5	12	133	**408**
0645 - 0700	96	89	85	13	26	139	**448**
0700 - 0715	59	99	103	12	19	171	**463**
0715 - 0730	98	71	114	6	19	168	**476**
0730 - 0745	70	85	132	5	18	175	**485**
0745 - 0800	80	100	150	5	21	213	**569**
0800 - 0815	99	101	126	6	27	200	**559**
0815 - 0830	107	105	141	13	29	194	**589**
0830 - 0845	120	118	132	21	28	143	**562**
0845 - 0900	146	95	134	23	21	158	**577**
0900 - 0915	106	92	80	20	17	159	**474**
0915 - 0930	94	99	87	20	17	134	**451**
Period End	**1156**	**1145**	**1370**	**149**	**254**	**1987**	**6061**

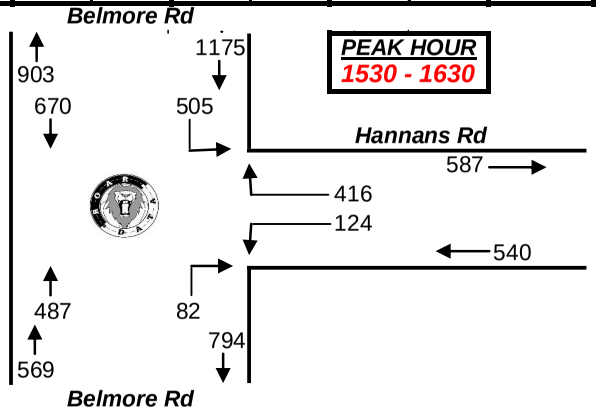
Peak Per	NORTH Belmore Rd T	NORTH Belmore Rd L	EAST Hannans Rd R	EAST Hannans Rd L	SOUTH Belmore Rd R	SOUTH Belmore Rd T	TOTAL
0630 - 0730	334	350	388	36	76	611	**1795**
0645 - 0745	323	344	434	36	82	653	**1872**
0700 - 0800	307	355	499	28	77	727	**1993**
0715 - 0815	347	357	522	22	85	756	**2089**
0730 - 0830	356	391	549	29	95	782	**2202**
0745 - 0845	406	424	549	45	105	750	**2279**
0800 - 0900	472	419	533	63	105	695	**2287**
0815 - 0915	479	410	487	77	95	654	**2202**
0830 - 0930	466	404	433	84	83	594	**2064**
PEAK HR	**472**	**419**	**533**	**63**	**105**	**695**	**2287**



All Vehicles

Time Per	NORTH Belmore Rd T	NORTH Belmore Rd L	EAST Hannans Rd R	EAST Hannans Rd L	SOUTH Belmore Rd R	SOUTH Belmore Rd T	TOTAL
1530 - 1545	176	93	122	30	17	137	**575**
1545 - 1600	149	101	101	32	21	136	**540**
1600 - 1615	158	159	99	29	24	106	**575**
1615 - 1630	187	152	94	33	20	108	**594**
1630 - 1645	142	108	104	23	18	137	**532**
1645 - 1700	143	107	105	20	21	89	**485**
1700 - 1715	192	135	118	27	17	109	**598**
1715 - 1730	165	133	85	33	17	116	**549**
1730 - 1745	165	146	106	19	18	103	**557**
1745 - 1800	173	118	104	24	18	100	**537**
1800 - 1815	168	95	71	14	23	99	**470**
1815 - 1830	140	93	94	23	15	92	**457**
Period End	**1958**	**1440**	**1203**	**307**	**229**	**1332**	**6469**

Peak Per	NORTH Belmore Rd T	NORTH Belmore Rd L	EAST Hannans Rd R	EAST Hannans Rd L	SOUTH Belmore Rd R	SOUTH Belmore Rd T	TOTAL
1530 - 1630	670	505	416	124	82	487	**2284**
1545 - 1645	636	520	398	117	83	487	**2241**
1600 - 1700	630	526	402	105	83	440	**2186**
1615 - 1715	664	502	421	103	76	443	**2209**
1630 - 1730	642	483	412	103	73	451	**2164**
1645 - 1745	665	521	414	99	73	417	**2189**
1700 - 1800	695	532	413	103	70	428	**2241**
1715 - 1815	671	492	366	90	76	418	**2113**
1730 - 1830	646	452	375	80	74	394	**2021**
PEAK HR	**670**	**505**	**416**	**124**	**82**	**487**	**2284**



R.O.A.R. DATA

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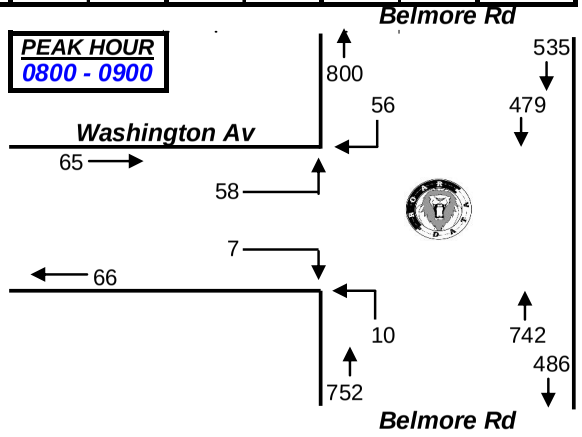
Client : Varga Traffic Planning
Job No/Name : 3344 RIVERWOOD Intersection Counts
Day/Date : Tuesday / 26th October 2010

All Vehicles

	NORTH		WEST		SOUTH		
	Belmore Rd		*Washington Av*		*Belmore Rd*		
Time Per	**R**	**T**	**L**	**R**	**L**	**T**	**TOTAL**
0630 - 0645	0	86	10	0	0	135	**231**
0645 - 0700	2	107	5	0	0	160	**274**
0700 - 0715	3	68	7	3	1	183	**265**
0715 - 0730	9	95	8	1	0	179	**292**
0730 - 0745	2	73	8	2	1	185	**271**
0745 - 0800	5	80	11	1	0	223	**320**
0800 - 0815	8	97	12	1	1	215	**334**
0815 - 0830	12	108	20	1	2	203	**346**
0830 - 0845	21	120	14	2	2	157	**316**
0845 - 0900	15	154	12	3	5	167	**356**
0900 - 0915	9	117	20	1	4	156	**307**
0915 - 0930	14	100	13	1	3	138	**269**
Period End	**100**	**1205**	**140**	**16**	**19**	**2101**	**3581**

