Major Project Directorate, Housing NSW

West Ryde Redevelopment Project

Transport and Accessibility Impact Study

February 2010

Issue

ARUP

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Arup Pty Ltd
Level 10 201 Kent Street,
Sydney NSW 2000
Tel +61 2 9320 9320 Fax +61 2 9320 9321
www.arup.com

ARUP

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Contents

Plans of the Proposed Development

Appendix B

Supplementary Transport and Accessibility Report

1 Introduction

1.1 Scope of Report

Arup was commissioned by the Major Projects Directorate (MPD) at Housing New South Wales to undertake a traffic and transport assessment and advice for the proposed development of a site at 63 to 77 West Parade, West Ryde, Sydney, about 15 kilometres northwest of the Sydney CBD.

This report was prepared to address the issues being considered in the planning stage of the project, and to support a Part 3A concept application to the Minister of Planning incorporating a simplified urban design document. The report responds to the Director-General's Requirements (DGR's) from Planning NSW dated 04/05/2009.

Based on the initial Arup traffic report (dated 08/07/2009), a number of issues have been raised by the different state and local government authorities (e.g. Ministry of Transport, RTA and City of Ryde Council). These issues have been considered and addressed in a supplementary report which is attached in Appendix B of this report.

1.2 Key Issues and Objectives

The objective of the study is to address the following key issues and provide practical transport solutions to accommodate the proposed development.

- Traffic generation
- Traffic demand management
- Access to and from the site
- Traffic movements within the site
- Vehicle loading and unloading
- Traffic exposure and interaction with Victoria Road
- Pedestrian and public transport access
- Integration with current and future development surrounding the site
- Existing and future traffic patterns and flows
- Traffic and pedestrian safety in and around the site

1.3 Existing Studies and Reports

Existing studies and reports include area studies by Ryde Council and the Roads and Traffic Authority NSW (RTA) on some nearby roads, and traffic impact reports for proposed development. The Metropolitan Strategy for Sydney also has some information regarding this area.

The cancellation of the Northwest Metro in November 2008 has reduced the opportunity for new transport services in the Ryde municipality.

1.3.1 Transport Guidelines

The key transport guidelines taken into account in this study are:

- Australian Standards
- AUSTROADS Guidelines
- West Ryde Masterplan
- RTA guide to Traffic Generating Developments

- NSW Planning Guidelines for Walking and Cycling (2004)
- City of Ryde Integrated Transport and Land Use Strategy and
- Ryde Bicycle Strategy and Masterplan 2007

2 Existing Conditions

2.1 Description of the Site

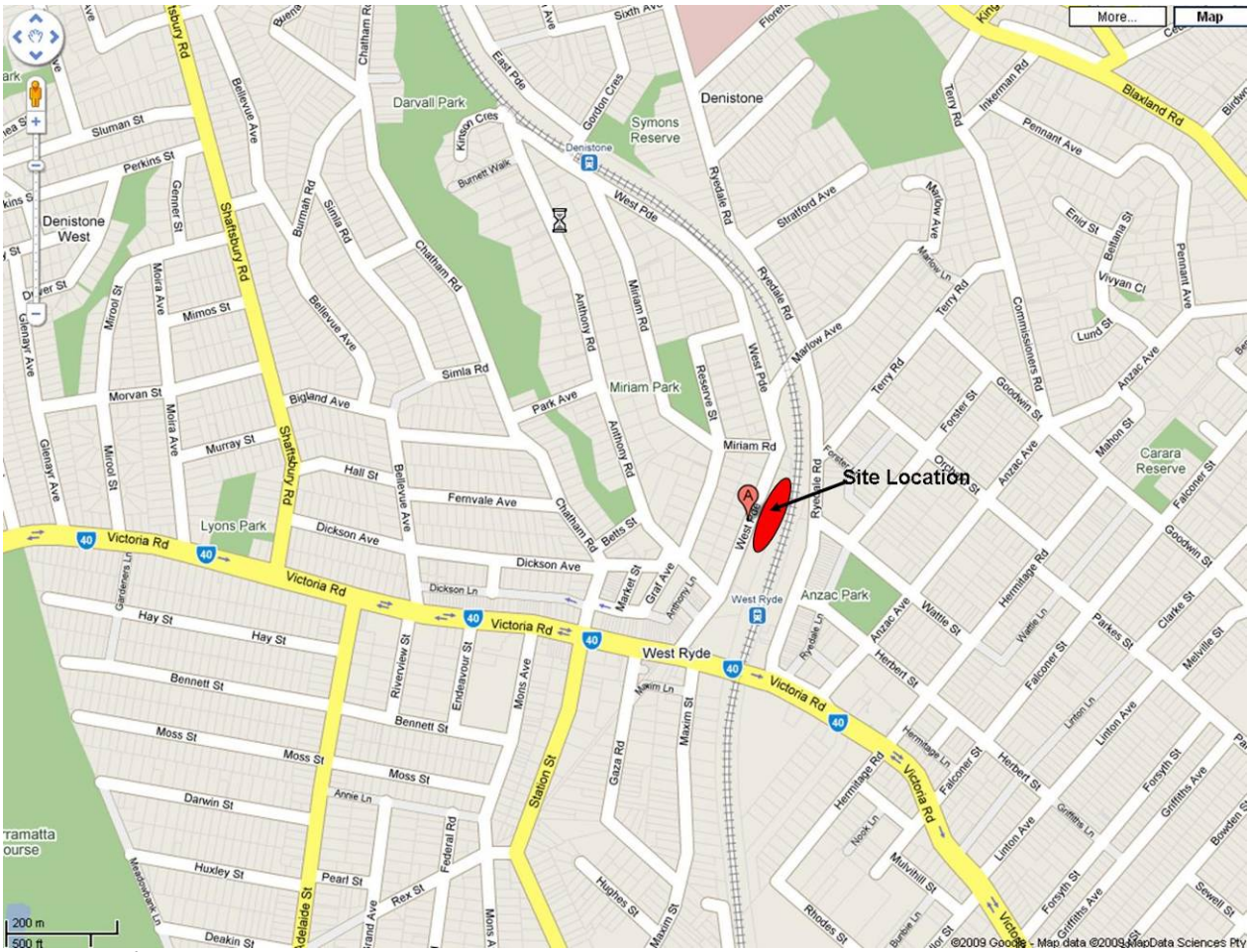
The development site fronts 63 to 77 West Parade in West Ryde adjacent to the West Ryde railway station. The existing site comprises 8 single detached residential dwellings, some now demolished. The frontage road West Parade is a four-lane road with car parking along each kerb and one through traffic lane in each direction. The west side of the road is predominantly one hour un-metered parking which appears to be about 30% utilized during weekdays. The east side is unrestricted parking which is almost 100% utilised as the whole area is under pressure from commuter railway parking, and bus lay by area. Commuter parking extends in all of the unrestricted parking along West Parade, extends the other side of the rail, and it also extends back away from the railway station along the back streets for about a kilometre walking distance from the railway station.

There is therefore a major limit to the amount of on-street car parking in the area and little opportunity for the proposed development to use long term on street car parking as part of its requirement.

2.2 Site Location

The site is north of the overpass intersection of the Strathfield to Epping rail line over Victoria Road, as shown in the following three figures.

Figure 1 Site location



Source: Google Map

West Parade opposite site, view to north

West Parade opposite site, view to south

West Parade / Miriam Road

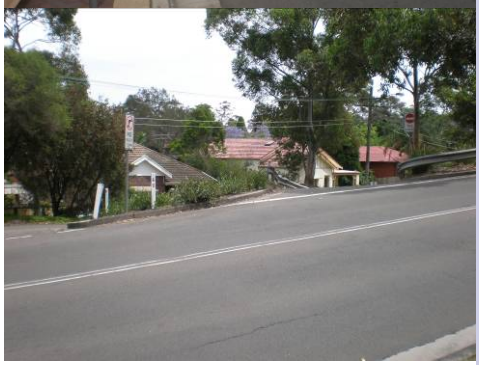
Railway from the east

West Ryde Station

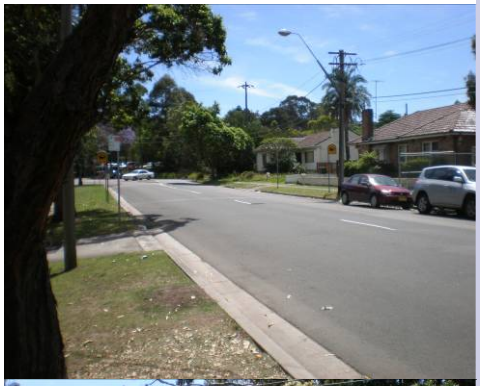
West Ryde Station Bus and Taxi Interchange off West Parade

Vehicle access along railway west

West Parade approach to Victoria Road



West Parade/ Marlow Avenue



Subject site frontage view to north

Subject site frontage

Figure 2 Site Photos

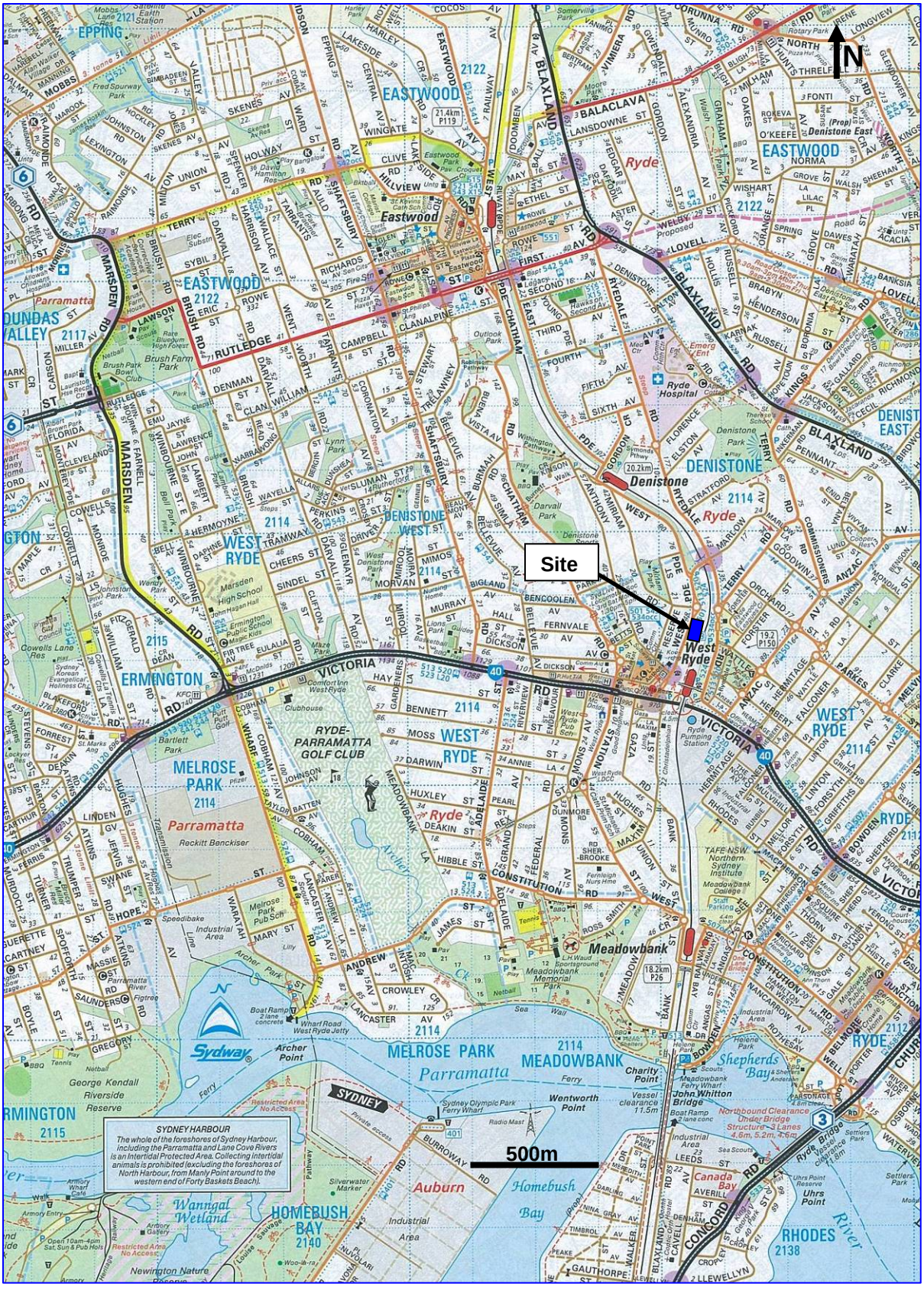


Figure 3 Site Context

2.3 Site Access

Site access is off the frontage road from a series of driveways to the single storey detached dwellings. Driveways on each of the sites give a total of eight driveways along the frontage of the site.

The lots are bound in their south by a nine storey residential complex constructed in the early 1970s and at the northern end by the curve of the railway as it changes to run directly beside West Parade. On the western side of West Parade opposite side is a row of two and three-story residential buildings dating from the 1960s and early 1970s. Further north from the roundabout at the intersection of West Parade, Miriam Road, and West Parade, is a RailCorp commuter car park off-street between West Parade and the railway reserves. There will therefore be significant pedestrian traffic along West Parade for commuters walking to and from the railway station.

At the railway station there is a significant bus and taxi interchange. There are wide driveway accesses near the signalised intersection of Anthony Road and West Parade. This is access only for buses and taxis and accommodates up to ten taxis at a time. There are kerbside bus layover bays for 3 buses approaching southbound on West Street, confirming that this is a significant hub for bus public transport in the area.

West Ryde station provides an accessible pedestrian link bridge up and over the railway to the other side of the railway to Ryedale Road with its shopping centre and services club. The next pedestrian crossings are where Marlow Avenue /West Parade crosses over the rail some half a kilometre to the north, and the Victoria Road rail underpass approximately 100m to the south.

2.4 Road hierarchy

The different roads and speed limits are listed below, although some of the roads may have lower posted speed limits due to the urban environment and local activities (speed limits based on Functional Classification of Roads in Urban Areas, RTA, 1993):

- Motorway (70-110km/h limit)
  - nil

- Arterial Road (70-110km/h limit)
  - Victoria Road
  - Metroad Route 3 Church Street
  - Blaxland Road
  - Marsden Road

- Sub Arterial Road (60-80 km/h limit)
  - Rutledge Street – First Avenue

- Collector Road (40-60km/h limit)
  - Ryedale Road
  - West Parade
  - Chatham Road
  - East Parade
  - West Parade

- Local Road (50km /h limit)
  - All other roads

Route 3 Metroad route 3 of Church Street and Concorde Road creates a link across the Parramatta River and north to a Newcastle and the northern beaches. Victoria Road Route 40 is a major arterial road running east-west near the study area from Sydney to Parramatta.

Turns from Victoria Road towards the site are restricted: the right turn from the East not being available into West Parade (drivers must continue on to Chatham Road signals and then work their way back past a shopping centre). Coming from the west left turns are available into West Parade directly. Exit exiting from West Parade is available left-hand and right onto Victoria Road.

The next level down of the road hierarchy includes Marsden Road some 2 km to the west running to the north and Rutledge Street running east-west some 1 km 1.5 km north of the site which connects with Blaxland Road east-west. On the more local road hierarchy the combination of West Parade and Ryedale Road does provide an opportunity for north-south movement across the study area but these are effectively local distributor roads although they will carry substantial through traffic. A degree of traffic calming is evident in the vicinity: a roundabout at West Parade and Miriam Road and signals at West Parade and Ryedale (see Figure 2).

The area has a local speed limit of 50 km/h.

An inventory of the existing traffic controls is shown in Figure 4.

