'DISCOVERY POINT'
S75W APPLICATION (MOD 4)

PRINCES HIGHWAY AND BRODIE SPARK DRIVE, WOLLI CREEK

Assessment of Traffic, Transport and Parking Implications

May 2014
(Rev C)

Reference 14028

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TABLE OF CONTENTS

1. INTRODUCTION 1

2. PROPOSED DEVELOPMENT SCHEME 3

2.1 Site, Context and Existing Circumstances 3
2.2 Master Plan and Concept Plan 3
2.3 Existing Circumstances 5
2.4 Proposed S75W Modification 5

3. ROAD NETWORK AND TRAFFIC CONTROLS 7

3.1 Road Network 7
3.2 Traffic Controls 8
3.3 Traffic Conditions 8
3.4 Transport Services 10

4. ROAD NETWORK AND VEHICLE ACCESS 13

5. TRAFFIC 15

6. PARKING 18

7. PUBLIC TRANSPORT, WALKING AND CYCLING 21

8. WOLLI CREEK TRAFFIC AND TRANSPORT STUDY 23

9. CONCLUSION 25

APPENDIX A S94 SCHEDULE
APPENDIX B RMS DOCUMENT

LIST OF ILLUSTRATIONS

FIGURE 1 LOCATION
FIGURE 2 SITE
FIGURE 3 ROAD NETWORK
FIGURE 4 TRAFFIC CONTROLS

1. INTRODUCTION

This report has been prepared to accompany a S75W Application to the Department of Planning for modification of the approved Concept Plan for development of the 'Discovery Point' site at Wolli Creek (Figure 1).

The 'Discovery Point' site is bounded by Princes Highway, Brodie Spark Drive, Magdalene Terrace and the Railway Line and a number of building elements have already been constructed or commenced under the approved Concept Plan (MOD 3) and previous Master Plan with subsequent individual consents.

The Concept Plan which has been the subject of a number of modifications (15/6/12, 13/3/13 and 21/1/14) together with that constructed under the former Master Plan provides for:

CONCEPT PLAN	**MASTER PLAN**
123,000m^2 residential (1,230 apts say)	311 apartments
9,000m^2 commercial/retail	636m^2 commercial
	1,270m^2 retail
1,877 parking spaces (max)	363 parking spaces

The S75W Application proposes to modify the Concept Plan to:

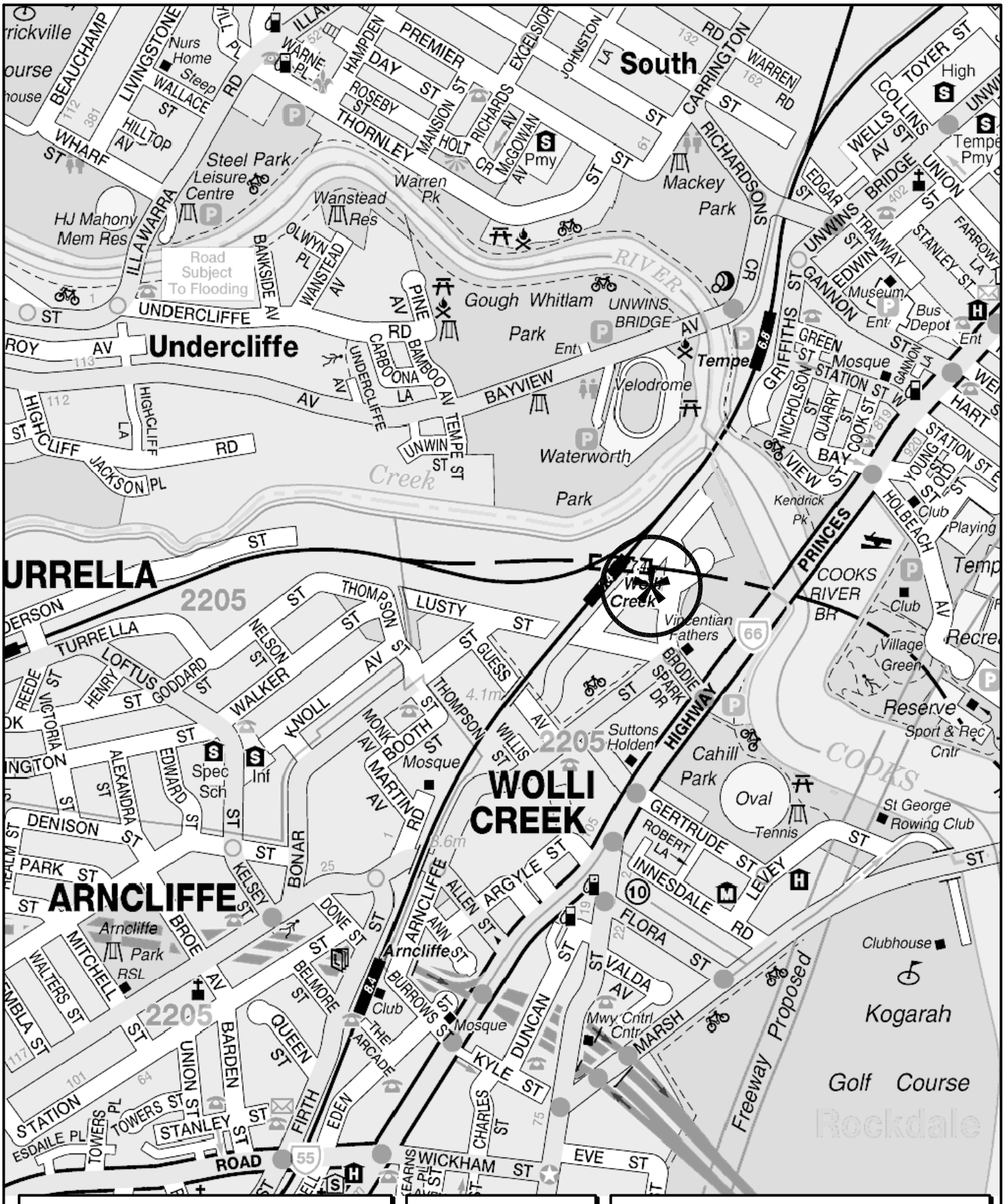
- increase the total gross floorspace by 10,000m^2 (i.e 132,000m^2 to 142,000m^2) which is anticipated to result in some 76 additional apartments (subject to final mix) for Buildings 11, 12 and 13
- incorporate 4 above ground parking levels within podium rather than 2 above ground levels as already approved