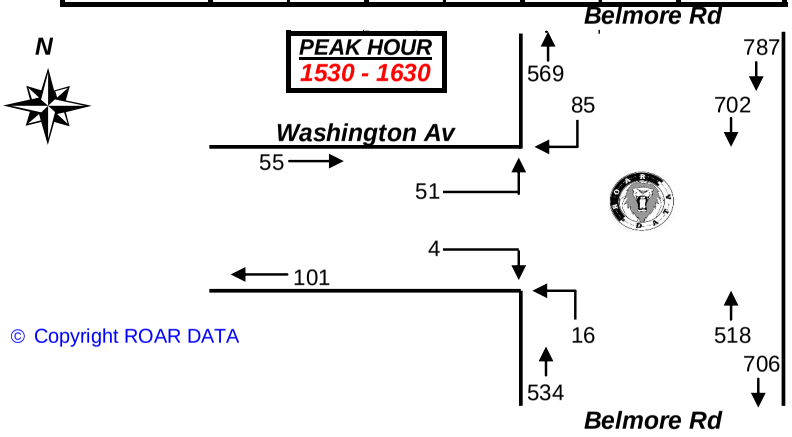
	NORTH		WEST		SOUTH		
	Belmore Rd		*Washington Av*		*Belmore Rd*		
Peak Per	**R**	**T**	**L**	**R**	**L**	**T**	**TOTAL**
0630 - 0730	14	356	30	4	1	657	**1062**
0645 - 0745	16	343	28	6	2	707	**1102**
0700 - 0800	19	316	34	7	2	770	**1148**
0715 - 0815	24	345	39	5	2	802	**1217**
0730 - 0830	27	358	51	5	4	826	**1271**
0745 - 0845	46	405	57	5	5	798	**1316**
0800 - 0900	56	479	58	7	10	742	**1352**
0815 - 0915	57	499	66	7	13	683	**1325**
0830 - 0930	59	491	59	7	14	618	**1248**
PEAK HR	**56**	**479**	**58**	**7**	**10**	**742**	**1352**



All Vehicles

	NORTH		WEST		SOUTH		
	Belmore Rd		*Washington Av*		*Belmore Rd*		
Time Per	**R**	**T**	**L**	**R**	**L**	**T**	**TOTAL**
1530 - 1545	24	184	8	1	2	146	**365**
1545 - 1600	20	157	17	0	4	140	**338**
1600 - 1615	18	166	13	1	5	117	**320**
1615 - 1630	23	195	13	2	5	115	**353**
1630 - 1645	21	150	18	0	2	137	**328**
1645 - 1700	14	151	5	2	1	105	**278**
1700 - 1715	15	200	8	1	3	118	**345**
1715 - 1730	21	173	16	2	1	117	**330**
1730 - 1745	19	173	14	3	2	107	**318**
1745 - 1800	14	181	14	2	2	104	**317**
1800 - 1815	13	177	14	4	1	108	**317**
1815 - 1830	6	150	9	4	3	98	**270**
Period End	**208**	**2057**	**149**	**22**	**31**	**1412**	**3879**

	NORTH		WEST		SOUTH		
	Belmore Rd		*Washington Av*		*Belmore Rd*		
Peak Per	**R**	**T**	**L**	**R**	**L**	**T**	**TOTAL**
1530 - 1630	85	702	51	4	16	518	**1376**
1545 - 1645	82	668	61	3	16	509	**1339**
1600 - 1700	76	662	49	5	13	474	**1279**
1615 - 1715	73	696	44	5	11	475	**1304**
1630 - 1730	71	674	47	5	7	477	**1281**
1645 - 1745	69	697	43	8	7	447	**1271**
1700 - 1800	69	727	52	8	8	446	**1310**
1715 - 1815	67	704	58	11	6	436	**1282**
1730 - 1830	52	681	51	13	8	417	**1222**
PEAK HR	**85**	**702**	**51**	**4**	**16**	**518**	**1376**



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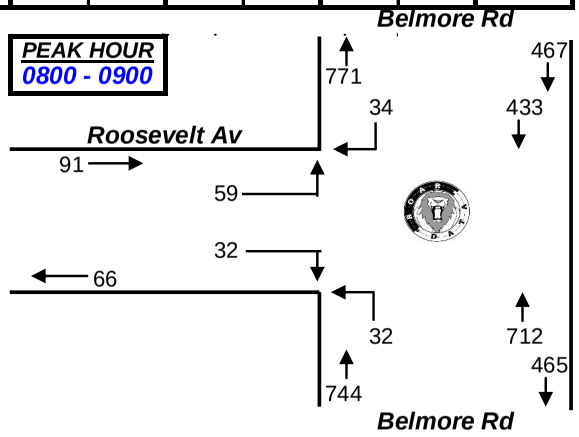
Day/Date : Tuesday / 26th October 2010

All Vehicles

Time Per	NORTH Belmore Rd R	NORTH Belmore Rd T	WEST Roosevelt Av L	WEST Roosevelt Av R	SOUTH Belmore Rd L	SOUTH Belmore Rd T	TOTAL
0630 - 0645	0	91	9	3	5	137	**245**
0645 - 0700	1	101	6	4	1	162	**275**
0700 - 0715	2	77	6	0	3	180	**268**
0715 - 0730	2	74	7	3	2	165	**253**
0730 - 0745	2	77	15	5	3	184	**286**
0745 - 0800	1	69	9	6	4	195	**284**
0800 - 0815	6	93	13	5	9	199	**325**
0815 - 0830	9	98	21	12	13	195	**348**
0830 - 0845	11	103	12	7	4	145	**282**
0845 - 0900	8	139	13	8	6	173	**347**
0900 - 0915	10	109	7	8	6	159	**299**
0915 - 0930	8	104	11	7	2	144	**276**
Period End	**60**	**1135**	**129**	**68**	**58**	**2038**	**3488**