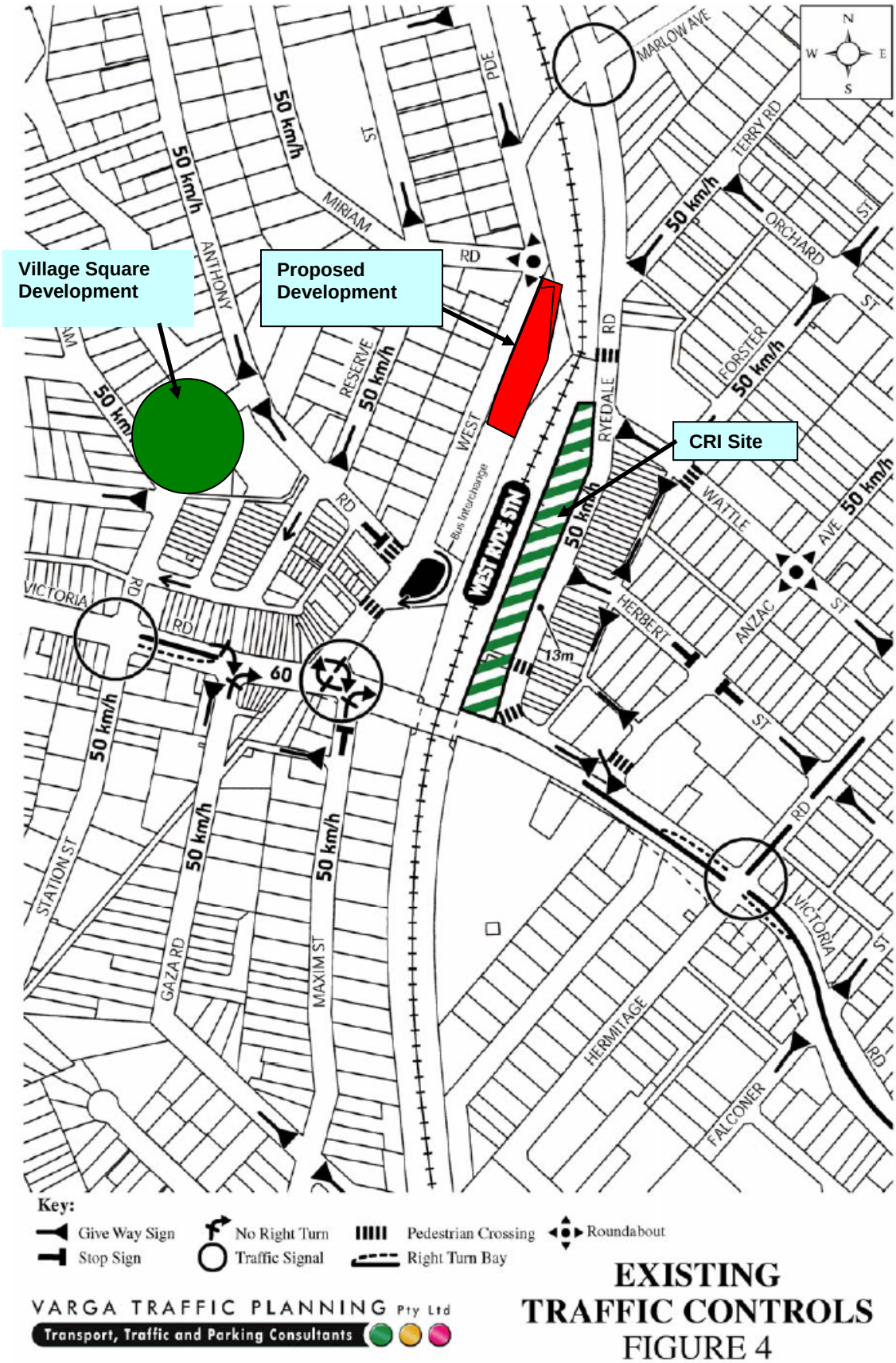


Figure 4 CRI development and surrounds

2.5 Existing Traffic Conditions

Victoria Road is the major arterial road in the area running east-west. It is generally configured as three eastbound lanes and two westbound lanes to the east of Chatham Road due to the constriction under the railway line (Figure 2) and the right turn bay into Chatham Road (Figure 3). The right turn bay into Chatham Road currently accommodates approximately 12 vehicles.

Figure 5 Victoria Road looking east from West Parade

Figure 6 Victoria Road looking east from Chatham Road

Figure 7 Victoria Road looking west from West Parade

Chatham Road and West Parade intersect with Victoria Road and provide a distributor road function for north-south traffic accessing the West Ryde town centre and the residential precinct to the north. Chatham Road is a 12.8m wide road generally configured as a traffic lane in each direction with kerbside car parking. At the Dickson Avenue roundabout, Chatham Road continues with a single lane in each direction and no car parking until the north of Betts Street.

Figure 8 Chatham Road looking north from Victoria Road

Figure 9 West Parade southbound approach to Victoria Road

2.6 Current and proposed road works, traffic management works and bikeways

Investigation of Ryde Council and RTA websites did not indicate any major proposals apart from the issues in the DGR's that are addressed later in this report.

2.7 Traffic Flows

A peak hourly traffic count was undertaken by Arup on West Parade (in front of the site) on Wednesday, 24 April 2009. It was found that the two way traffic volume on West Parade various between 430 veh/h around the midday and 750 veh/h during the pm peak period.

Traffic volumes and forecasts are contained in the various Masterplan studies for Victoria Road and a recent study for the area[1]. Typical daily (AADT) and AM and PM peak hour are reproduced in Table 1 and Table 2 respectively.

station	Road	Location	1987	1989	1991	1993	1996	1999	2002	2005
51.213	VICTORIA RD,MR165-SL1	WEST RYDE-AT RAILWAY OVERBRIDGE					59051	57590	58335	58238
00.661	VICTORIA RD(E/W)	ADELAIDE ST(S).WEST RYDE-TCS 785	61373	62997	62274	60395	61921	62447	55016	60582

Source: Daily Traffic, AADT, RTA NSW, 2008

Table 1 Daily Traffic Volumes

Day	Rd	Location	Scenario	Duration	Veh/h(both direction)
Thursday	West Parade	N of Vic Rd	AM Peak	7.30am-8.30am	533
	West Parade	N of Anthony St			459
	Vic Rd	W of West Parade			5350
	Vic Rd	E of West Parade			5027
	West Parade	N of Vic Rd	PM Peak	5pm-6pm	695
	West Parade	N of Anthony St			748
	Vic Rd	W of West Parade			4876
	Vic Rd	E of West Parade			4347
Saturday	West Parade	N of Vic Rd	Midday Peak	11.45am-12.45pm	537
	West Parade	N of Anthony St			629
	Vic Rd	W of West			4082
	Vic Rd	E of West			3809

Source: Arup, West Ryde Shopping Centre, 2003

Table 2 Existing Traffic Volumes

[1] West Ryde Village Traffic Study, Arup, 2007

2.8 Traffic Analysis

The following traffic analysis is drawn from the Arup 2007 report. The key intersections forming the access road system to the West Ryde precinct were surveyed during the peak periods for turning volumes by light and heavy vehicles. Thursday was chosen for the week day count due to late night shopping usually has some influence on traffic flow. Saturday midday was chosen as a typical busy period on weekend days.

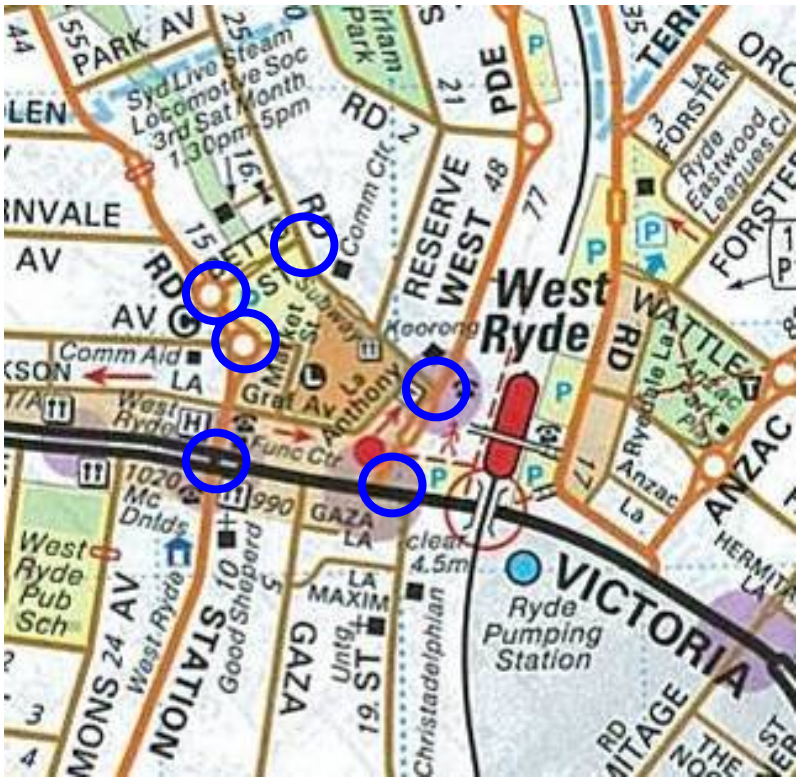


Figure 10 Traffic Survey Locations

On Saturday it was reasonably busy with some traffic congestion mainly at the Chatham Road roundabouts. Due to the Victoria Road signals a queue would build up at times back into the Dickson Avenue roundabout. On the green phase it was noticed that not all the vehicles got through on the phase. On a couple of occasions it became blocked. This was also the case for the Betts Street roundabout. At this roundabout the queue appeared in the opposite direction northbound and only very briefly. There were quite a number of u-turns at the Dickson Avenue roundabout turning from northbound to southbound to access Graf Avenue as there is no right turn into the street and to return to Victoria Road due to the right turn ban from Station Street into Victoria Road. It was a little the same for Thursday along Chatham Road with queuing etc. There were a few u-turns at the Dickson Avenue roundabout.

The seven intersections surrounding the development site were analysed using the SIDRA intersection analysis program. A summary of this analysis is shown in Table 3**.**

Table 3 Summary of Intersection Analysis (Existing Traffic Flow)

Intersection	Scenario	Peak Hour	Level of Service	Degree of Saturation	Average Delay	95% Back Of Queue (m)
Victoria Road / West Parade	Saturday	midday	A	0.76	11.4	135
	Thursday	AM	B	1.183	17.7	154
		PM	B	1.02	17.8	202
Victoria Road / Chatham Road	Saturday	midday	B	1.04	16.7	162
	Thursday	AM	E	1.12	66.7	1,187
		PM	B	1.04	22.3	487
Chatham Road / Dickson Avenue	Saturday	midday	A	0.53	10.3	29
	Thursday	AM	A	0.36	8.8	19
		PM	A	0.59	10.3	33
Chatham Road / Betts Street	Saturday	midday	A	0.55	10.6	43
	Thursday	AM	A	0.54	10.2	33
		PM	A	0.62	10.7	50
Anthony Road / West Parade	Saturday	midday	D	0.69	46.9	96
	Thursday	AM	C	0.67	37.0	67
		PM	D	0.63	43.3	115
Anthony Road / Betts Street	Saturday	midday	B	0.28	9.6	8
	Thursday	AM	A	0.24	8.5	1
		PM	B	0.26	9.3	7
Anthony Rd / Reserve Street*	Saturday	midday	B	0.19	2.2	6
	Thursday	AM	B	0.13	2.3	3
		PM	B	0.362	3.5	14

*Traffic volumes estimated from adjacent counts. Extract Arup West Ryde Urban Village Report, July 2008

2.9 Traffic Safety

There is not an RTA accident black spot in the area. However the high volumes of pedestrian activity around the railway station heighten accident exposures. The absence of a pedestrian crossing of West Parade on the north side of the Anthony Road intersection signals is contrary to current RTA practice and a pedestrian crossing as median pedestrian refuge outside the bookshop may be warranted. The next pedestrian crossing refuge point is at the Miriam Road roundabout to the north.

2.10 Public Transport

The site has excellent access to bus and rail public transport services as well as a taxi rank within the accepted 400m walk radius of a railway station and bus services. As such, the site is well suited to a high mode split to public transport. Bus services run to locations such

as Parramatta and Ryde. The railway station provides frequent services to Hornsby to the north and to the south to Strathfield and provides direct services to a central Sydney CBD and North Sydney.

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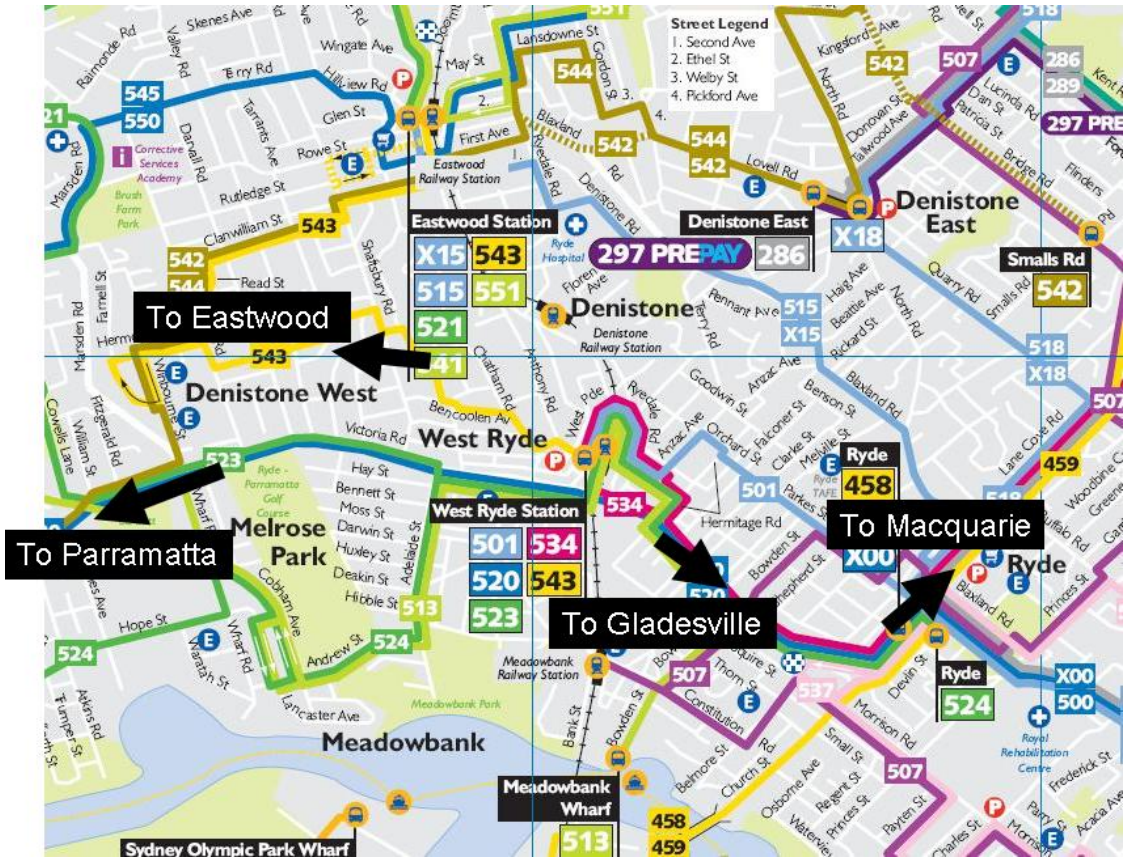


Source: Sydney Buses website

Figure 11 Public Transport Services

3 Proposed Development

3.1 The Development

The project contains lots located at 63 to 77 West Parade adjacent to West Ryde railway station and the railway line. The development includes demolition of the existing dwellings and construction of approximately 138 units comprising 61 social housing units, 20 affordable housing units, 57 private dwellings, 620m^2 GFA of office space and 71m^2 of retail space (refer to drawings to **Appendix A** drawings prepared by Caldis Cook Group, drawing nos. 09-098 sk – 02,04,05). The Housing NSW Ryde client services team will be accommodated on the site office. The whole development will comprise of the following three buildings:

- 12 storey Building A – 77 residential dwellings, ground level retail and two level of basement parking
- 8 storey Building B – 32 residential dwellings and lower level office spaces
- 5 storey Building C – 29 residential dwellings

A combined (in and out) driveway is proposed with the development on the northern end of Building A.

The 17 carparking bays will be located on the northern end of the building and will be separated from the residential parking. These commercial parking bays are proposed to be accessible by the key card/ swipe card operated boom gates.

The site frontage is reasonably level and the sight distances of the driveway provide sufficient views along the road and across the footpath.

3.1.1 Projected number of employees/users/patrons

The anticipated number of staff and visitors on site and the associated car parking requirement is approximately:

- There will be 30-40 office staff DOH Ryde Client Services Team in 620m² GFA office floorspace. Social Housing tenants from the Ryde Gladesville area will visit the office to access HNSW services.
- There may be 3 - 5 staff for the retail component of the development. There may be some outside visitors to the retail shops, although it is anticipated that the retail component of the development will mainly serve the residential and commercial component of the development

3.1.2 Hours and days of operation

The office will be open 5 days a week generally between 8.00am and 6.00pm. The retail shops may operate till late at night.

3.1.3 Selection of appropriate design vehicles for determining access and circulation requirements

The design vehicle for the building is the Australian Standards B99 (99th percentile vehicle represented by Ford Transit Van medium wheelbase van) to public basement parking and private parking above ground.

The design vehicle to service waste via the basement using a private contractor is also likely to be the B99 vehicle due to headroom limitations.

3.1.4 Analysis of projected queuing at entrances

Sufficient staff resident and visitor parking and traffic management elements are provided on site in the basement car park to avoid queuing at the entrance. There will be entry control gates and no expected delay to vehicles entering the site.

3.1.5 Provision for access to, and by public transport

An opportunity for provision of a staff shuttle bus is not necessary due to the proximity of bus, rail and taxis.

3.1.6 Parking layout

All parking spaces and circulation aisles must comply with AS 2890.1 – 2004 off street car parking.

3.1.7 Parking for Service / courier vehicles

Service vehicle access is envisaged to be relatively minor and perhaps associated with the change of tenancies within the development. In this case it would seem appropriate not to provide a loading dock for the development. However if the loading dock is chosen to be developed for vans and full garbage removal then this can be managed with a small rigid truck and 8.8 m long trucks. It will be a design issue as to whether removal vans pass inside or serve from the kerbside.