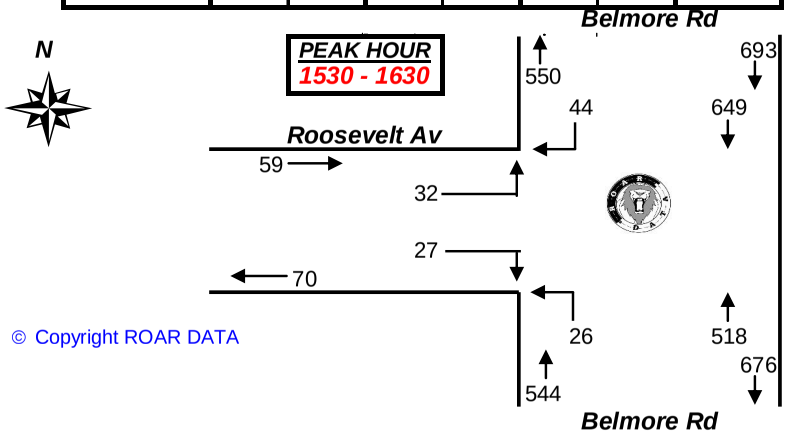
Peak Per	NORTH Belmore Rd R	NORTH Belmore Rd T	WEST Roosevelt Av L	WEST Roosevelt Av R	SOUTH Belmore Rd L	SOUTH Belmore Rd T	TOTAL
0630 - 0730	5	343	28	10	11	644	**1041**
0645 - 0745	7	329	34	12	9	691	**1082**
0700 - 0800	7	297	37	14	12	724	**1091**
0715 - 0815	11	313	44	19	18	743	**1148**
0730 - 0830	18	337	58	28	29	773	**1243**
0745 - 0845	27	363	55	30	30	734	**1239**
0800 - 0900	34	433	59	32	32	712	**1302**
0815 - 0915	38	449	53	35	29	672	**1276**
0830 - 0930	37	455	43	30	18	621	**1204**
PEAK HR	**34**	**433**	**59**	**32**	**32**	**712**	**1302**



All Vehicles

Time Per	NORTH Belmore Rd R	NORTH Belmore Rd T	WEST Roosevelt Av L	WEST Roosevelt Av R	SOUTH Belmore Rd L	SOUTH Belmore Rd T	TOTAL
1530 - 1545	7	181	4	6	8	141	**347**
1545 - 1600	11	145	13	5	7	145	**326**
1600 - 1615	9	167	8	11	5	113	**313**
1615 - 1630	17	156	7	5	6	119	**310**
1630 - 1645	10	137	9	7	12	147	**322**
1645 - 1700	11	145	6	8	5	104	**279**
1700 - 1715	9	184	14	8	6	124	**345**
1715 - 1730	12	145	10	2	9	101	**279**
1730 - 1745	13	158	7	6	14	107	**305**
1745 - 1800	5	167	6	6	2	98	**284**
1800 - 1815	5	183	12	3	5	96	**304**
1815 - 1830	2	143	2	3	4	93	**247**
Period End	**111**	**1911**	**98**	**70**	**83**	**1388**	**3661**

Peak Per	NORTH Belmore Rd R	NORTH Belmore Rd T	WEST Roosevelt Av L	WEST Roosevelt Av R	SOUTH Belmore Rd L	SOUTH Belmore Rd T	TOTAL
1530 - 1630	44	649	32	27	26	518	**1296**
1545 - 1645	47	605	37	28	30	524	**1271**
1600 - 1700	47	605	30	31	28	483	**1224**
1615 - 1715	47	622	36	28	29	494	**1256**
1630 - 1730	42	611	39	25	32	476	**1225**
1645 - 1745	45	632	37	24	34	436	**1208**
1700 - 1800	39	654	37	22	31	430	**1213**
1715 - 1815	35	653	35	17	30	402	**1172**
1730 - 1830	25	651	27	18	25	394	**1140**
PEAK HR	**44**	**649**	**32**	**27**	**26**	**518**	**1296**



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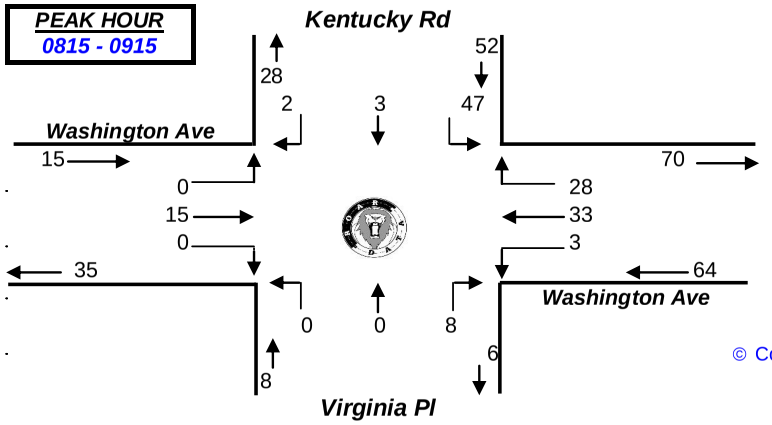
Client : Varga Traffic Planning
Job No/Name : 3344 RIVERWOOD Intersection Counts
Day/Date : Tuesday / 26th October 2010

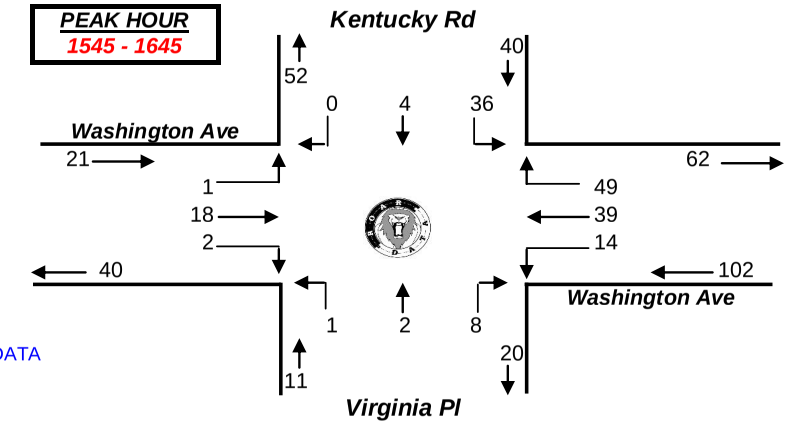
All Vehicles	NORTH Kentucky Rd			WEST Washington Ave			SOUTH Virginia Pl			EAST Washington Ave			
Time Per	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0630 - 0645	5	0	0	0	3	0	0	0	1	0	1	0	**10**
0645 - 0700	5	0	0	0	1	0	0	0	0	1	0	2	**9**
0700 - 0715	8	0	0	0	2	0	0	0	0	1	1	2	**14**
0715 - 0730	6	0	0	0	1	0	0	0	1	2	3	4	**17**
0730 - 0745	6	0	1	0	3	0	0	0	2	1	2	2	**17**
0745 - 0800	8	0	0	0	4	0	0	0	0	1	2	2	**17**
0800 - 0815	6	1	0	0	5	1	0	1	1	3	4	2	**24**
0815 - 0830	14	2	0	0	3	0	0	0	3	0	8	6	**36**
0830 - 0845	7	0	0	0	3	0	0	0	3	2	14	7	**36**
0845 - 0900	7	0	2	0	6	0	0	0	1	1	9	8	**34**
0900 - 0915	19	1	0	0	3	0	0	0	1	0	2	7	**33**
0915 - 0930	5	2	0	1	6	0	0	0	3	1	11	5	**34**
Period End	**96**	**6**	**3**	**1**	**40**	**1**	**0**	**1**	**16**	**13**	**57**	**47**	**281**

All Vehicles	NORTH Kentucky Rd			WEST Washington Ave			SOUTH Virginia Pl			EAST Washington Ave			
Time Per	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1530 - 1545	6	2	1	2	1	0	0	0	0	0	8	17	**37**
1545 - 1600	13	0	0	1	5	2	0	1	2	1	11	16	**52**
1600 - 1615	5	2	0	0	5	0	1	0	1	3	9	8	**34**
1615 - 1630	11	1	0	0	3	0	0	1	3	3	13	12	**47**
1630 - 1645	7	1	0	0	5	0	0	0	2	7	6	13	**41**
1645 - 1700	5	2	0	0	2	0	0	0	0	6	3	5	**23**
1700 - 1715	7	1	1	0	3	0	0	0	1	1	5	13	**32**
1715 - 1730	9	0	0	0	8	0	0	1	0	4	10	11	**43**
1730 - 1745	10	0	0	0	0	0	1	0	4	2	7	13	**37**
1745 - 1800	10	2	0	0	4	0	0	0	0	1	4	11	**32**
1800 - 1815	10	0	2	0	4	0	0	0	2	0	6	7	**31**
1815 - 1830	10	0	0	0	3	0	2	0	0	1	2	6	**24**
Period End	**103**	**11**	**4**	**3**	**43**	**2**	**4**	**3**	**15**	**29**	**84**	**132**	**433**

	NORTH Kentucky Rd			WEST Washington Ave			SOUTH Virginia Pl			EAST Washington Ave			
Peak Time	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0630 - 0730	24	0	0	0	7	0	0	0	2	4	5	8	**50**
0645 - 0745	25	0	1	0	7	0	0	0	3	5	6	10	**57**
0700 - 0800	28	0	1	0	10	0	0	0	3	5	8	10	**65**
0715 - 0815	26	1	1	0	13	1	0	1	4	7	11	10	**75**
0730 - 0830	34	3	1	0	15	1	0	1	6	5	16	12	**94**
0745 - 0845	35	3	0	0	15	1	0	1	7	6	28	17	**113**
0800 - 0900	34	3	2	0	17	1	0	1	8	6	35	23	**130**
0815 - 0915	47	3	2	0	15	0	0	0	8	3	33	28	**139**
0830 - 0930	38	3	2	1	18	0	0	0	8	4	36	27	**137**
PEAK HOUR	**47**	**3**	**2**	**0**	**15**	**0**	**0**	**0**	**8**	**3**	**33**	**28**	**139**

	NORTH Kentucky Rd			WEST Washington Ave			SOUTH Virginia Pl			EAST Washington Ave			
Peak Time	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1530 - 1630	35	5	1	3	14	2	1	2	6	7	41	53	**170**
1545 - 1645	36	4	0	1	18	2	1	2	8	14	39	49	**174**
1600 - 1700	28	6	0	0	15	0	1	1	6	19	31	38	**145**
1615 - 1715	30	5	1	0	13	0	0	1	6	17	27	43	**143**
1630 - 1730	28	4	1	0	18	0	0	1	3	18	24	42	**139**
1645 - 1745	31	3	1	0	13	0	1	1	5	13	25	42	**135**
1700 - 1800	36	3	1	0	15	0	1	1	5	8	26	48	**144**
1715 - 1815	39	2	2	0	16	0	1	1	6	7	27	42	**143**
1730 - 1830	40	2	2	0	11	0	3	0	6	4	19	37	**124**
PEAK HOUR	**36**	**4**	**0**	**1**	**18**	**2**	**1**	**2**	**8**	**14**	**39**	**49**	**174**





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Client : Varga Traffic Planning