3.1.8 Bicycle Parking

Secure bicycle parking will be provided as per Council requirements.

3.2 Parking Policy

3.2.1 Council code and local parking policies and plans

City of Ryde Council Parking Policies: The City of Ryde Development Control Plan 2006 outlines Parking requirements relating to specific land uses, and objectives of:

- Recognising the varying degrees of availability of public transport within Ryde, the aim of the car parking provisions of this Part is to provide a comprehensive guide for the provision of parking for new development in order to:
- Ensure adequate traffic safety and management
- Ensure an adequate environmental quality of parking areas (both safety and amenity) and
- Provide parking areas that are convenient and sufficient for the use of employees and visitors generated by new developments

Land use	Parking Requirements
Residential	
(i) Boarding Houses	1 space/2 bedrooms and 1 space/manager/1 spacer/2 employees
(ii) Dwelling housing and residential flat buildings	2 spaces/dwelling
(iii) Residential flats – for properties within 400m or Victoria Road, Epping Road or a Railway Station:	
One bedroom dwelling	1 space/dwelling
Two bedroom dwelling	1.2 spaces/dwelling
Three bedroom dwelling	1.6 spaces/dwelling
Visitors	1 space/4 dwellings
(iv) Urban Housing	As per part 3.6 of this Plan
Dual Occupancy	1 space/dwelling
Business	
(ix) Offices	1 space/ 30 m²

Table 4 Council Parking Policy

On Site Car Parking Requirements In The West Ryde Urban Village

Land Use	Car Parking Requirement
Restaurants, cafes, etc. *that front onto public road, footway, or the like, at ground level*	1 space/25m^2 floor area accessible to the public. Nil for outdoor area on or abutting public roads/footways
Other restaurants, cafes, etc.	1 space/5m^2 dining area
Squash courts, tennis courts	1 space/court
Gymnasia	1 space/20m^2 floor area accessible to the public
Educational establishments	1 space/3 employees + 1 space/10 students
Places of worship and meeting rooms up to 200m^2 floor area*.	1 space/30m^2 floor area
Residential dwellings (new development)	0.75 space/1 bedroom dwelling 1 space/2 bedroom dwelling 1.25 space/3 bedroom dwelling 1 space/4 dwellings for visitors
Residential dwellings (involving adaptive re-use of existing floor space only)	Nil
* Car parking requirements for use of floor space in excess of 200m^2 will be assessed in accordance with Part 9.3 Car Parking of this Plan	

Table 5 Urban Village Parking Policy

3.3 Proposed Mode Split and Parking Review

The Central Sydney Housing Division group (CSHD) are forecasting a shift in market demand towards social housing, affordable housing and aged housing with reduced car use. This is evidenced in developments such where less than 10% of the provided bays are regularly used.

Few, if any, social housing clients drive to existing offices of Housing NSW, where offices such as Sussex Street in Sydney provide no parking at all. Existing offices in Ryde and Gladesville have no formal client parking.

Housing NSW staff use pool cars – an estimated 8 pool cars out of 40 staff suggests a low mode split of 23% less cars to work (17 cars – 8 pool cars / 40 staff).

A preliminary project parking provision is shown in Table 6. It should be possible to further reduce this rate of car parking provision due to the proximity and ease of access to trains, buses and taxis, the lower car ownerships rates of social housing tenants as derived from other areas such as Riverwood, easy walking to shopping and dining, and NSW Government and Ryde Council policies to encourage sustainable development.

In regards to low parking provision, introduction of car sharing scheme (e.g. Go Get) in West Parade in the vicinity of the site could be investigated.

Table 6: Proposed Parking Provision

Land Use	GFA/ Units	Reduced parking rate due to good transport access*	Number of space Required	Number of space proposed
Social Housing	61 units	1 space/ 10 units	6	12
Affordable Housing	20 units	1 space/ 5 units	4	6
Private Housing	57 units	0.8 space/ unit	46	46
Private Visitor	57 units	1 space/ 4 units	14	14
HNSW office	620 m^2 GFA (496 NLA)	1 space/ 70 NLA	7	17
Retail	71 m^2 GFA	-		-
Total			**77**	**95**

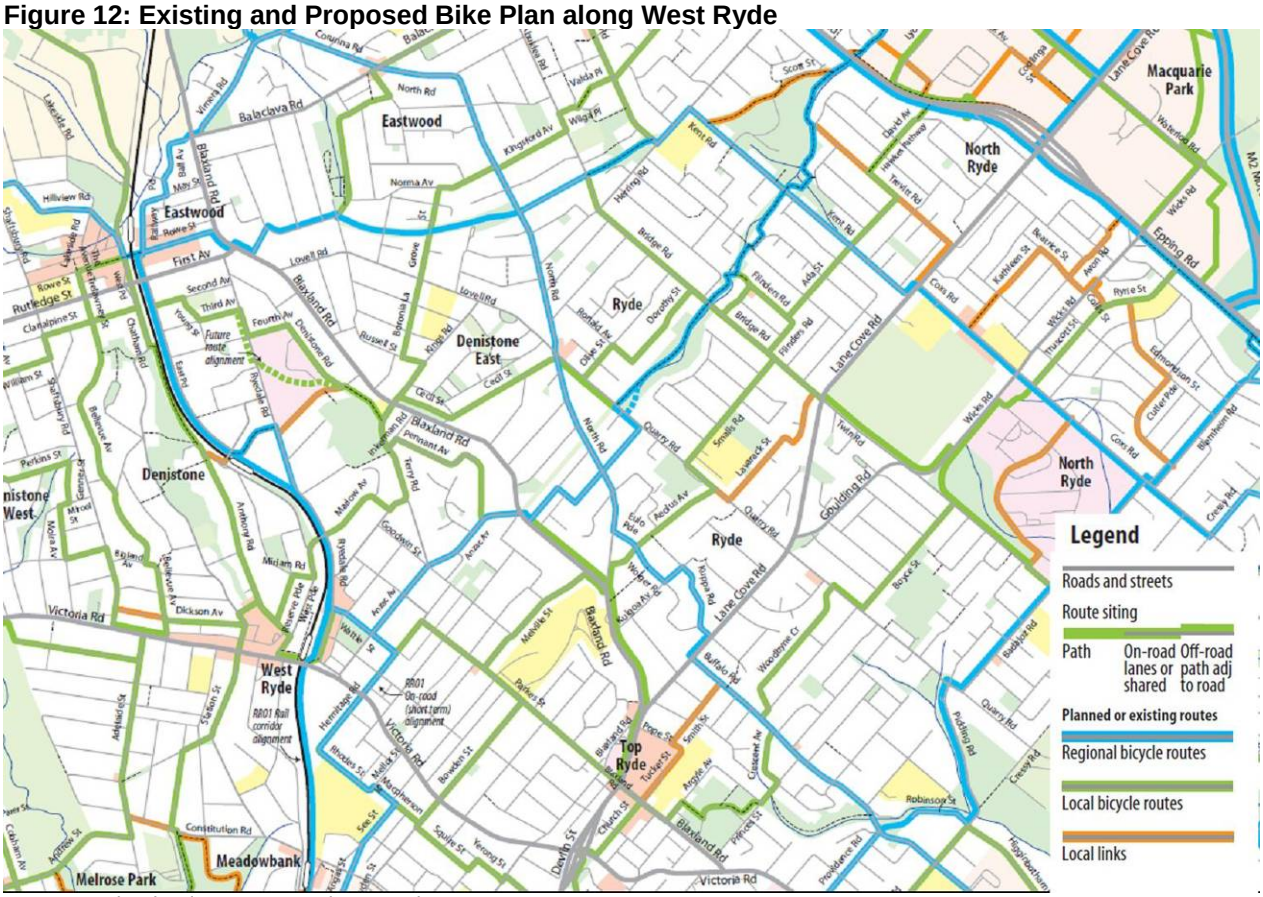
*Refer to Appendix B of this report (Supplementary Report – section 2.3)

3.4 Existing and Bicycle Routes at the Vicinity of the Site

On road cycle route is provided on Ryedale Road to the east of the railway line. This cycle route continues to Meadowbank via Hermitage Road, Meadowbank TAFE and Bowden Road to the south.

'City of Ryde Integrated Transport and Land Use Strategy' for West Ryde states that RTA Action for Bikes 2010 sets out a 10 year plan for a series of arterial bicycle networks across NSW. One of the proposed routes outlined in the RTA plan links Macquarie Park and Meadowbank via West Ryde. The proposed route follows Marlow Avenue, West Parade and Bank Street. The existing and proposed bike networks via West Ryde are shown in Figure 12.

Figure 12: Existing and Proposed Bike Plan along West Ryde

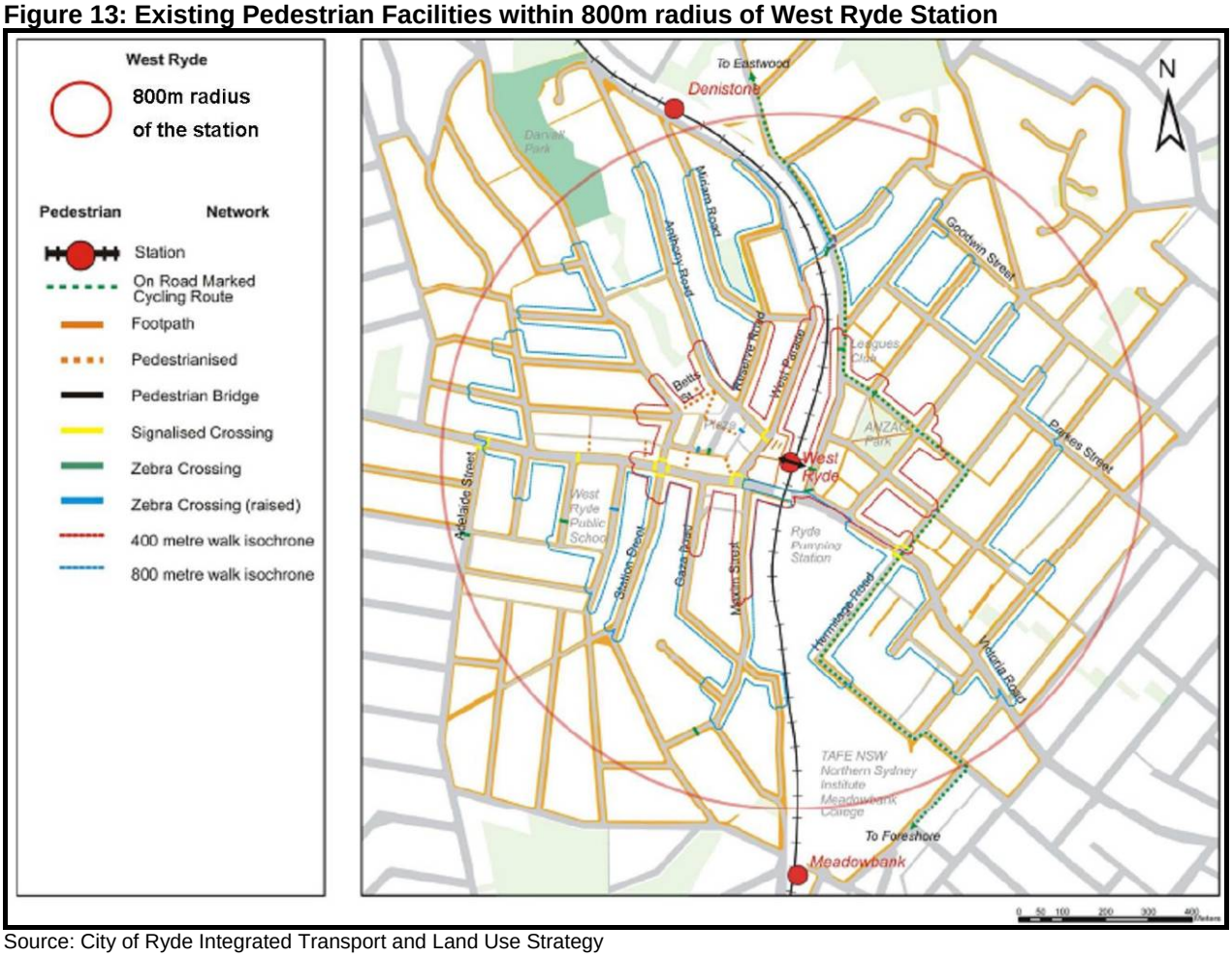


Source: Ryde Bicycle Strategy and Masterplan

3.5 Pedestrian Networks at the Vicinity of the Site

The existing pedestrian network at the vicinity of the site is shown in Figure 13. City of Ryde 'Integrated Transport and Land Use Strategy' states that the railway line is the major barrier for east – west pedestrian movement. East – west connectivity is provided at the station over bridge and Marlow Avenue/ Ryedale Road intersection which are located approximately 500m apart. Pedestrian footpaths are missing on further north on West Parade between Marlow Avenue and Denistone Station. The documents also shows the recent upgrade of footpaths on West Parade and Victoria Road (refer to Photograph 1).

Figure 13: Existing Pedestrian Facilities within 800m radius of West Ryde Station



Source: City of Ryde Integrated Transport and Land Use Strategy

Photograph 1: Footpath Upgrade on West Parade and Victoria Road

Recent footpath upgrade, West Parade | Victoria Road footpath

Source: City of Ryde Integrated Transport and Land Use Strategy

3.6 Other Plans

3.6.1 CRI Site

The Mixed Used Development Adjoining West Ryde Station (MP 05_0130) by CRI West Ryde Pty Ltd is a mixed use development consisting of 4 buildings (7 to 12 storeys) containing 195 dwellings, associated retail and commercial premises, child care centre,

private and commuter parking, landscape works, and consolidation/subdivision of lots Location: 2, 2F, 1/2F and 2/2F Ryedale Road, West Ryde (Lots 100, 101, 102, 103 DP 1067460 and Lots 1 & 2 and common property of SP 7370) (eastern side of West Ryde Railway Station- refer to Figure 4)

The Varga traffic report describes 195 apartments with 301 parking spaces with 2 driveways, 90 commuter parking spaces. The forecast total traffic generation is 144vtph, and probably lower due to proximity to the railway station.

3.6.2 West Ryde Urban Village

Council is currently considering major redevelopment of the West Ryde Urban Village Development within close proximity, just south of the study site. This does not apply to the subject site.. The West Ryde Urban Village Development is subject to controls under 4.3 of the City of Ryde Development Control Plan 2006.

Figure 14 West Ryde Urban Village Area

The City of Ryde Development Control Plan – 4.3 West Ryde Urban Village has objectives to provide a reasonable amount of safe and convenient car parking within the centre.

4 Impact of Proposed Development

4.1 Traffic generation during design periods

4.1.1 Daily and seasonal factors

61 social housing dwelling @ 0.2 vehicle trips/dwelling/hr (RTA) = 13

77 private housing dwelling @ 0.24 vehicle trips/dwelling/hr (RTA) = 19

40 office staff @ 2/100m² x 640m² (RTA) = 13

Total peak hour vehicular traffic generated – vehicle trips = **45**

Based on the arrival and departure times for staff, residents and visitors to the site described above, the peak hour traffic generation is anticipated to be:

- AM Peak (8.00 – 9.00am) – **45 veh**
- PM Peak (5.00 – 6.00pm) – **45 veh**

The existing site which currently accommodates approximately 6 dwellings can generate up to 6 vehicular trips in the peak hours, resulting a net increase of approximately 39 trips in the peak hours for the proposed development.

4.1.2 Pedestrian generation and movements

Pedestrian generation from the development will be able to circulate via the public pathways that exist to the site.

4.2 Integrated Transport Impact Assessment

The vehicular trips generated by the development during the peak hours will distribute across the access network. Residential trips out in the morning will be offset by office staff arriving and vice versa in the afternoon.

The peak hour levels of traffic generated, and the interpeak arrival and departure of vehicles to the site will be well provided for by the and its connections to the main road access system, supplemented by good walking cycling and public transport facilities.

It should be noted that the other two significant developments are proposed near the subject development (discussed in section 3.6). The significance of the three proposed development is compared in Table 7.

Table 7: Comparison of the large scale developments at West Ryde

West Ryde Urban Village	CRI Site	Subject Development
Parking Provision – 533 and Approximate Traffic Generation – am peak on network – 205 veh/h and pm peak – 600 veh/h	Parking Provision – 301 and Traffic Generation in the peak hours – 144 veh/h	Parking Provision – 95 and Traffic Generation in the peak hours 45 veh/h

Based on the comparison in the above table, it is evident that the other two developments at the vicinity are significantly higher compared to the subject development. Due to the proposed development the traffic generation will be minor and will not be noticeable most of the times. Due to the West Ryde Urban Village development, the following road improvements are proposed:

- The length of the right turn bay from Victoria Road to Chatham Road to be extended to 130m to accommodate more right turning vehicles.
- One designated left only and one through lane on Chatham Road at Victoria Road intersection to improve the traffic flow.