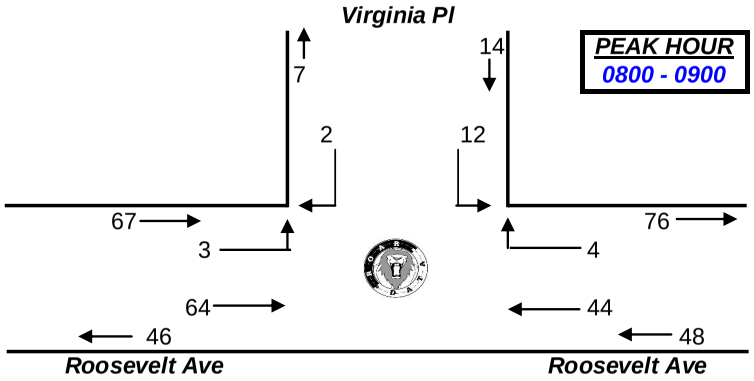
Job No/Name : 3344 RIVERWOOD Intersection Counts

Day/Date : Tuesday / 26th October 2010

All Vehicles

	WEST		NORTH		EAST		
	Roosevelt Ave		*Virginia Pl*		*Roosevelt Ave*		
Time Per	**L**	**T**	**R**	**L**	**T**	**R**	**TOTAL**
0630 - 0645	0	13	0	0	5	0	**18**
0645 - 0700	0	6	0	2	2	0	**10**
0700 - 0715	0	6	1	1	3	0	**11**
0715 - 0730	0	10	0	1	1	0	**12**
0730 - 0745	0	16	0	1	4	0	**21**
0745 - 0800	0	12	0	1	2	1	**16**
0800 - 0815	0	10	2	4	9	1	**26**
0815 - 0830	1	21	0	2	12	1	**37**
0830 - 0845	1	16	0	4	14	1	**36**
0845 - 0900	1	17	0	2	9	1	**30**
0900 - 0915	0	8	1	1	9	1	**20**
0915 - 0930	1	14	0	3	8	0	**26**
Period End	**4**	**149**	**4**	**22**	**78**	**6**	**263**

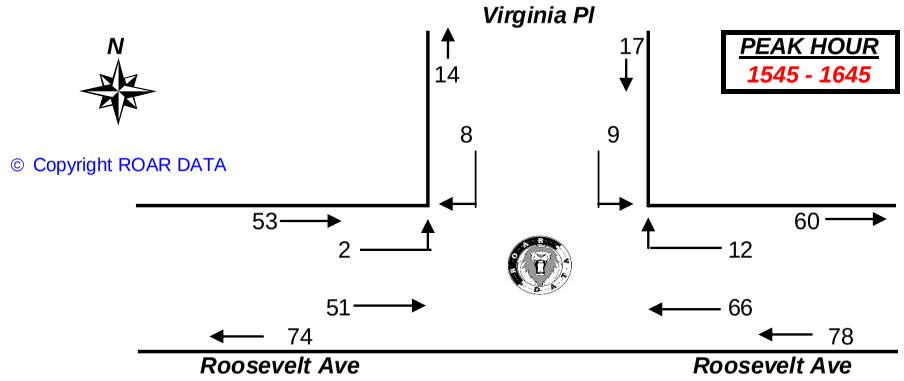
	WEST		NORTH		EAST		
	Roosevelt Ave		*Virginia Pl*		*Roosevelt Ave*		
Peak Per	**L**	**T**	**R**	**L**	**T**	**R**	**TOTAL**
0630 - 0730	0	35	1	4	11	0	**51**
0645 - 0745	0	38	1	5	10	0	**54**
0700 - 0800	0	44	1	4	10	1	**60**
0715 - 0815	0	48	2	7	16	2	**75**
0730 - 0830	1	59	2	8	27	3	**100**
0745 - 0845	2	59	2	11	37	4	**115**
0800 - 0900	3	64	2	12	44	4	**129**
0815 - 0915	3	62	1	9	44	4	**123**
0830 - 0930	3	55	1	10	40	3	**112**
PEAK HR	**3**	**64**	**2**	**12**	**44**	**4**	**129**



All Vehicles

	WEST		NORTH		EAST		
	Roosevelt Ave		*Virginia Pl*		*Roosevelt Ave*		
Time Per	**L**	**T**	**R**	**L**	**T**	**R**	**TOTAL**
1530 - 1545	0	7	1	3	13	1	**25**
1545 - 1600	1	15	2	1	15	4	**38**
1600 - 1615	0	16	1	3	9	1	**30**
1615 - 1630	1	12	3	2	20	3	**41**
1630 - 1645	0	8	2	3	22	4	**39**
1645 - 1700	0	9	3	5	13	1	**31**
1700 - 1715	0	13	0	3	11	2	**29**
1715 - 1730	0	9	0	3	21	1	**34**
1730 - 1745	1	13	1	1	13	1	**30**
1745 - 1800	0	7	1	2	6	1	**17**
1800 - 1815	1	12	0	1	5	2	**21**
1815 - 1830	1	6	0	0	5	1	**13**
Period End	**5**	**127**	**14**	**27**	**153**	**22**	**348**

	WEST		NORTH		EAST		
	Roosevelt Ave		*Virginia Pl*		*Roosevelt Ave*		
Peak Per	**L**	**T**	**R**	**L**	**T**	**R**	**TOTAL**
1530 - 1630	2	50	7	9	57	9	**134**
1545 - 1645	2	51	8	9	66	12	**148**
1600 - 1700	1	45	9	13	64	9	**141**
1615 - 1715	1	42	8	13	66	10	**140**
1630 - 1730	0	39	5	14	67	8	**133**
1645 - 1745	1	44	4	12	58	5	**124**
1700 - 1800	1	42	2	9	51	5	**110**
1715 - 1815	2	41	2	7	45	5	**102**
1730 - 1830	3	38	2	4	29	5	**81**
PEAK HR	**2**	**51**	**8**	**9**	**66**	**12**	**148**



R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849, Mob.0418-239019

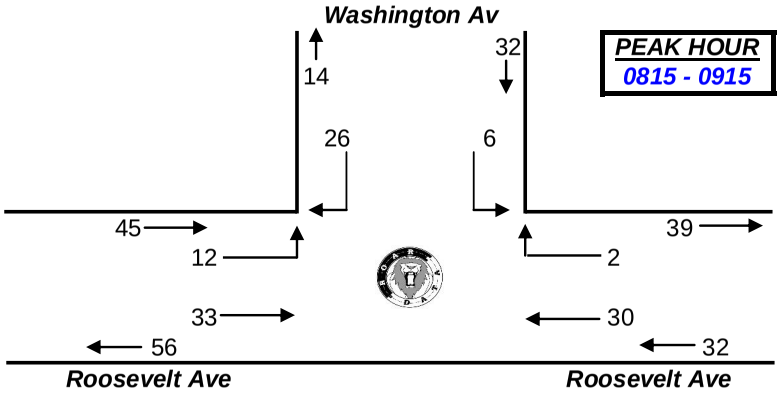
Client : Varga Traffic Planning

Job No/Name : 3344 RIVERWOOD Intersection Counts

Day/Date : Tuesday / 26th October 2010

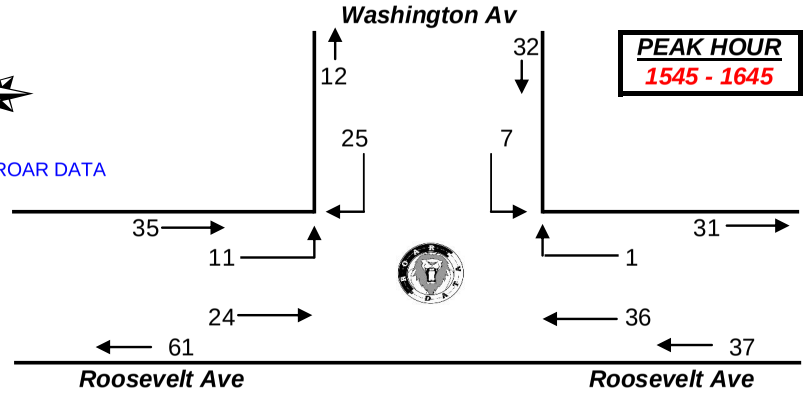
All Vehicles	WEST		NORTH		EAST		
	Roosevelt Ave		*Washington Av*		*Roosevelt Ave*		
Time Per	**L**	**T**	**R**	**L**	**T**	**R**	**TOTAL**
0630 - 0645	2	7	0	0	4	0	**13**
0645 - 0700	0	4	0	0	2	1	**7**
0700 - 0715	0	5	0	0	1	0	**6**
0715 - 0730	0	5	1	0	0	0	**6**
0730 - 0745	2	6	2	3	2	1	**16**
0745 - 0800	3	9	2	0	3	0	**17**
0800 - 0815	3	2	2	0	6	1	**14**
0815 - 0830	2	13	5	2	7	1	**30**
0830 - 0845	2	6	11	1	12	0	**32**
0845 - 0900	6	8	6	3	9	1	**33**
0900 - 0915	2	6	4	0	2	0	**14**
0915 - 0930	5	4	5	1	3	1	**19**
Period End	**27**	**75**	**38**	**10**	**51**	**6**	**207**

	WEST		NORTH		EAST		
	Roosevelt Ave		*Washington Av*		*Roosevelt Ave*		
Peak Per	**L**	**T**	**R**	**L**	**T**	**R**	**TOTAL**
0630 - 0730	2	21	1	0	7	1	**32**
0645 - 0745	2	20	3	3	5	2	**35**
0700 - 0800	5	25	5	3	6	1	**45**
0715 - 0815	8	22	7	3	11	2	**53**
0730 - 0830	10	30	11	5	18	3	**77**
0745 - 0845	10	30	20	3	28	2	**93**
0800 - 0900	13	29	24	6	34	3	**109**
0815 - 0915	12	33	26	6	30	2	**109**
0830 - 0930	15	24	26	5	26	2	**98**
PEAK HR	**12**	**33**	**26**	**6**	**30**	**2**	**109**



All Vehicles	WEST		NORTH		EAST		
	Roosevelt Ave		*Washington Av*		*Roosevelt Ave*		
Time Per	**L**	**T**	**R**	**L**	**T**	**R**	**TOTAL**
1530 - 1545	1	4	5	2	8	3	**23**
1545 - 1600	4	8	8	1	7	1	**29**
1600 - 1615	2	4	5	2	9	0	**22**
1615 - 1630	4	8	8	1	7	0	**28**
1630 - 1645	1	4	4	3	13	0	**25**
1645 - 1700	0	1	1	1	10	1	**14**
1700 - 1715	0	8	3	1	14	3	**29**
1715 - 1730	2	5	6	0	9	1	**23**
1730 - 1745	0	6	5	1	13	1	**26**
1745 - 1800	0	5	3	1	3	0	**12**
1800 - 1815	4	5	5	1	4	1	**20**
1815 - 1830	0	6	3	4	4	1	**18**
Period End	**18**	**64**	**56**	**18**	**101**	**12**	**269**