- A new roundabout at the intersection of Chatham Road and New Betts Street with two northbound lanes
- Two northbound lanes at the Chatham Road and Dickson Avenue roundabout

West Parade and Miriam Road intersection is controlled by a roundabout and was observed to be free flowing traffic in all directions during the site inspection. If it is assume that approximately 40% of the forecast site vehicles access the site to/ from the north, it is unlikely to have any significant impact with the additional 18 vehicles in the peak hours, hence the intersection is not analysed.

Ryedale Road and Marlow Road intersection is located north of the site just east of the railway over bridge. This intersection is currently controlled by a traffic signal. This intersection was also observed to be free flowing in all directions in the peak periods. This intersection was analysed in the traffic impact assessment of CRI development. Since due to the proposed development additional 10-15 vehicles in the peak hours is unlikely to have any significant impact, this intersection has not been analysed in Sidra intersection modelling.

The following extract from the West Ryde Village Traffic Study showed the following intersection operations. The other seven intersections surrounding the development site and the new site access intersection were analysed using the SIDRA intersection analysis program. A summary of this analysis is shown in Table 8. It should be noted that a growth factor of 1% per annum has been applied on all roads in the study area for a 10 year period. The intersections have been analysed for year 2016 assuming 10 years growth from existing flows to provide a 2016 base conditions assessment.

Table 8 Summary of Future Intersection Analysis

Intersection	Scenario	Peak Hour	Level of Service	Degree of Saturation	Average Delay	95% Back Of Queue (m)
Victoria Road / West Parade	Saturday	midday	A	0.85	11.6	198
	Thursday	AM	C	1.36	28.7	219
		PM	C	1.15	35.6	535
Victoria Road / Chatham Road	Saturday	midday	F	1.16	71.4	759
	Thursday	AM	F	1.25	117.0	1677
		PM	E	1.15	61.2	903
Chatham Road / Dickson Avenue	Saturday	midday	A	0.72	13.6	64
	Thursday	AM	A	0.43	9.3	20
		PM	B	0.77	15.4	76
Chatham Road / New Betts Street	Saturday	midday	A	0.49	8.3	29
	Thursday	AM	A	0.60	8.6	42
		PM	A	0.63	8.5	46
Anthony Road / West Parade	Saturday	midday	C	0.92	41.1	81
	Thursday	AM	C	0.83	35.6	62
		PM	C	0.81	38.2	112
Anthony Road / New Betts Street	Saturday	midday	C	0.33	14.3	49
	Thursday	AM	B	0.30	8.9	2

		PM	C	0.38	10.1	13
Anthony Road / Reserve Street	Saturday	midday	B	0.22	2.4	7
	Thursday	AM	B	0.17	2.9	5
		PM	C	0.58	5.1	24
New Betts Street/ Residential Access Intersection	Saturday	midday	B	0.32	2.9	30
	Thursday	AM	B	0.30	2.3	21
		PM	C	0.36	3.9	46

It is apparent that Chatham Street/Victoria Road will remain congested, but more generally this can be managed.

5 Authorities Issues

5.1 From Notes by Housing NSW from West Ryde Town Centre Masterplan Workshop , October 2008

5.1.1 Ryde Council

Remo redevelopment of Council car park in Anthony Road, next to Woolworths:

The main traffic issue for Council was access to/ from Victoria Road. Also, Victoria Road commercial strip generally have access to the rear of the shops. Several shops are now trying to reverse their frontage so that they back on to Victoria Road and face the Woolworths “Village Square”. They are more likely to attract business from the Village Square rather than Victoria Road which is seen as a commercial dead spot.

Provision of commuter parking in West Ryde was an issue. There is the potential for Council to look at sites on the east side of the railway line for development as parking facilities.

5.1.2 RTA

No new development with regard to private vehicle uses is planned for Victoria Road. RTA is looking at the feasibility of introducing bus lanes on Victoria Road (which will affect parking facilities). Most traffic signals in the West Ryde town centre have been recently modelled and identified.

The issue of turning right off Victoria Road into Chatham Road is problematic, especially when the Anthony Road development comes on stream – Council is looking at further improving the right turn lane into Chatham Road by amending the linemarking on Victoria Road. Turning right off Victoria Road into West Parade is also problematic as a Telstra mainframe would have to be relocated at a cost of $ 1.5M approx.

RTA focus is to try and maximise pedestrian safety on Victoria Road by creating traffic islands etc. Currently it is difficult to cross Victoria Road and businesses on the south side suffer accordingly. This area could be good for alternative use redevelopment e.g. commercial etc.

5.1.3 State Transit Authority

Pedestrian movements within the Interchange are an issue. Bus usage has increased in taking commuters to and from railway stations. Of the 150 new articulated buses ordered by State Transit, 30 are for Ryde.

5.1.4 RailCorp

The area is experiencing rapid growth in train usage “from Rhodes down”. A new timetable is being introduced from 2009 replacing 6 car passenger trains with 8 cars.

The new Epping to Chatswood line opened in February 2009. RailCorp has confirmed that an extra freight track on the west side of the RailCorp precinct is planned (for the northern good line).

6 Department of Planning Director-General's Requirements to Transport and Accessibility Impacts (construction and operational)

Director-General's Environmental Assessment (EA) requirements have been received from Department of Planning (DoP) for the subject development dated 4 May 2009. The conditions are valid for two years. Section 5 of the document addressed the "Transport & Accessibility Impacts (Construction and Operational)" requirements. The conditions are described and discussed as follows:

6.1 Provide a Transport & Accessibility Impact Study prepared in accordance with the RTA's Guide to Traffic Generating Developments, considering traffic generation (including daily and peak traffic movements), any required road / intersection upgrades, access, loading dock(s), car parking arrangements, measures to promote public transport usage and pedestrian and bicycle linkages

The peak hourly traffic for the subject development has been calculated based on the RTA rate (refer to section 4.1.1). The nearby road and intersection update due the other large developments at the vicinity has been described in section 4.2. Loading dock service arrangements is outlined in section 3.1.7. Due to the close proximity of public transport availability parking provision is minimised as much as possible so that it would have minimal traffic and parking impact at the locality.

Bicycle parking will be provided with the proposed development in accordance with Council requirements. The development, located within the 400m radius of the railway station and well connected streets and walking and cycling catchments, will achieve the 60% connectivity efficiency according to NSW DoP 'Planning Guidelines for Walking and Cycling'.

6.2 Provide an assessment of the implications of the proposed development for non-car travel modes (including public transport, walking and cycling), including an assessment of existing and proposed pedestrian and cycle movements within the vicinity of the subject site, and possible linkage to the "Rail Trail Shared Use Path Cycle/Pedestrian Route" which runs along the rail corridor

There are existing paved footpaths at the vicinity of the site joining all the public transport accessibility and retail precincts (refer to Figure 13). The footpaths on both sides of West Parade are in good conditions and will be retained. In addition, a significant reduction of driveways due to the proposed development should improve the pedestrian safety on eastern side of West Parade.

As discussed in section 3.4, there is an existing on road cycle route on Ryedale Road to the east of the railway line. For the west of the railway line, the future regional bicycle route is proposed via Marlow Avenue, West Parade and Bank Street. Details of the "Rail Trail Shared Cycle/ Pedestrian Route" are not known at this stage. However, if a Rail Trail shared path along the railway corridor is proposed in future, there may be an opportunity to connect the shared path from the site.

6.3 Demonstrate that a minimalist approach to carparking provision is taken based on the accessibility of the site to public transport

The proposed development will provide minimal parking provisions due to the close proximity of public transport. Due to the availability of public transport facilities and minimal provision of parking, the majority of the staff of the commercial and retail component of the development would need to catch public transport to access the site.

In addition, due to the close proximity of the major retail precincts, trip generation by the residential components of the development would be low.

6.4 Demonstrate how users of the development will be able to make travel choices that support the achievement of relevant State Plan targets

The NSW Government and Ryde City Council seek to reduce the demand for travel by private car and commercial vehicle to developments located in close proximity of public transport services. The relatively low parking provision for the development is in keeping with this philosophy. The site is well-served by public transport and therefore suitable alternatives to private car travel are readily available.

6.5 Demonstrate consistency with the accessibility and traffic/transport principles which are currently being developed as part of the West Ryde Masterplan Principles report (by Council)

West Ryde Masterplan has been prepared for Council in February 2009. In the Masterplan the 'City of Ryde Integrated Transport and Land use Strategy, 2007' states that:

- Victoria Corridor is identified to be a greater bus artery which will provide increase public transport options for local residents
- To reduce car dependency, the growth in vehicles kilometres (VKT) travelled and greenhouse gas emissions
- To increase the share of trips made by public transport, walking and cycling and reduce the number of trips made by private vehicles

The proposed development will fulfil the above objectives of the Masterplan.

6.6 Details of service vehicle movements

Details of service arrangements are outlined in 3.1.7. If an internal service dock is required, it will be designed in accordance with 2890.2 Off-street commercial vehicle facilities.

6.7 Consideration into a one way internal road system

The development of the site in stages may mitigate against using two driveways in a one way circulation. For this small peak, there may be more hazards for vehicles and pedestrians and signage clutters in enforcing a one-way circulation.

Potential for one-way traffic will be analysed in the detailed design stage. The internal road system will be designed in accordance with Council code and 2890.1 Off-street car parking. All safety and design issues will be in accordance with DoP 'Development near Rail Corridors and Busy Roads – Interim Guidelines'.

6.8 The EA should consider and investigate the opportunities for providing a pedestrian bridge across the rail corridor to link to the West Ryde Centre and improve pedestrian flows

There are excellent pedestrian linkages between the site and all the pedestrian generators at the vicinity. There is an existing pedestrian crossing facility at Anthony Road and West Parade intersection. All the pedestrian desire lines are well served by the existing footpaths.

As discussed in section 2.3, West Ryde station provides an accessible pedestrian link bridge up and over the railway to the other side of the railway to Ryedale Road with its shopping centre and services club.

The pedestrian volume generated by the development will have no significant impact on pedestrian traffic in surrounding streets. Therefore, a pedestrian overbridge due to this development is considered unwarranted. However, as described in section 2.9, there is a lack of pedestrian crossing facility on West Parade between Anthony Road and Miriam Road and a median pedestrian refuge islands may be warranted in that section.

The provision of an isolated pedestrian bridge over the railway past of the subject development would not attract heavy pedestrian flows, be underutilized, and therefore likely become a personal security risk. Most pedestrians, including disabled, would prefer the more secure active “Easy Access” bridge crossing at the railway station, or the footpath of the Marlow Avenue bridge activated by passing drivers.

In addition to the six transport issues above, Council’s response to DoP outlines the following transport issues:

6.9 As West Parade carries a significant proportion of through traffic, it is preferred that the proposed development considers one way movement of motor vehicles within the site i.e. one way entry and one way exit points

The development proposes two combined entry/ exit points. Traffic estimate in section 4.1.1 shows that there will be 45 vehicles in the peak periods. 45 vehicles in the peak hour or 1 vehicle in every 1.3 minutes is unlikely to have any significant impact to the through traffic movement on West Parade.

6.10 The impact on the local and state road networks that takes into consideration the recently approved large scale development of West Ryde Urban Village and CRI development at Ryedale Road in its overall assessment

This transport impact assessment considered and compared other large scaled development at the vicinity as described in section 4.2.

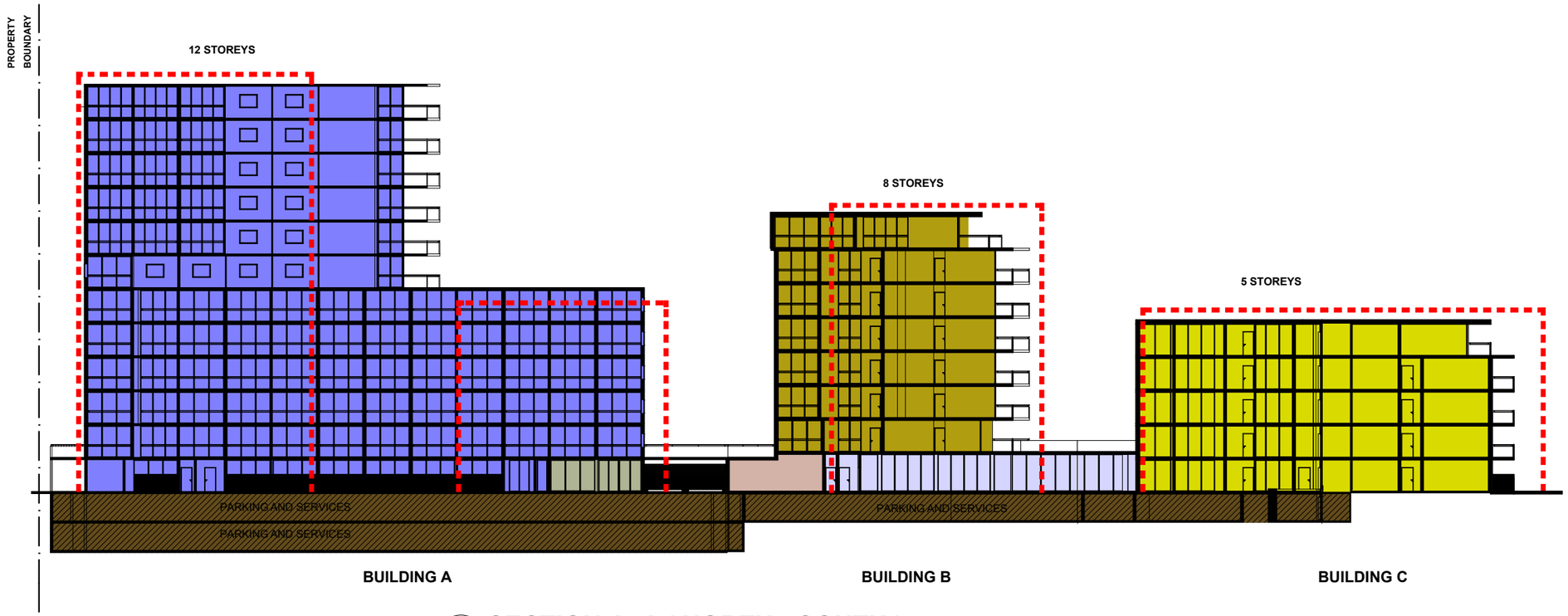
7 Conclusions

This report describes the existing situation, development proposal, forecast traffic generation, transport impact assessment and compliance with government policy for the proposed development at 63 to 77 West Parade, West Ryde, Sydney. The conclusions of this study can be summarised as follows:

- The site is suited to the proposed use from a transport and sustainability perspective.
- On-site parking supply can be modest because of the social housing component and the good local public transport and walkable access to local services. This supports the City of Ryde Integrated Transport and Land use Strategy 2007.
- Traffic generated by the proposed development can be accommodated on the existing and proposed road network with minimal impact.
- Adequate secure bike parking should be provided, at a rate of 1 bike space per two units or two staff.
- An upgrade of the crossing of West Parade should be considered, in the form of adding a signalised pedestrian crossing on the north leg of the signalised intersection with Anthony Road, or by a pedestrian refuge in this section of West Parade.
- Further transport advice can be provided after the concept design development for the subject site is progressed.
- A Travel Access Guide (TAG)/ Green Travel Plan can be produced when the detailed design is completed.
- All the transport and accessibility issues in the DoP Director - General's Requirements have been considered and addressed.