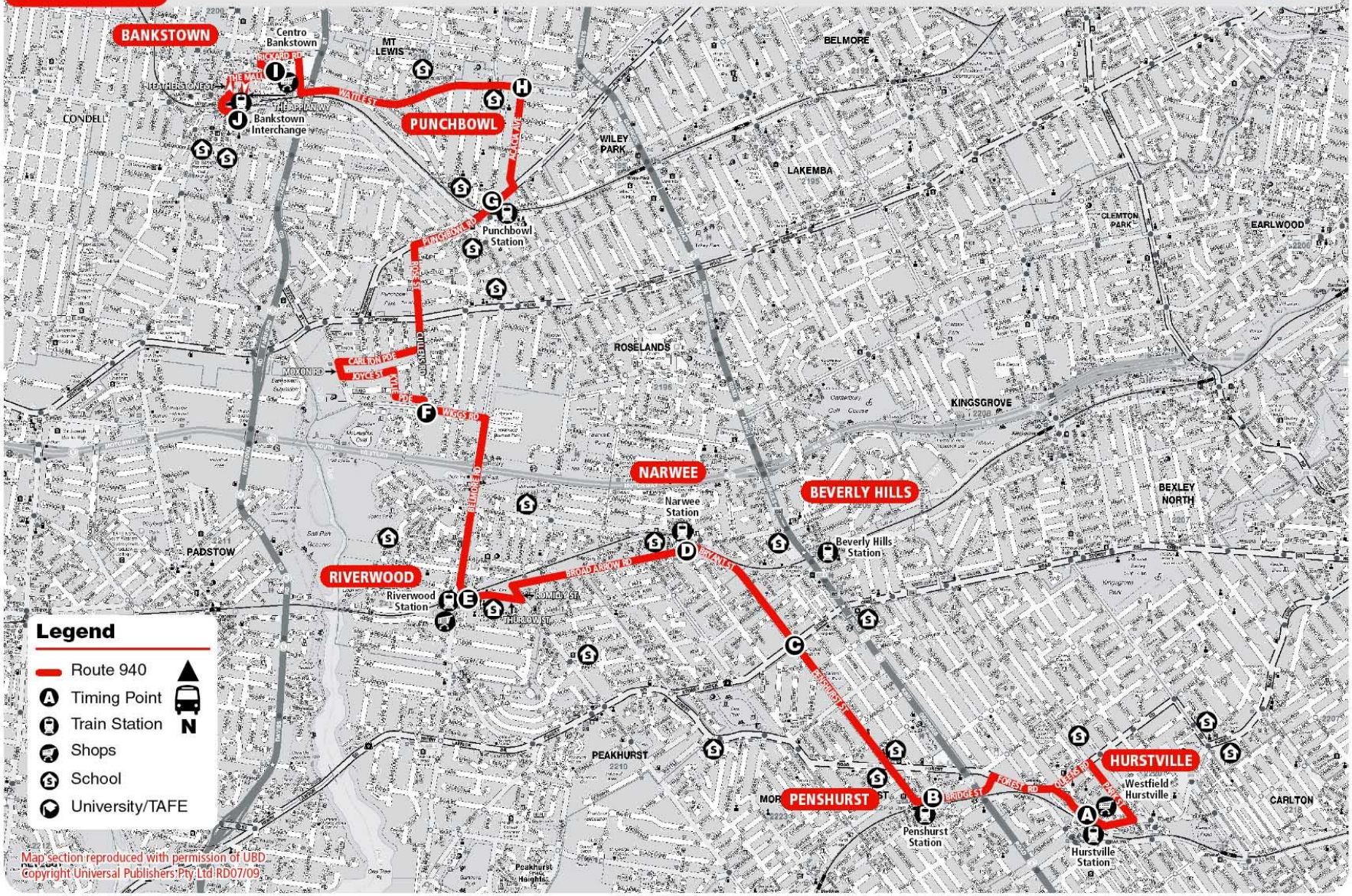
	WEST		NORTH		EAST		
	Roosevelt Ave		*Washington Av*		*Roosevelt Ave*		
Peak Per	**L**	**T**	**R**	**L**	**T**	**R**	**TOTAL**
1530 - 1630	11	24	26	6	31	4	**102**
1545 - 1645	11	24	25	7	36	1	**104**
1600 - 1700	7	17	18	7	39	1	**89**
1615 - 1715	5	21	16	6	44	4	**96**
1630 - 1730	3	18	14	5	46	5	**91**
1645 - 1745	2	20	15	3	46	6	**92**
1700 - 1800	2	24	17	3	39	5	**90**
1715 - 1815	6	21	19	3	29	3	**81**
1730 - 1830	4	22	16	7	24	3	**76**
PEAK HR	**11**	**24**	**25**	**7**	**36**	**1**	**104**