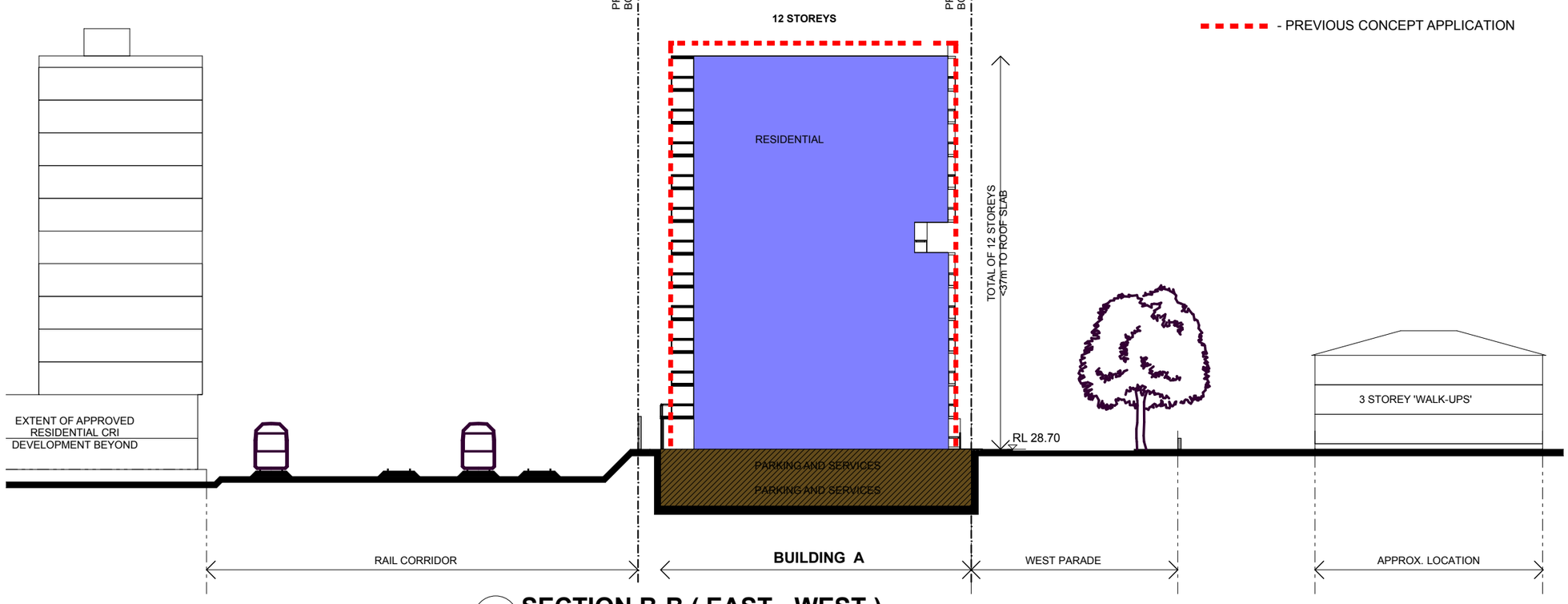
Appendix A

Plans of the Proposed Development



SECTION A -A (NORTH - SOUTH)

- PREVIOUS CONCEPT APPLICATION



SECTION B-B (EAST - WEST)

CALDIS COOK GROUP
ACN 051 302 900
ARCHITECTS
LEVEL 2,
45 CHIPPEN STREET
CHIPPENDALE
NSW 2008
TEL (02) 9319 3077
FAX (02) 9319 3577
ACN 051302900
Website:www.caldiscook.com
Email: projects@caldiscook.com

CLIENT

HOUSING NSW

PROJECT

PREFERRED CONCEPT
WEST RYDE HOUSING
DEVELPOMENT

63-77 West Parade,
West Ryde

DRAWING

SECTION A -A , B -B

PROJECT No.	DWG.No. SK - 05
09-098	SCALE

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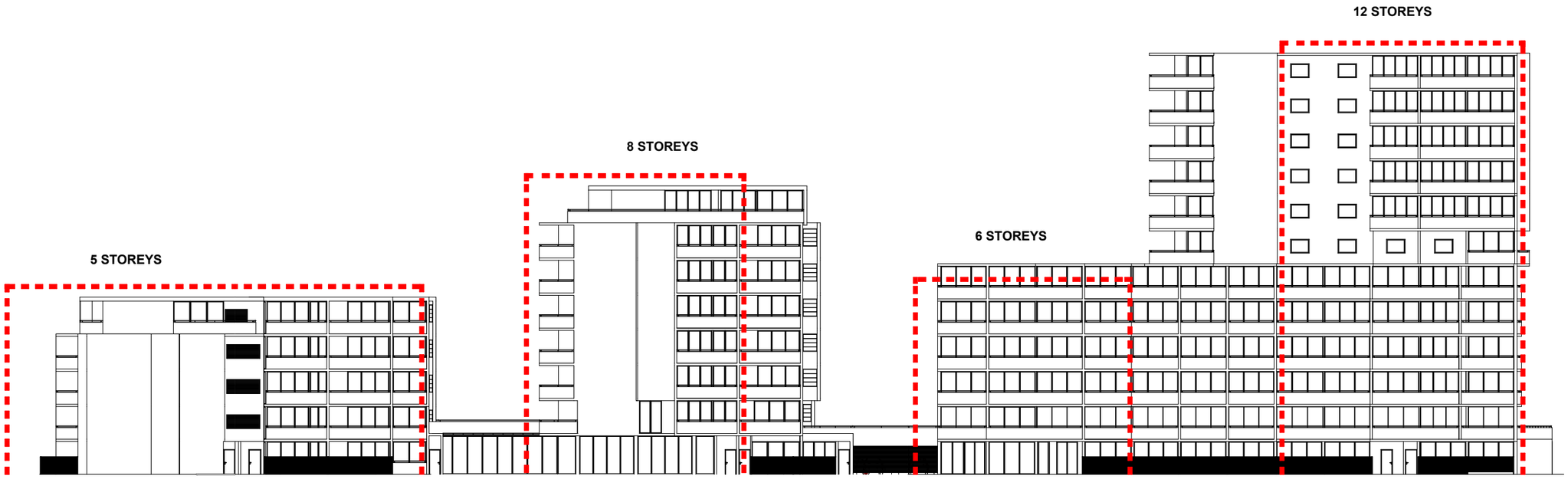

WEST PARADE ELEVATION

0 m 5 m 10m 20m

- PREVIOUS CONCEPT APPLICATION

CALDIS COOK GROUP
ACN 051 302 900
ARCHITECTS
LEVEL 2,
45 CHIPPEN STREET
CHIPPENDALE
NSW 2008
TEL (02) 9319 3077
FAX (02) 9319 3577
ACN 051302900
Website:www.caldiscook.com
Email: projects@caldiscook.com

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WEST RYDE HOUSING
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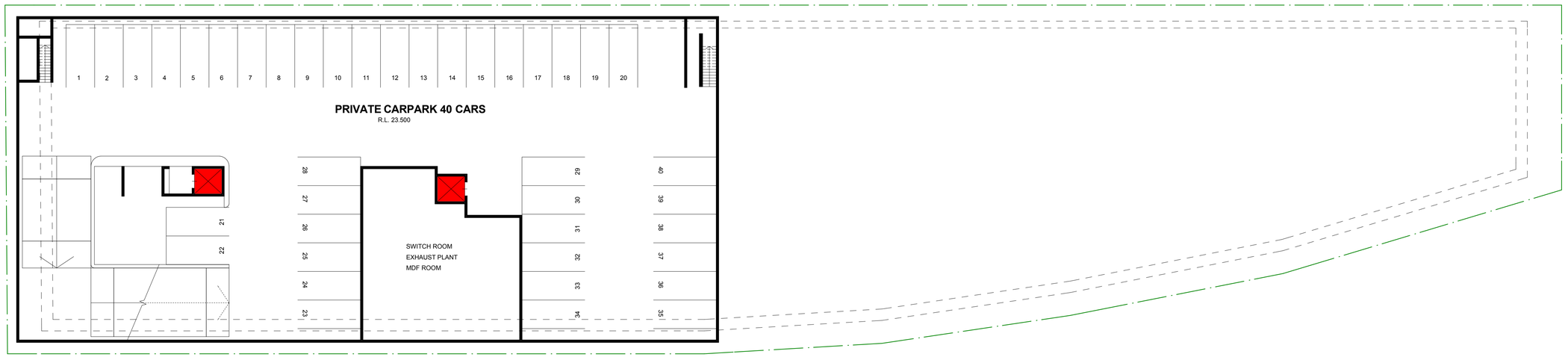
63-77 West Parade,
West Ryde

DRAWING

WEST ELEVATION

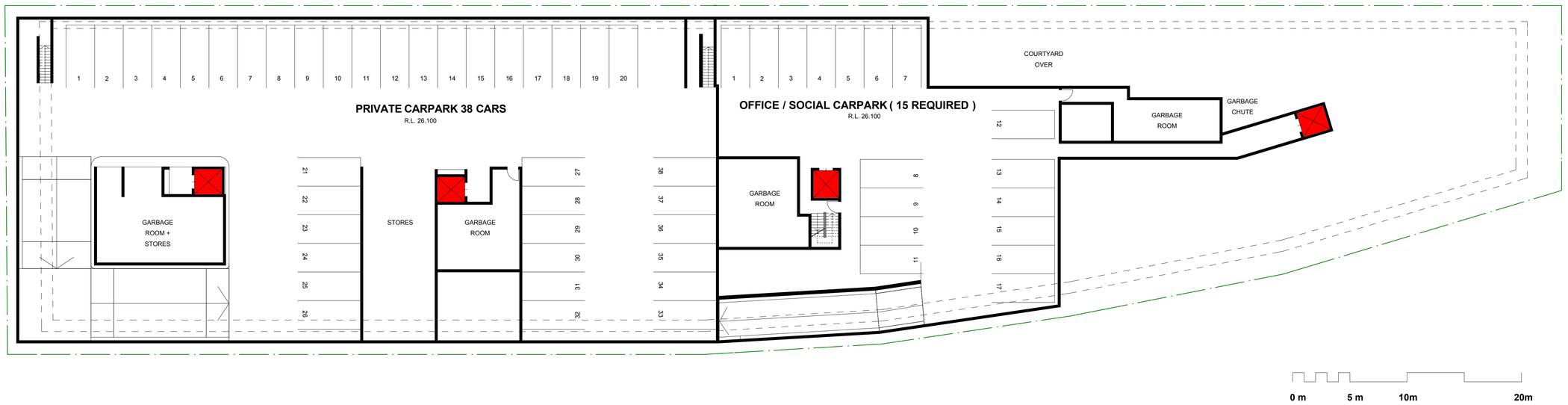
PROJECT No.	DWG.No. SK - 04
09-098	SCALE

CCG Info:



CARPARKING - LEVEL CP 2

TOTAL CAR SPACES = 95



0 m 5 m 10m 20m

CARPARKING - LEVEL CP 1

INTERNAL PLAN LAYOUTS ARE INDICATIVE ONLY
- THEY ARE SUBJECT TO CHANGE

CALDIS COOK GROUP
ACN 051 302 900

ARCHITECTS
LEVEL 2,
45 CHIPPEN STREET
CHIPPENDALE
NSW 2008
TEL.(02) 9319 3077
FAX.(02) 9319 3577
ACN 051302900
Website:www.caldiscook.com
Email: projects@caldiscook.com

CLIENT

HOUSING NSW

PROJECT

PREFERRED CONCEPT
WEST RYDE HOUSING
DEVELPOMENT

63-77 West Parade,
West Ryde

DRAWING

CARPARKING -
LEVEL CP1 & CP2

PROJECT No.	DWG.No.
09-098	SCALE 1:200 @ A1

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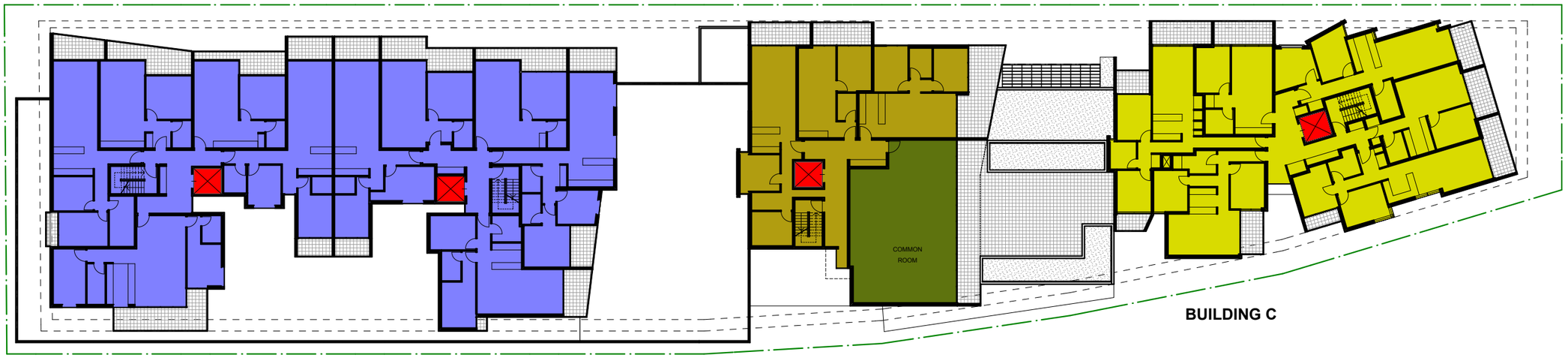
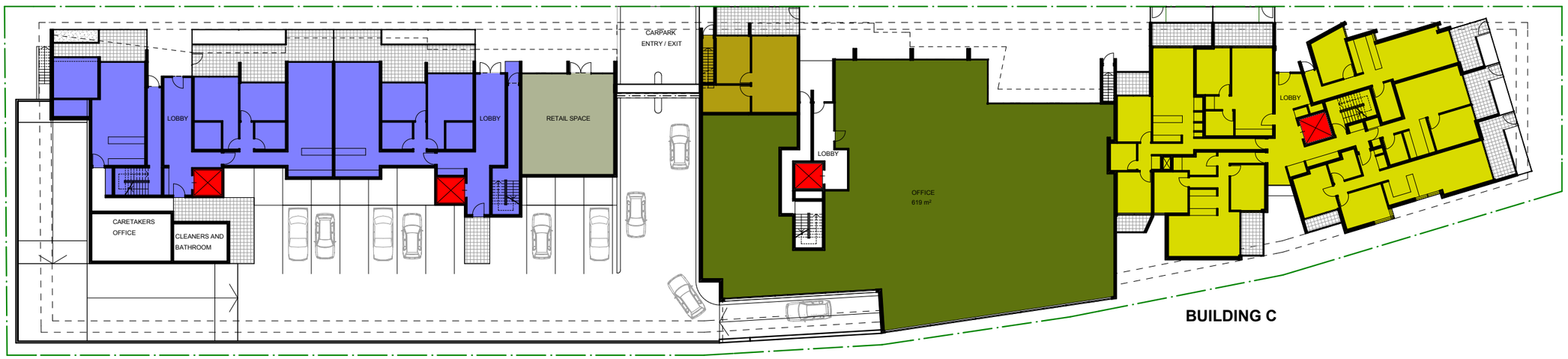


BUILDING A

BUILDING B

BUILDING C

BUILDING A,B,C - LEVEL 2



BUILDING A

BUILDING B

BUILDING C

BUILDING A,B,C - LEVEL 1

0 m 5 m 10m 20m

INTERNAL PLAN LAYOUTS ARE INDICATIVE ONLY
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CALDIS COOK GROUP
ACN 051 302 900
ARCHITECTS
LEVEL 2.
45 CHIPPEN STREET
CHIPPENDALE
NSW 2008
TEL.(02) 9319 3077
FAX.(02) 9319 3577
ACN 051302900
Website:www.caldiscook.com
Email: projects@caldiscook.com

CLIENT
HOUSING NSW

PROJECT
PREFERRED CONCEPT
WEST RYDE HOUSING
DEVELPOMENT
63-77 West Parade,
West Ryde

DRAWING
FLOOR PLAN
LEVEL 1 & 2

PROJECT No.	DWG.No. SK - 02
09-098	SCALE

CCG Info:

Appendix B

Supplementary Transport and Accessibility Report

Major Project Directorate,
Housing NSW

West Ryde Redevelopment Project

Supplementary Transport and Accessibility Report

REV A

ARUP

Major Project Directorate, Housing NSW

West Ryde Redevelopment Project

Supplementary Transport and Accessibility Report

February 2010

Arup
Arup Pty Ltd ABN 18 000 966 165

Arup
Level 10 201 Kent Street, Sydney NSW 2000
Tel +61 2 9320 9320 Fax +61 2 9320 9321
www.arup.com

Job number 205913

ARUP

Document Verification

Job title	West Ryde Redevelopment Project		Job number 205913
Document title	Supplementary Transport and Accessibility Report		File reference

Document ref

Revision	Date				
Draft 1	04/12/09	Filename	0011SuplimentaryTransport&AccessibilityReport.doc		
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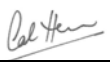
			Prepared by	Checked by	Approved by
		Name	Abdullah Uddin	Colin Henson	Colin Henson
		Signature			
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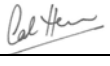
		Name	Abdullah Uddin	Colin Henson	Colin Henson
		Signature			
Rev A	01/02/10	Filename	0014SupplementaryTransport&AccessibilityReport.doc		
		Description	Amended report as per Feb 10 Plan – Supplementary report is attached as an appendix of the main traffic report		
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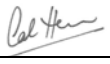
		Signature			
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		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			

Issue Document Verification with Document ✓

Contents

Appendices

1 Introduction

This supplementary report has been prepared in response to traffic and transport related issues raised by the different state and local government authorities for the proposed development at 63 to 77 West Parade, West Ryde, Sydney.

The initial transport and accessibility impact study was prepared by Arup (dated 08/07/2009) to support a Part 3A concept application to the Department of Planning (DoP). The report responded to the Director General's Requirements (DGR's) from planning NSW dated 04/05/2009.

Based on the Arup traffic report, a number of issues have been raised by Ministry of Transport, RTA and City of Ryde Council. These issues have been considered and addressed in this supplementary report.

2 Transport Issues Raised by the Different Government Authorities

2.1 Ministry of Transport (MoT)

MoT at its letter dated 2 October 2009 (reference: TP09/06327) requested the following matters to be considered in preparing conditions of consent for the proposal:

1. Preparation of a **Work Place Travel Plan** for business components of the development together with a **Travel Access Guide** (TAG).

Arup Response: Arup Transport & Accessibility Impact Study report indicated that *A Travel Access Guide (TAG)/ Green Travel Plan can be produced when the detailed design is completed* (refer to section 7 of Arup report).