APPENDIX B

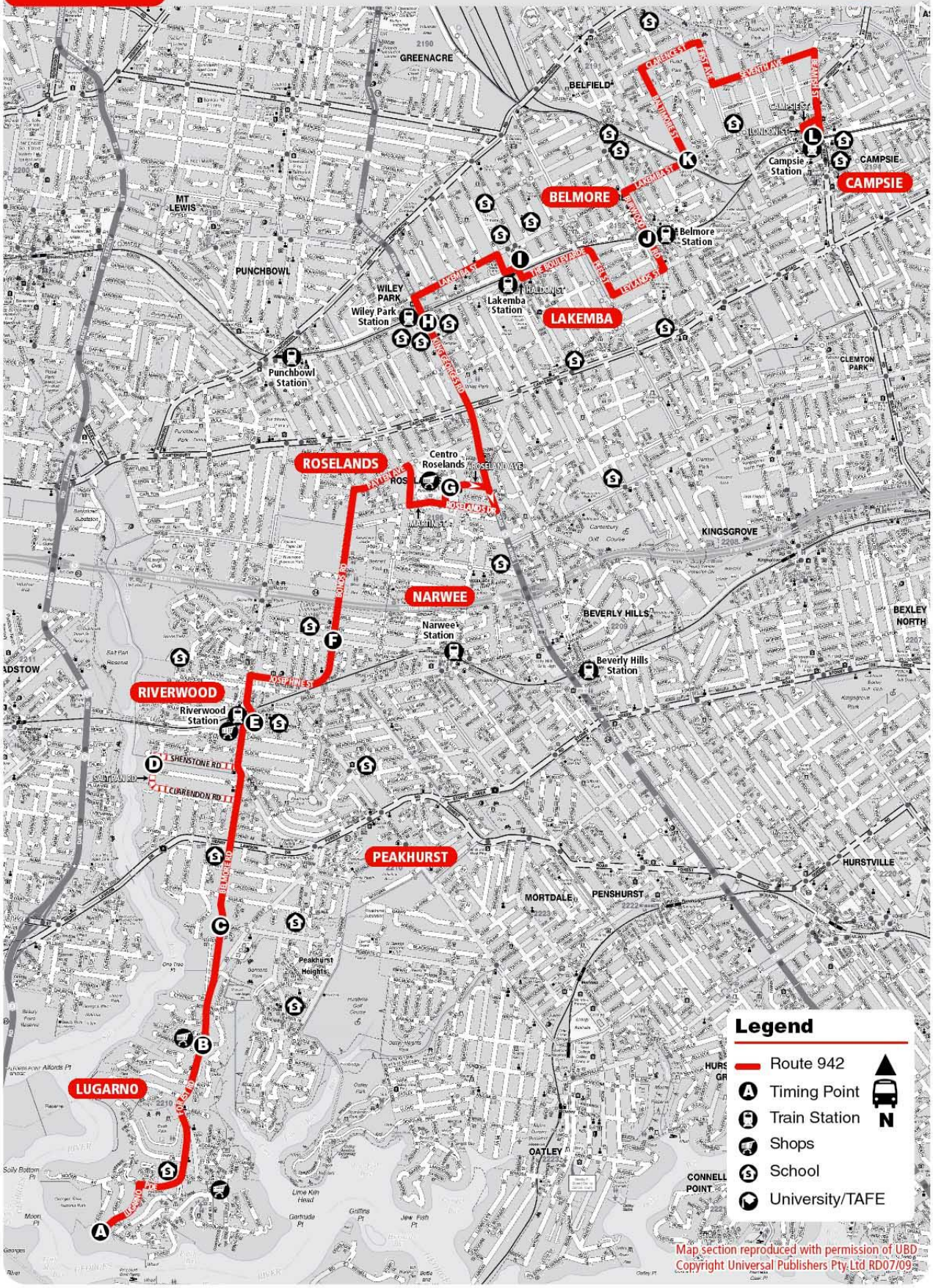
BUS ROUTE MAPS

Route 940 Bus Route Map

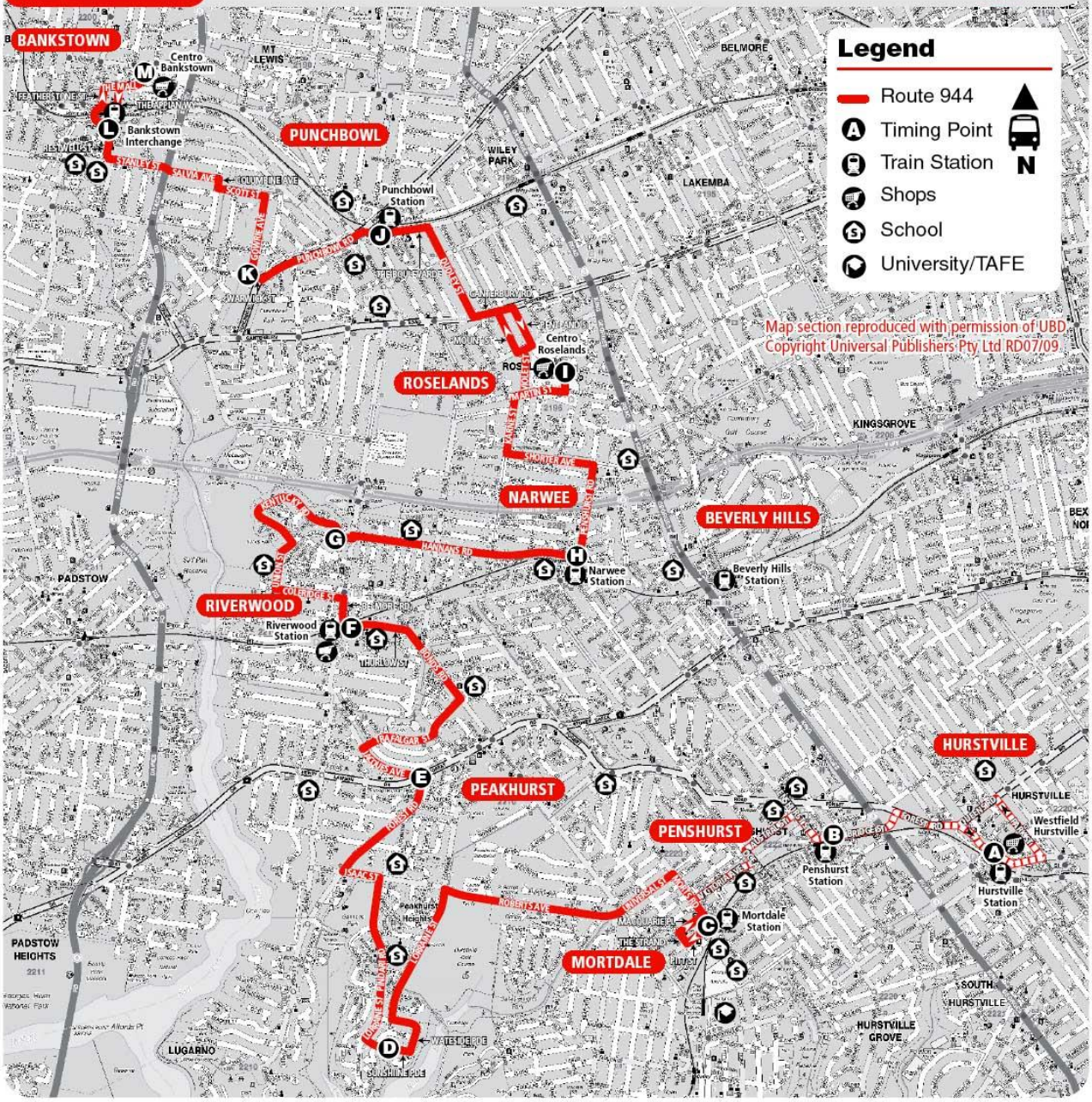


Route 942

Bus Route Map



Route 944 Bus Route Map



Route 945

Bus Route Map