2. A **minimalist approach to car parking** as described in the Transport Study.

Arup Response: Agreed with the statement. Minimal parking is proposed to be provided as described in the Arup report.

3. The identification of measures to mitigate potential impacts for pedestrians, public transport users and cyclists **during construction** of the proposal.

Arup Response: A **Construction Traffic Management Plan** (CTMP) would need to be prepared by the construction contractor and approved by the relevant approval authorities before any commencement of construction work of the development. CTMP would address all the issues to mitigate any potential impacts to pedestrians, public transport users and cyclists during the entire construction period.

2.2 Roads and Traffic Authority (RTA)

RTA letter dated 30 September 2009 (reference: RDC 09M499-2) addressed the following transport issues:

1. The developer will be required to provide an **additional pedestrian crossing for the northern leg of West Parade and Anthony Road intersection** (TCS 3938) to better facilitate the crossing of West Parade by pedestrians. The signal should be designed to meet the RTA's requirements, and be endorsed by a suitably qualified and Chartered Engineer (i.e. registered with the Institute of Engineers, Australia). The certified copies of the signal design plans shall be submitted to the RTA for consideration and approval prior to the release of the construction certificate for the first Project Specific application and commencement of road works.

Arup Response: Arup transport report stated that *An upgrade of the crossing of West Parade should be considered, in the form of adding a signalised pedestrian crossing on the north leg of the signalised intersection with Anthony Road, or by a pedestrian refuge in this section of West Parade* (refer to section 7). The signal plan will be designed by a qualified engineer (registered by Engineers Australia) for RTA's consideration.

2. Proposed development **exceeds** the present development standards in relation to height, density and **parking** prescribed by the Ryde Planning Scheme Ordinance (RPSO) 2006.

Arup Response: Parking provision in the subject development is **less** than in accordance with RPSO 2006. However, RTA state: "*Council should be satisfied with the proposed development*".

3. Concern has been raised with the location of the proposed **northern access of the development and the existing bus zone** on the eastern side of West Parade. The

bus zone may need to be relocated and consolation should be carried out with Council's Local Traffic Committee to satisfy their requirements.

Arup Response: The existing bus stop is located in front of 75 West Parade (about 45-50m from Miriam Road intersection). Due to the proposed northern driveway, the bus stop would need to be relocated about 15-20 to the south. Therefore, discussion should be held with the State Transit Authority (STA) and Ryde Council for an agreed outcome. The net effect of the proposed development will be to reduce the number of driveways existing to the detached dwellings on the site, and hence reduce the loss of available kerb parking length.

The option to reduce the number of driveways to a single driveway is supported. This would reduce the number of conflict points with vehicular and pedestrian traffic. The detail design within the carpark would separate parking streams within queuing back off the site.

4. The **layout of the proposed car parking** areas associated with the subject development (including driveways, queuing areas, grades, turn paths, sight distance requirements, aisle widths and parking bay dimensions) should be in accordance with AS 2890.1 – 2004 and AS 2890.2 – 2002 for heavy vehicle usage. If loading dock is chosen to be developed, it will cater for an 8.8m vehicle.

Arup Response: Arup report stated that *All parking spaces and circulation aisles must comply with AS 2890.1 – 2004 off street car parking* (refer to section 3.1.6).

Section 3.1.7 of Arup report also stated that *Service vehicle access is envisaged to be relatively minor and perhaps associated with the change of tenancies within the development. In this case it would seem appropriate not to provide a loading dock for the development. However if the loading dock is chosen to be developed for vans and full garbage removal then this can be managed with a small rigid truck and 8.8 m long trucks. It will be a design issue as to whether removal vans pass inside or serve from the kerbside.* If on site service vehicle provision is provided in the development, it must comply with AS 2890.2 – 2002 (Off – street commercial vehicle facilities).

5. To encourage alternative modes of transport, the development should ensure that the developer prepares and implements a **TAG/ Green Travel Plan**. This could include the implementation of **car sharing** scheme.

Arup Response: TAG has been discussed in section 2.1 of this report. Regarding car sharing scheme, Arup report stated that *Introduction of car sharing scheme (e.g. Go Get) in West Parade in the vicinity of the site could be investigated* (refer to section 3.3).

6. In addition to the two proposed driveways there is a possibility of a **third to provide secure parking**. To limit vehicle conflicts, two driveway accesses are preferred.

Arup Response: Comment noted. However, as stated in Arup traffic report, the frontage is long enough to accommodate three driveways and will reduce the number of driveways quite significantly from the current eight driveways that exist (refer to section 3.1).

7. All vehicles must enter/ exit the property in a **forward direction**.

Arup Response: All site vehicles will able to enter and exit the property in a forward direction.

8. The development should ensure that suitable/ secure **bicycle parking** facilities are provided.

Arup Response: Arup report stated that *Secure bicycle parking will be provided as per Council requirements* (refer to section 3.1.8).

9. The developer will be required to prepare and submit a traffic management plan for all demolition/ construction activities, detailing vehicle routes, number of trucks, hours of operation, access arrangements and traffic control measures. This should be submitted to Council for approval.

Arup Response: A traffic management plan during the demolition and construction period will be prepared by the contractor as discussed in section 2.1 of this report.

2.3 City of Ryde Council

City of Ryde Council's submission dated 20 October 2009 raised two main issues, car parking provision and providing details of the intersection analysis results (section 2.4).

2.3.1 Car Parking Provision

Based on the strict interpretation of the RPSO, the proposal requires a total of 235 car parking spaces. If the proposal is assessed against the requirements of the West Ryde Urban Village Precinct, then the requirement is 190 spaces.

With a discount rate applied for Social Housing (having regard to the lesser parking requirements under West Ryde Urban Village DCP) it would suggest that an off – street parking provision in the order of 138 spaces would be considered adequate. The proponent has suggested a parking provision of 86 spaces which is 52 spaces less than the minimum required under the West Ryde Urban Village DCP with a parking rate discount applied for Social Housing.

Arup Response: In regards to parking, DGR's letter (MP 09_0029) stated that ***Demonstrate that a minimalist approach to carparking provision is taken based on the accessibility of the site to public transport***. Therefore, due to the close proximity of public transport facilities (bus, trains and taxis), Arup estimation of carparking provision was aimed to meet the DGR's requirements.

The number of units in the subject development has slightly revised since the submission of the December 2009 Arup report. The current number of units is 138, a reduction of about 3% from the previous proposal (142). The current breakdown of units is provided in Table 1.

Table 1: Current Number of Units

Tower	Land Use	Number of Units			Gross Floor Area (m^2)
		1 – bed	2 – bed	3 – bed	
A	Affordable Housing	?	?	?	
	Private Housing	?	?	?	
	Retail	-	-	-	71
B	Social Housing	13	19	-	
	HNSW Office	-	-	-	620
C	Social Housing	13	16	-	
Total		53	74	11	

The parking provision of each type of land use is described below:

Social and Affordable Housing

Research shows that the car ownership in social and affordable housing is significantly lower especially if the development is located within close proximity of public transport fringe. The following three examples from Queensland, Melbourne and NSW are provided below:

Affordable Housing Design Guidelines, Queensland Government Department of Housing (September 2004)

Carparking rates for Affordable Housing: *Carparking rates in planning schemes for one, two and three-bedroom dwellings are generally reduced by **25 percent** where housing is within 400 metres of public transport (train, ferry, bus)*.

Review of Social Housing Car Parking Demands: Inner Melbourne, GTA Consultants (2009)

A study was undertaken by consultants on behalf of the City of Port Phillip (an inner metropolitan area) to research and update social housing land use rates. All current social housing sites identified within the study were considered to be well serviced by public transport. Data collected for the nominated social housing sites found for **single bedroom** units, the number of cars owned per unit was **0.19**, and for **family units** (between 2 and 4 bedrooms), the rate was **0.35**.

Housing NSW Design Requirements, Housing NSW (2009)

The design requirements recommend the following parking rates for multi-unit dwellings within 400m of a shopping centre and good public transport:

- 1 bed 1:10
- 2 bed 1:5
- 3+ bed 1:2

These rates are suggested to be modified where less parking is justifiable owing to a site's location.

Based on the above three examples, it is evident that the parking need for affordable and social housing is significantly lower for developments within close proximity of public transport system. Therefore, Arup's estimation of 1 space per 10 units for social housing and 1 space per 5 units for affordable housing is considered appropriate.

Private Housing

The parking requirements of the City of Ryde 'West Ryde Urban Village' DCP are as follows:

- 1 bed – 0.75 space/ unit
- 2 bed – 1 space/ unit
- 3 bed – 1.25 spaces/ unit
- Visitors – 1 space/ 4 units

As per the above parking rate, the proposed 57 private housing units of the development would require ?? parking spaces. This Council rate equates to ?? spaces/ unit overall. However, as per ABS 2006 census data, the average car ownership for a flat, unit or apartment in Ryde LGA is **0.86** vehicle per household. As West Ryde has rail access, the average car ownership per unit is likely to be lower. Therefore, the Council rate is considered higher considering the location of the site in close proximity of the public transport.

Both NSW Government and Ryde City Council seek to reduce the demand for travel by private car and commercial vehicle usage for the developments located in close proximity of public transport services. With this philosophy, Arup estimation of 0.8 spaces per unit and 1 space/ 4 units for visitor (total 60 parking spaces) is considered appropriate.

Commercial

Section 3.3 of the Arup report state that *Few, if any, social housing clients drive to existing offices of Housing NSW, where offices such as Sussex Street in Sydney provide no parking at all. Existing offices in Ryde and Gladesville have no formal client parking*. It is reasonable to assume that the Housing NSW staff will use the pool car for office related activities. In new developments close to rail such as Macquarie Park, rates of 1 bay/ 80 m^2 are being applied. Therefore, for 620m^2 GFA (or 496 NLA, assuming NLA = 0.8 * GFA) of office space, 7 car spaces are considered adequate.

Retail

The development would provide a relatively minor retail component (71m^2 GFA). This retail will be one convenience store type of shop at the ground floor of building A. As this retail shop will mainly serve the residential and commercial component of the development, no parking provision is warranted for retail component of the development.

Based on the above discussions, the required and proposed parking provision of the development is shown in Table 2. The calculation in the table shows that 18 additional parking spaces are proposed on top of Arup estimation.

Table 2: Proposed Parking Provision

Land Use	GFA/ Units	Reduced parking rate due to good transport access*	Number of space Required	Number of space proposed
Social Housing	61 units	1 space/ 10 units	6	12
Affordable Housing	20 units	1 space/ 5 units	4	6
Private Housing	57 units	0.8 space/ unit	46	46
Private Visitor	57 units	1 space/ 4 units	14	14
HNSW office	620 m^2 GFA (496 NLA)	1 space/ 70 NLA	7	17
Retail	71 m^2 GFA	-		-
Total			**77**	**95**

2.3.2 Intersection Modelling

Applicant's traffic report needs to provide details on the Level of Service, Degree of Saturation etc. for the nearby intersection(s).

Arup Response: The results of the intersection modelling are attached in Appendix A.

3 Conclusions

This supplementary report has been prepared in response to traffic and transport related issues raised by RTA, MoT and City of Ryde Council for the proposed development at 63 to 77 West Parade, West Ryde, Sydney. The key points of this report are summarised below:

- The proposed parking provision of the development is in accordance with DoP DGR's requirements for minimal levels of parking. RTA and MoT letters also suggest minimal parking provision with the development. Housing NSW Design Requirements and other interstate studies, ABS data for Ryde LGA justify minimal parking provision. Due to the convenient location of the site with easy walking to shopping/ dinning and most importantly, availability of alternative modes of transport on the future resident's doorstep, it is considered that the demand for car parking is likely to be low. Therefore, low parking provision is considered in accordance with Stage Government and City of Ryde Council's policy to reduce the vehicle kilometres travelled (VKT) and green house gas emissions.
- Following the completion of detailed design of the development, a TAG/ Green Travel Plan will be produced for the development.
- A Construction Traffic Management Plan will be prepared by the construction contractor which would need to be approved by the relevant approval authorities before any commencement of construction work of the development.
- All off – street parking will be designed in accordance with AS 2890.1 – 2004 and AS 2890.2 – 2002.
- An additional pedestrian crossing will be provided on the northern leg of West Parade and Anthony Road intersection with the development. A signal plan will be designed by a qualified engineer and submitted to RTA for consideration.
- Due to the proposed northern driveway of the development, discussion should be held with State Transit Authority (STA) and Ryde Council for the relocation of the bus stop to the south.

Appendix A

Sidra Intersection Modelling Results

SIDRA INTERSECTION

Movement Summary

Victoria Road / West Parade

Saturday Future 1145-1245

Signalised - Fixed time **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Victoria Road (East)										
5	T	2243	1.0	0.848	5.1	LOS A	198	0.38	0.36	52.6
Approach		**2243**	**1.0**	**0.848**	**5.1**	**LOS A**	**198**	**0.38**	**0.36**	**52.6**
West Parade (North)										
7	L	145	2.1	0.662	77.0	LOS F	85	1.00	0.83	19.2
9	R	325	3.1	0.709	78.0	LOS F	96	1.00	0.85	19.1
Approach		**471**	**2.8**	**0.709**	**77.7**	**LOS F**	**96**	**1.00**	**0.85**	**19.1**
Victoria Road (West)										
10	L	124	4.8	0.563	12.3	LOS A	76	0.19	0.72	45.0
11	T	2099	1.0	0.562	3.6	LOS A	76	0.18	0.16	54.6
Approach		**2223**	**1.2**	**0.562**	**4.1**	**LOS A**	**76**	**0.18**	**0.19**	**54.0**
All Vehicles		**4937**	**1.3**	**0.848**	**11.6**	**LOS A**	**198**	**0.35**	**0.33**	**45.5**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	53	69.1	LOS F	0	0.96	0.96
P5	53	7.7	LOS A	0	0.32	0.32
P7	53	69.1	LOS F	0	0.96	0.96
All Peds	**159**	**48.6**	**LOS D**	**0**	**0.75**	**0.75**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

SIDRA INTERSECTION

Movement Summary

Victoria Road / West Parade

AM Future 0730-0830

Signalised - Fixed time **Cycle Time = 140 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Victoria Road (East)										
5	T	2371	1.0	0.837	2.9	LOS A	141	0.27	0.25	55.6
Approach		**2371**	**1.0**	**0.837**	**2.9**	**LOS A**	**141**	**0.27**	**0.25**	**55.6**
West Parade (North)										
7	L	131	2.3	1.118	206.8	LOS F	124	1.00	1.32	9.0
9	R	334	3.0	1.355	413.2	LOS F	219	1.00	1.70	4.9
Approach		**465**	**2.8**	**1.355**	**355.1**	**LOS F**	**219**	**1.00**	**1.59**	**5.6**
Victoria Road (West)										
10	L	179	5.0	0.841	11.3	LOS A	142	0.27	0.74	45.9
11	T	3382	1.0	0.840	2.9	LOS A	144	0.27	0.26	55.6
Approach		**3561**	**1.2**	**0.840**	**3.3**	**LOS A**	**144**	**0.27**	**0.28**	**55.0**
All Vehicles		**6397**	**1.3**	**1.355**	**28.7**	**LOS C**	**219**	**0.32**	**0.37**	**33.5**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	53	64.1	LOS F	0	0.96	0.96
P5	53	5.2	LOS A	0	0.27	0.27
P7	53	64.1	LOS F	0	0.96	0.96
All Peds	**159**	**44.5**	**LOS D**	**0**	**0.73**	**0.73**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

SIDRA INTERSECTION

Movement Summary

Victoria Road / West Parade

PM Future 1700-1800

Signalised - Fixed time **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Victoria Road (East)										
5	T	2540	1.0	0.960	23.8	LOS B	535	0.74	0.81	36.3
Approach		**2540**	**1.0**	**0.960**	**23.8**	**LOS B**	**535**	**0.74**	**0.81**	**36.3**
West Parade (North)										
7	L	113	1.8	0.510	74.8	LOS F	67	0.98	0.80	19.6
9	R	531	3.0	1.154	240.4	LOS F	265	1.00	1.53	7.9
Approach		**643**	**2.8**	**1.154**	**211.6**	**LOS F**	**265**	**1.00**	**1.41**	**8.8**
Victoria Road (West)										
10	L	177	5.1	0.681	12.9	LOS A	109	0.24	0.73	44.4
11	T	2509	1.0	0.680	4.1	LOS A	109	0.23	0.21	53.9
Approach		**2686**	**1.3**	**0.681**	**4.7**	**LOS A**	**109**	**0.23**	**0.25**	**53.1**
All Vehicles		**5869**	**1.3**	**1.154**	**35.6**	**LOS C**	**535**	**0.53**	**0.62**	**30.3**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	53	69.1	LOS F	0	0.96	0.96
P5	53	7.7	LOS A	0	0.32	0.32
P7	53	69.1	LOS F	0	0.96	0.96
All Peds	**159**	**48.6**	**LOS D**	**0**	**0.75**	**0.75**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

SIDRA INTERSECTION

Movement Summary

Victoria Road / Chatham Road

Saturday Future 1145-1245

Signalised - Actuated coordinated **Cycle Time = 130 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Chatham Road (South)										
1	L	37	0.0	0.125	60.3	LOS E	18	0.87	0.74	22.5
2	T	283	0.0	0.737	55.2	LOS D	134	0.97	0.82	23.8
Approach		**320**	**0.0**	**0.737**	**55.8**	**LOS D**	**134**	**0.96**	**0.81**	**23.7**
Victoria Road (East)										
4	L	47	0.0	0.754	10.4	LOS A	95	0.19	0.72	46.7
5	T	2154	1.0	0.755	2.2	LOS A	103	0.19	0.18	56.6
6	R	382	1.0	0.883	34.8	LOS C	128	0.96	0.89	30.7
Approach		**2583**	**1.0**	**0.883**	**7.1**	**LOS A**	**128**	**0.30**	**0.29**	**50.2**
Chatham Road (North)										
7	L	348	0.9	0.345	28.0	LOS B	103	0.61	0.79	33.9
8	T	277	0.0	0.679	54.3	LOS D	130	0.96	0.81	24.1
Approach		**625**	**0.5**	**0.679**	**39.6**	**LOS C**	**130**	**0.76**	**0.80**	**28.7**
Victoria Road (West)										
10	L	198	1.0	0.284	26.0	LOS B	47	0.45	0.75	35.0
11	T	1836	1.0	1.161	180.2	LOS F	759	1.00	1.89	10.1
Approach		**2033**	**1.0**	**1.161**	**165.2**	**LOS F**	**759**	**0.95**	**1.78**	**10.8**
All Vehicles		**5561**	**0.9**	**1.161**	**71.4**	**LOS F**	**759**	**0.63**	**0.92**	**20.3**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	59.1	LOS E	0	0.95	0.95
P3	53	59.1	LOS E	0	0.95	0.95
P5	53	59.1	LOS E	0	0.95	0.95
P7	53	59.1	LOS E	0	0.95	0.95
All Peds	**212**	**59.1**	**LOS E**	**0**	**0.95**	**0.95**

SIDRA INTERSECTION

Movement Summary

Victoria Road / Chatham Road

AM Future 0730-0830

Signalised - Fixed time **Cycle Time = 155 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Chatham Road (South)										
1	L	28	0.0	0.097	63.8	LOS E	18	0.86	0.73	21.8
2	T	228	0.0	0.541	57.7	LOS E	115	0.94	0.79	23.2
Approach		**256**	**0.0**	**0.541**	**58.3**	**LOS E**	**115**	**0.93**	**0.78**	**23.0**
Victoria Road (East)										
4	L	11	0.0	0.911	11.4	LOS A	200	0.35	0.77	45.7
5	T	2509	1.0	0.886	3.2	LOS A	214	0.35	0.33	55.1
6	R	139	0.7	0.873	85.3	LOS F	89	1.00	0.90	17.9
Approach		**2659**	**1.0**	**0.886**	**7.5**	**LOS A**	**214**	**0.38**	**0.36**	**49.7**
Chatham Road (North)										
7	L	294	1.0	0.437	49.4	LOS D	126	0.82	0.83	25.4
8	T	202	0.0	0.451	56.2	LOS D	102	0.92	0.76	23.6
Approach		**496**	**0.6**	**0.451**	**52.2**	**LOS D**	**126**	**0.86**	**0.80**	**24.6**
Victoria Road (West)										
10	L	91	1.1	0.249	10.2	LOS A	14	0.07	0.68	46.8
11	T	3119	1.0	1.247	228.6	LOS F	1677	0.95	2.05	8.2
Approach		**3210**	**1.0**	**1.247**	**222.4**	**LOS F**	**1677**	**0.92**	**2.01**	**8.4**
All Vehicles		**6621**	**0.9**	**1.247**	**117.0**	**LOS F**	**1677**	**0.70**	**1.21**	**14.2**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	17.2	LOS B	0	0.47	0.47
P3	53	56.2	LOS E	0	0.85	0.85
P5	53	18.1	LOS B	0	0.48	0.48
P7	53	55.4	LOS E	0	0.85	0.85
All Peds	**212**	**36.7**	**LOS C**	**0**	**0.66**	**0.66**

SIDRA INTERSECTION

Movement Summary

Victoria Road / Chatham Road

PM Future 1700-1800

Signalised - Fixed time **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Chatham Road (South)										
1	L	35	0.0	0.120	66.3	LOS E	22	0.89	0.74	21.2
2	T	412	0.0	1.110	191.4	LOS F	366	1.00	1.54	9.6
Approach		**447**	**0.0**	**1.110**	**181.6**	**LOS F**	**366**	**0.99**	**1.47**	**10.0**
Victoria Road (East)										
4	L	3	0.0	0.849	11.2	LOS A	219	0.37	0.77	45.8
5	T	2645	1.0	0.897	3.0	LOS A	234	0.37	0.35	55.2
6	R	304	1.1	1.149	188.3	LOS F	211	1.00	1.28	9.7
Approach		**2952**	**1.0**	**1.149**	**20.0**	**LOS B**	**234**	**0.43**	**0.44**	**38.7**
Chatham Road (North)										
7	L	272	1.1	0.359	42.2	LOS C	107	0.75	0.81	27.7
8	T	360	0.0	0.913	79.0	LOS F	207	1.00	1.05	18.9
Approach		**632**	**0.5**	**0.913**	**63.2**	**LOS E**	**207**	**0.89**	**0.95**	**21.9**
Victoria Road (West)										
10	L	121	0.8	0.214	13.4	LOS A	23	0.16	0.70	43.9
11	T	2407	1.0	1.072	91.3	LOS F	903	0.97	1.42	17.1
Approach		**2528**	**1.0**	**1.072**	**87.5**	**LOS F**	**903**	**0.93**	**1.38**	**17.6**
All Vehicles		**6559**	**0.9**	**1.149**	**61.2**	**LOS E**	**903**	**0.71**	**0.92**	**22.4**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	68.2	LOS F	0	0.95	0.95
P3	53	52.9	LOS E	0	0.84	0.84
P5	53	17.8	LOS B	0	0.49	0.49
P7	53	52.9	LOS E	0	0.84	0.84
All Peds	**212**	**47.9**	**LOS D**	**0**	**0.78**	**0.78**

SIDRA INTERSECTION

Movement Summary

Dickson Avenue / Chatham Road 2 Lane approach (N/B)

Sat Midday 1145-1245 (Feb 2008 Analysis)

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Chatham Road (South)										
1	L	23	0.0	0.442	9.8	LOS A	28	0.61	0.71	46.8
2	T	421	1.0	0.440	9.0	LOS A	28	0.61	0.69	47.2
3	R	341	0.0	0.365	13.4	LOS A	21	0.58	0.76	44.1
Approach		**785**	**0.5**	**0.440**	**10.9**	**LOS A**	**28**	**0.60**	**0.72**	**45.8**
New Market Street (East)										
4	L	111	0.0	0.539	20.0	LOS B	37	0.92	1.07	38.6
5	T	41	0.0	0.539	18.9	LOS B	37	0.92	1.06	39.4
6	R	88	0.0	0.537	22.8	LOS B	37	0.92	0.99	37.1
Approach		**240**	**0.0**	**0.538**	**20.9**	**LOS B**	**37**	**0.92**	**1.04**	**38.1**
Chatham Road (North)										
7	L	228	0.0	0.371	12.9	LOS A	16	0.63	0.89	44.2
8	T	497	0.0	0.724	13.7	LOS A	64	0.83	1.01	43.5
9	R	151	0.0	0.722	18.3	LOS B	64	0.83	1.04	40.2
Approach		**876**	**0.0**	**0.724**	**14.3**	**LOS A**	**64**	**0.78**	**0.98**	**43.1**
Dickson Avenue (West)										
10	L	98	0.0	0.462	12.8	LOS A	21	0.72	0.95	44.3
11	T	140	0.0	0.462	11.8	LOS A	21	0.72	0.92	45.2
12	R	47	0.0	0.461	15.7	LOS B	21	0.72	0.97	42.1
Approach		**285**	**0.0**	**0.463**	**12.8**	**LOS A**	**21**	**0.72**	**0.94**	**44.3**
All Vehicles		**2186**	**0.2**	**0.724**	**13.6**	**LOS A**	**64**	**0.72**	**0.89**	**43.5**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Dickson Avenue / Chatham Road 2 Lane approach (N/B)

AM Future 0730-0830 (Feb 2008 Analysis)

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Chatham Road (South)										
1	L	13	0.0	0.265	8.2	LOS A	15	0.30	0.60	48.1
2	T	327	0.9	0.267	7.3	LOS A	15	0.30	0.55	48.9
3	R	164	0.0	0.164	12.2	LOS A	8	0.30	0.68	44.9
Approach		**504**	**0.6**	**0.267**	**9.0**	**LOS A**	**15**	**0.30**	**0.59**	**47.5**
New Market Street (East)										
4	L	23	0.0	0.071	12.6	LOS A	3	0.66	0.77	44.5
5	T	11	0.0	0.071	11.5	LOS A	3	0.66	0.74	45.6
6	R	9	0.0	0.071	15.4	LOS B	3	0.66	0.73	42.4
Approach		**43**	**0.0**	**0.071**	**12.9**	**LOS A**	**3**	**0.66**	**0.75**	**44.3**
Chatham Road (North)										
7	L	71	0.0	0.108	10.5	LOS A	4	0.37	0.72	46.5
8	T	422	0.0	0.429	8.1	LOS A	20	0.41	0.64	48.1
9	R	74	0.0	0.430	12.1	LOS A	20	0.41	0.73	44.9
Approach		**567**	**0.0**	**0.429**	**8.9**	**LOS A**	**20**	**0.41**	**0.66**	**47.4**
Dickson Avenue (West)										
10	L	134	0.0	0.240	10.0	LOS A	8	0.49	0.79	47.0
11	T	31	0.0	0.240	9.0	LOS A	8	0.49	0.75	47.8
12	R	29	0.0	0.240	12.9	LOS A	8	0.49	0.80	44.5
Approach		**194**	**0.0**	**0.240**	**10.2**	**LOS A**	**8**	**0.49**	**0.78**	**46.7**
All Vehicles		**1308**	**0.2**	**0.430**	**9.3**	**LOS A**	**20**	**0.39**	**0.66**	**47.2**

Symbols which may appear in this table:

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Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Dickson Avenue / Chatham Road 2 Lane approach (N/B)

PM Future 1700-1800 (Feb 2008 Analysis)

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Chatham Road (South)										
1	L	19	0.0	0.613	13.5	LOS A	52	0.83	0.92	43.7
2	T	504	1.0	0.614	12.6	LOS A	52	0.83	0.91	44.5
3	R	339	0.0	0.455	15.4	LOS B	28	0.75	0.87	42.4
Approach		**862**	**0.6**	**0.614**	**13.7**	**LOS A**	**52**	**0.80**	**0.89**	**43.6**
New Market Street (East)										
4	L	108	0.0	0.688	27.2	LOS B	57	1.00	1.18	34.2
5	T	57	0.0	0.687	26.1	LOS B	57	1.00	1.18	34.9
6	R	114	0.0	0.691	30.0	LOS C	57	1.00	1.11	33.1
Approach		**279**	**0.0**	**0.689**	**28.1**	**LOS B**	**57**	**1.00**	**1.15**	**33.9**
Chatham Road (North)										
7	L	239	0.0	0.381	12.0	LOS A	17	0.60	0.85	45.0
8	T	483	0.0	0.768	12.8	LOS A	76	0.85	0.95	44.4
9	R	269	0.0	0.769	17.1	LOS B	76	0.85	0.97	41.1
Approach		**991**	**0.0**	**0.768**	**13.8**	**LOS A**	**76**	**0.79**	**0.93**	**43.5**
Dickson Avenue (West)										
10	L	103	0.0	0.315	12.4	LOS A	13	0.73	0.91	44.6
11	T	39	0.0	0.315	11.5	LOS A	13	0.73	0.89	45.6
12	R	25	0.0	0.316	15.3	LOS B	13	0.73	0.91	42.4
Approach		**167**	**0.0**	**0.315**	**12.6**	**LOS A**	**13**	**0.73**	**0.91**	**44.5**
All Vehicles		**2299**	**0.2**	**0.769**	**15.4**	**LOS B**	**76**	**0.81**	**0.94**	**42.2**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Chatham Road / New Betts 2 Lane N/B approach

SAT Future 1145-1245 (Feb 2008 Analysis)

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Chatham Road (South)										
2	T	295	3.1	0.296	4.9	LOS A	17	0.43	0.53	24.2
3	R	440	3.0	0.409	8.1	LOS A	26	0.47	0.66	21.1
Approach		**735**	**3.0**	**0.409**	**6.8**	**LOS A**	**26**	**0.45**	**0.60**	**22.2**
New Betts Street										
4	L	306	2.9	0.472	9.3	LOS A	27	0.58	0.75	30.1
6	R	155	2.6	0.472	10.9	LOS A	27	0.58	0.77	29.8
Approach		**460**	**2.8**	**0.472**	**9.8**	**LOS A**	**27**	**0.58**	**0.76**	**30.0**
Chatham Road (North)										
7	L	123	3.3	0.490	11.3	LOS A	29	0.66	0.85	44.3
8	T	306	2.9	0.490	8.2	LOS A	29	0.66	0.79	40.9
Approach		**429**	**3.0**	**0.490**	**9.1**	**LOS A**	**29**	**0.66**	**0.81**	**41.8**
All Vehicles		**1624**	**3.0**	**0.490**	**8.3**	**LOS A**	**29**	**0.54**	**0.70**	**33.4**

Symbols which may appear in this table:

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Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: Rbout SAT
J:\85638 - West Ryde Reopened\SIDRA 09\J51A_Chatham New Betts Rbout_2 lanes 1.aap
Processed May 01, 2009 02:14:32PM

A0085, Arup, Large Office

SIDRA INTERSECTION

Movement Summary

Chatham Road / New Betts 2 Lane N/B approach

AM Future 0730-0830 (Feb 2008 Analysis)

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Chatham Road (South)										
2	T	121	3.3	0.145	4.7	LOS A	7	0.33	0.48	25.0
3	R	328	3.0	0.291	7.7	LOS A	16	0.34	0.63	21.6
Approach		**450**	**3.1**	**0.291**	**6.9**	**LOS A**	**16**	**0.34**	**0.59**	**22.4**
New Betts Street										
4	L	143	2.8	0.269	9.2	LOS A	13	0.53	0.75	30.2
6	R	104	2.9	0.269	10.8	LOS A	13	0.53	0.77	29.4
Approach		**247**	**2.8**	**0.270**	**9.9**	**LOS A**	**13**	**0.53**	**0.75**	**29.8**
Chatham Road (North)										
7	L	238	2.9	0.604	11.2	LOS A	42	0.65	0.82	44.5
8	T	364	3.0	0.604	8.1	LOS A	42	0.65	0.76	41.1
Approach		**602**	**3.0**	**0.604**	**9.3**	**LOS A**	**42**	**0.65**	**0.78**	**42.3**
All Vehicles		**1299**	**3.0**	**0.604**	**8.6**	**LOS A**	**42**	**0.52**	**0.71**	**37.0**

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Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: Rbout AM
J:\85638 - West Ryde Reopened\SIDRA 09\J51A_Chatham New Betts Rbout_2 lanes 1.aap
Processed May 01, 2009 02:14:32PM

A0085, Arup, Large Office

SIDRA INTERSECTION

Movement Summary

Chatham Road / New Betts 2 Lane N/B approach

PM Future 1700-1800 (Feb 2008 Analysis)

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Chatham Road (South)										
2	T	412	2.9	0.411	5.4	LOS A	26	0.55	0.60	23.3
3	R	415	2.9	0.414	8.7	LOS A	26	0.55	0.70	20.7
Approach		**825**	**2.9**	**0.414**	**7.1**	**LOS A**	**26**	**0.55**	**0.65**	**21.9**
New Betts Street										
4	L	425	3.1	0.626	9.8	LOS A	46	0.65	0.77	29.4
6	R	227	3.1	0.626	11.4	LOS A	46	0.65	0.79	28.5
Approach		**654**	**3.1**	**0.627**	**10.4**	**LOS A**	**46**	**0.65**	**0.78**	**29.1**
Chatham Road (North)										
7	L	123	3.3	0.439	10.6	LOS A	24	0.63	0.81	45.0
8	T	267	3.0	0.440	7.6	LOS A	24	0.63	0.74	41.3
Approach		**390**	**3.1**	**0.440**	**8.5**	**LOS A**	**24**	**0.63**	**0.76**	**42.4**
All Vehicles		**1869**	**3.0**	**0.626**	**8.5**	**LOS A**	**46**	**0.60**	**0.72**	**32.1**

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SIDRA SOLUTIONS

Site: Rbout PM
J:\85638 - West Ryde Reopened\SIDRA 09\J51A_Chatham New Betts Rbout_2 lanes 1.aap
Processed May 01, 2009 02:14:32PM

A0085, Arup, Large Office

SIDRA INTERSECTION

Movement Summary

West Pde / Anthony Road

Saturday Future 1145-1245

Signalised - Fixed time **Cycle Time = 60 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
West Parade (South)										
1	L	37	2.7	0.206	36.9	LOS C	12	0.95	0.73	29.7
2	T	163	1.2	0.880	37.8	LOS C	54	1.00	1.04	29.4
3	R	2	100.0	0.870	49.0	LOS D	54	1.00	1.04	27.4
Approach		**203**	**2.5**	**0.880**	**37.8**	**LOS C**	**54**	**0.99**	**0.98**	**29.5**
West Parade (North)										
7	L	16	31.2	0.912	50.7	LOS D	81	1.00	1.13	25.5
8	T	291	0.0	0.915	40.5	LOS C	81	1.00	1.13	28.4
9	R	205	0.0	0.915	49.0	LOS D	79	1.00	1.13	25.5
Approach		**512**	**1.0**	**0.915**	**44.2**	**LOS D**	**81**	**1.00**	**1.13**	**27.1**
Anthony Road (West)										
10	L	225	0.0	0.821	40.8	LOS C	64	1.00	0.98	28.2
12	R	166	0.0	0.605	36.0	LOS C	45	0.98	0.82	30.0
Approach		**391**	**0.0**	**0.820**	**38.8**	**LOS C**	**64**	**0.99**	**0.91**	**29.0**
All Vehicles		**1106**	**0.9**	**0.915**	**41.1**	**LOS C**	**81**	**1.00**	**1.03**	**28.1**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	24.3	LOS C	0	0.90	0.90
P11	53	24.3	LOS C	0	0.90	0.90
P7	53	24.3	LOS C	0	0.90	0.90
All Peds	**159**	**24.3**	**LOS B**	**0**	**0.90**	**0.90**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

SIDRA INTERSECTION

Movement Summary

West Pde / Anthony Road

AM Future 0730-0830

Signalised - Fixed time **Cycle Time = 60 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
West Parade (South)										
1	L	31	0.0	0.166	35.5	LOS C	11	0.93	0.72	30.3
2	T	163	8.0	0.832	34.5	LOS C	58	1.00	0.98	30.8
3	R	14	61.5	0.832	44.4	LOS D	58	1.00	0.99	27.7
Approach		**207**	**10.1**	**0.832**	**35.3**	**LOS C**	**58**	**0.99**	**0.94**	**30.5**
West Parade (North)										
7	L	27	64.3	0.771	42.1	LOS C	62	1.00	0.93	28.7
8	T	278	0.0	0.770	30.8	LOS C	60	1.00	0.93	32.5
9	R	117	0.0	0.771	39.0	LOS C	60	1.00	0.93	28.8
Approach		**423**	**4.3**	**0.770**	**33.8**	**LOS C**	**62**	**1.00**	**0.93**	**31.1**
Anthony Road (West)										
10	L	180	0.6	0.741	38.9	LOS C	52	1.00	0.90	28.9
12	R	152	0.0	0.624	37.2	LOS C	43	0.99	0.83	29.5
Approach		**332**	**0.3**	**0.741**	**38.1**	**LOS C**	**52**	**1.00**	**0.87**	**29.2**
All Vehicles		**962**	**4.2**	**0.832**	**35.6**	**LOS C**	**62**	**1.00**	**0.91**	**30.3**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	24.3	LOS C	0	0.90	0.90
P11	53	24.3	LOS C	0	0.90	0.90
P7	53	24.3	LOS C	0	0.90	0.90
All Peds	**159**	**24.3**	**LOS B**	**0**	**0.90**	**0.90**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

SIDRA INTERSECTION

Movement Summary

West Pde / Anthony Road

PM Future 1700-1800

Signalised - Fixed time **Cycle Time = 70 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
West Parade (South)										
1	L	40	2.4	0.228	41.5	LOS C	15	0.96	0.73	28.0
2	T	133	0.8	0.777	38.3	LOS C	51	1.00	0.91	29.2
3	R	9	80.0	0.775	48.8	LOS D	51	1.00	0.91	26.5
Approach		**183**	**5.5**	**0.777**	**39.6**	**LOS C**	**51**	**0.99**	**0.87**	**28.8**
West Parade (North)										
7	L	18	88.9	0.814	43.7	LOS D	112	1.00	0.98	28.4
8	T	437	0.9	0.812	31.6	LOS C	112	1.00	0.98	32.1
9	R	316	0.0	0.812	40.0	LOS C	107	1.00	0.98	28.5
Approach		**770**	**2.6**	**0.812**	**35.3**	**LOS C**	**112**	**1.00**	**0.98**	**30.4**
Anthony Road (West)										
10	L	179	0.0	0.762	44.4	LOS D	58	1.00	0.91	27.0
12	R	167	0.0	0.711	43.3	LOS D	54	1.00	0.87	27.3
Approach		**346**	**0.0**	**0.761**	**43.8**	**LOS D**	**58**	**1.00**	**0.89**	**27.1**
All Vehicles		**1299**	**2.3**	**0.814**	**38.2**	**LOS C**	**112**	**1.00**	**0.94**	**29.2**

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	29.3	LOS C	0	0.91	0.91
P11	53	29.3	LOS C	0	0.91	0.91
P7	53	29.3	LOS C	0	0.91	0.91
All Peds	**159**	**29.3**	**LOS C**	**0**	**0.91**	**0.91**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

SIDRA INTERSECTION

Movement Summary

New Betts / Anthony Road

SAT Peak 1145-1245

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Anthony Road (South)										
1	L	359	3.1	0.305	20.0	LOS B	49	0.90	0.07	38.7
2	T	34	2.9	0.306	18.8	LOS B	49	0.90	1.02	39.6
Approach		**393**	**3.1**	**0.305**	**19.9**	**LOS B**	**49**	**0.90**	**0.15**	**38.8**
Anthony Road (North)										
8	T	37	2.7	0.084	13.5	LOS A	3	0.60	0.81	43.8
9	R	57	3.5	0.326	32.8	LOS C	11	0.86	1.00	31.5
Approach		**94**	**3.2**	**0.326**	**25.2**	**LOS B**	**11**	**0.76**	**0.93**	**35.4**
New Betts Street (West)										
10	L	83	2.4	0.301	8.3	LOS A	0	0.00	0.67	49.0
12	R	465	3.0	0.301	8.5	LOS A	0	0.00	0.69	48.7
Approach		**548**	**2.9**	**0.301**	**8.5**	**LOS A**		**0.00**	**0.69**	**48.7**
All Vehicles		**1035**	**3.0**	**0.326**	**14.3**	**Not Applicable**	**49**	**0.41**	**0.50**	**43.1**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
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Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: SAT Peak
J:\85638 - West Ryde Reopened\SIDRA 09\J61_New Betts Anthony.aap
Processed May 01, 2009 02:42:02PM

A0085, Arup, Large Office
Produced by SIDRA Intersection 3.2.2.1563

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SIDRA INTERSECTION

Movement Summary

New Betts / Anthony Road

AM Peak 0730-0830

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Anthony Road (South)										
1	L	174	2.9	0.106	8.3	LOS A	0	0.00	0.67	49.0
2	T	15	6.7	0.039	14.6	LOS B	1	0.63	0.80	42.8
Approach		**188**	**3.2**	**0.106**	**8.8**	**LOS A**	**1**	**0.05**	**0.68**	**48.4**
Anthony Road (North)										
8	T	26	3.7	0.065	14.0	LOS A	2	0.61	0.81	43.4
9	R	14	7.1	0.052	20.1	LOS B	2	0.71	0.91	38.7
Approach		**41**	**4.9**	**0.065**	**16.1**	**LOS B**	**2**	**0.65**	**0.84**	**41.6**
New Betts Street (West)										
10	L	41	2.4	0.304	8.3	LOS A	0	0.00	0.67	49.0
12	R	514	2.9	0.304	8.3	LOS A	0	0.00	0.67	48.9
Approach		**554**	**2.9**	**0.304**	**8.3**	**LOS A**		**0.00**	**0.67**	**48.9**
All Vehicles		**783**	**3.1**	**0.304**	**8.9**	**Not Applicable**	**2**	**0.05**	**0.68**	**48.3**

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Following Queue
- Density for continuous movement

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SIDRA INTERSECTION

Movement Summary

New Betts / Anthony Road

PM Peak 1700-1800

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Anthony Road (South)										
1	L	589	3.1	0.362	8.3	LOS A	0	0.00	0.67	49.0
2	T	40	2.5	0.080	12.1	LOS A	3	0.57	0.77	45.0
Approach		**630**	**3.0**	**0.362**	**8.5**	**LOS A**	**3**	**0.04**	**0.67**	**48.7**
Anthony Road (North)										
8	T	62	3.2	0.115	11.7	LOS A	4	0.56	0.77	45.4
9	R	57	3.5	0.377	38.4	LOS C	13	0.89	1.02	29.1
Approach		**119**	**3.4**	**0.377**	**24.5**	**LOS B**	**13**	**0.72**	**0.89**	**35.8**
New Betts Street (West)										
10	L	68	2.9	0.242	8.3	LOS A	0	0.00	0.67	49.0
12	R	373	3.0	0.242	8.3	LOS A	0	0.00	0.67	48.9
Approach		**440**	**3.0**	**0.242**	**8.3**	**LOS A**		**0.00**	**0.67**	**48.9**
All Vehicles		**1189**	**3.0**	**0.377**	**10.1**	**Not Applicable**	**13**	**0.09**	**0.69**	**47.1**

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- Density for continuous movement

SIDRA SOLUTIONS

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SIDRA INTERSECTION

Movement Summary

Anthony Road and Reserve Street Intersection

Saturday Future 1145-1245

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Anthony Road (South)										
2	T	279	2.9	0.146	0.0	LOS A	0	0.00	0.00	60.0
3	R	12	8.3	0.014	10.7	LOS A	1	0.48	0.68	46.5
Approach		**291**	**3.1**	**0.146**	**0.4**	**LOS A**	**1**	**0.02**	**0.03**	**59.3**
Development (East)										
4	L	12	8.3	0.017	11.0	LOS A	1	0.46	0.70	46.2
6	R	58	3.4	0.217	21.7	LOS B	7	0.75	0.94	37.6
Approach		**70**	**4.3**	**0.217**	**19.8**	**LOS B**	**7**	**0.70**	**0.89**	**38.8**
Anthony Road (North)										
7	L	58	3.4	0.128	8.3	LOS A	0	0.00	0.67	49.0
8	T	426	3.0	0.128	0.0	LOS A	0	0.00	0.00	60.0
Approach		**485**	**3.1**	**0.128**	**1.0**	**LOS A**		**0.00**	**0.08**	**58.4**
All Vehicles		**846**	**3.2**	**0.217**	**2.4**	**Not Applicable**	**7**	**0.06**	**0.13**	**56.4**

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Following Queue
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SIDRA SOLUTIONS

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SIDRA INTERSECTION

Movement Summary

Anthony Road and Reserve Street Intersection

AM Future 0730-0830

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Anthony Road (South)										
2	T	212	2.8	0.110	0.0	LOS A	0	0.00	0.00	60.0
3	R	33	3.0	0.044	11.4	LOS A	1	0.53	0.76	45.7
Approach		**244**	**2.9**	**0.110**	**1.5**	**LOS A**	**1**	**0.07**	**0.10**	**57.6**
Development (East)										
4	L	40	2.5	0.062	11.7	LOS A	2	0.51	0.77	45.4
6	R	41	2.4	0.169	22.4	LOS B	5	0.76	0.93	37.1
Approach		**81**	**2.5**	**0.169**	**17.2**	**LOS B**	**5**	**0.64**	**0.85**	**40.8**
Anthony Road (North)										
7	L	113	2.7	0.161	8.3	LOS A	0	0.00	0.67	49.0
8	T	497	3.0	0.161	0.0	LOS A	0	0.00	0.00	60.0
Approach		**609**	**3.0**	**0.161**	**1.5**	**LOS A**		**0.00**	**0.12**	**57.6**
All Vehicles		**934**	**2.9**	**0.169**	**2.9**	**Not Applicable**	**5**	**0.07**	**0.18**	**55.6**

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SIDRA SOLUTIONS

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SIDRA INTERSECTION

Movement Summary

Anthony Road and Reserve Street Intersection

PM Future 1700-1800

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Anthony Road (South)										
2	T	522	3.1	0.273	0.0	LOS A	0	0.00	0.00	60.0
3	R	23	4.3	0.025	10.2	LOS A	1	0.45	0.68	46.9
Approach		**545**	**3.1**	**0.273**	**0.4**	**LOS A**	**1**	**0.02**	**0.03**	**59.3**
Development (East)										
4	L	66	3.0	0.084	10.5	LOS A	3	0.44	0.72	46.6
6	R	107	2.8	0.578	39.2	LOS C	24	0.90	1.11	28.8
Approach		**173**	**2.9**	**0.577**	**28.2**	**LOS B**	**24**	**0.73**	**0.96**	**33.8**
Anthony Road (North)										
7	L	87	3.4	0.115	8.3	LOS A	0	0.00	0.67	49.0
8	T	347	2.9	0.115	0.0	LOS A	0	0.00	0.00	60.0
Approach		**435**	**3.0**	**0.115**	**1.7**	**LOS A**		**0.00**	**0.14**	**57.4**
All Vehicles		**1153**	**3.0**	**0.578**	**5.1**	**Not Applicable**	**24**	**0.12**	**0.21**	**52.7**

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SIDRA INTERSECTION

Movement Summary

New Betts & Access Street Intersection

2016 Sat Midday Peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Residential Access (South)										
1	L	20	0.0	0.206	22.0	LOS B	6	0.76	0.86	17.3
3	R	24	0.0	0.207	22.4	LOS B	6	0.76	0.92	16.9
Approach		**44**	**0.0**	**0.207**	**22.2**	**LOS B**	**6**	**0.76**	**0.89**	**17.0**
New Betts St (east)										
4	L	20	0.0	0.225	5.6	LOS A	0	0.00	0.58	43.2
5	T	416	1.0	0.225	0.0	LOS A	0	0.00	0.00	50.0
Approach		**436**	**0.9**	**0.225**	**0.3**	**LOS A**		**0.00**	**0.03**	**49.7**
New Betts St (west)										
11	T	561	1.1	0.316	3.3	LOS A	30	0.68	0.00	44.4
12	R	24	0.0	0.316	9.3	LOS A	30	0.68	0.83	40.0
Approach		**585**	**1.0**	**0.316**	**3.5**	**LOS A**	**30**	**0.68**	**0.03**	**44.2**
All Vehicles		**1065**	**0.9**	**0.316**	**2.9**	**Not Applicable**	**30**	**0.40**	**0.07**	**45.4**

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Movement Summary

New Betts & Access Street Intersection

2016 AM Peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Residential Access (South)										
1	L	15	0.0	0.238	17.6	LOS B	8	0.66	0.68	19.6
3	R	53	0.0	0.238	18.0	LOS B	8	0.66	0.89	19.1
Approach		**68**	**0.0**	**0.237**	**17.9**	**LOS B**	**8**	**0.66**	**0.84**	**19.2**
New Betts St (east)										
4	L	7	0.0	0.100	5.6	LOS A	0	0.00	0.58	43.2
5	T	187	1.1	0.100	0.0	LOS A	0	0.00	0.00	50.0
Approach		**194**	**1.0**	**0.100**	**0.2**	**LOS A**		**0.00**	**0.02**	**49.7**
New Betts St (west)										
11	T	564	1.1	0.296	1.1	LOS A	21	0.42	0.00	46.3
12	R	5	0.0	0.294	7.2	LOS A	21	0.42	0.64	41.4
Approach		**570**	**1.1**	**0.296**	**1.2**	**LOS A**	**21**	**0.42**	**0.01**	**46.3**
All Vehicles		**832**	**1.0**	**0.296**	**2.3**	**Not Applicable**	**21**	**0.34**	**0.08**	**45.4**

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Movement Summary

New Betts & Access Street Intersection

2016 PM Peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Residential Access (South)										
1	L	6	0.0	0.094	31.9	LOS C	2	0.86	0.94	13.6
3	R	6	0.0	0.094	32.2	LOS C	2	0.86	0.95	13.3
Approach		**12**	**0.0**	**0.094**	**32.1**	**LOS C**	**2**	**0.86**	**0.94**	**13.5**
New Betts St (east)										
4	L	41	0.0	0.357	5.6	LOS A	0	0.00	0.58	43.2
5	T	646	0.9	0.355	0.0	LOS A	0	0.00	0.00	50.0
Approach		**687**	**0.9**	**0.355**	**0.3**	**LOS A**		**0.00**	**0.03**	**49.5**
New Betts St (west)										
11	T	536	0.9	0.333	7.3	LOS A	46	0.86	0.00	42.5
12	R	35	0.0	0.333	13.4	LOS A	46	0.86	1.03	36.9
Approach		**570**	**0.9**	**0.333**	**7.7**	**LOS A**	**46**	**0.86**	**0.06**	**42.1**
All Vehicles		**1269**	**0.9**	**0.357**	**3.9**	**Not Applicable**	**46**	**0.39**	**0.06**	**45.5**

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