The application does not seek to change the approved building envelopes or the maximum number of parking spaces permitted.

It should be noted that the gross floor area for the Concept Plan application refers to Standard Instrument Gross Floor area (SIGFA).

The purpose of this report is to:

* describe the site, the current Concept Plan and the existing development
* describe the proposed S75W modifications
* describe the road network serving the site and the planned road network upgrade
* assess the potential traffic implications
* assess the proposed parking provision
* assess the suitability of the proposed vehicle access, internal circulation and servicing arrangements
* assess the facilitation of bus services and the implications for non-car travel modes


Undercliffe
ARNCLIFFE
WOLLI CREEK
South
Steel Park Leisure Centre
HJ Mahony Mem Res
Wanstead Res
Warren Pk
Mackey Park
Gough Whitlam Park
Waterworth Park
Velodrome
Kendrick Pk
Cahill Park
Oval
Arncliffe Park
Kogarah Golf Course
Rockdale
Road Subject To Flooding
Creek
RIVER
HIGHWAY
Freeway Proposed
Nurs Home
Steep
Pmy
Mosque
Club
Tennis
Museum
Bus Depot
Spec Sch
Inf
Vincentian Fathers
Suttons Holden
St George Rowing Club
Clubhouse
Mwy Cntrl
Cntr
Village Green
Sport & Rec Cntr
Recreation Reserve
COOKS RIVER
BR
2205
4.1m
3.6m
66
10
84
55
LEGEND
LOCATION
FIG 1

2. PROPOSED DEVELOPMENT SCHEME

2.1 SITE, CONTEXT AND EXISTING CIRCUMSTANCES

The Discovery Point site (Figure 2) is bounded by Cooks River, Princes Highway, Brodie Spark Drive/Magdalene Terrace and the railway line and includes the historic Tempe House, St Magdalen's Chapel and the surrounding open space precinct (Discovery Point Park). The Wolli Creek Railway Station, which is accessed in the central part of the site, is supplemented by bus services.

The lands to the east and west comprise parkland which extend along the banks of Cooks River and its Wolli Creek tributary while to the south there are new apartment buildings with some remnant industrial and automotive uses. The major Sydney Airport Precinct is located further to the east while the Arncliffe and Rockdale Centres are located further to the south.

2.2 MASTER PLAN AND CONCEPT PLAN

The Concept Plan was proceeded by a Master Plan (modified under a number of S96 applications) which envisaged the development of :

- some 1200 apartments
- some 14,000m^2 retail floorspace
- some 40,000m^2 commercial floorspace
- some 2,240 parking spaces

Three buildings were constructed under this Master Plan along with a portion of the access road system and renovation of Tempe House Chapel and surrounding lands.

The Concept Plan comprises the staged development of 14 sites (exclusive of the 3 completed sites) together with the access road, pedestrian/cyclist and public transport networks.

LEGEND

N

SITE

FIG 2

The Concept Plan provides for above ground parking with a maximum of one level of basement parking to be provided with the exception of the existing excavated area at the southern end of the site. The proposed above ground parking level are to be framed by active residential and retail uses along major street frontages.

The Concept Plan provides for a total of 132,000m^2 SIGFA (excluding carparking areas) comprising:

* residential floorspace maximum of 123,000m^2
* non-residential floorspace minimum of 9,000m^2.

The Concept Plan provides for the following apartment mix across the whole site:

* maximum 50% studios and one-bedroom units
* minimum 40% two-bedroom units
* minimum 10% three+-bedroom units.

The Concept Plan provides for the following carparking rates:

* Residential
  - maximum 1.0 space per studio/one-bedroom unit
  - maximum 2.0 spaces per two and three+-bedroom unit
  - minimum 1 space per 20 apartments for visitors

* Non-Residential
  - minimum 1 space per 50m^2 commercial floorspace
  - minimum 1 space per 35m^2 retail floorspace

The maximum permitted total parking provision is 2,240 spaces. The Indicative Design Scheme which accompanied the original Concept Plan application included 1,467 apartments, however it noted that the total number of apartments to be developed within the approved Concept Plan would depend on future mix and detailed design.

2.3 EXISTING CIRCUMSTANCES

A number of elements of the former Masterplan have been completed. These include Buildings 1, 2 and 4 as well as sections of Brodie Spark Drive, Magdalene Terrace and basement areas constructed under the Masterplan which comprise:

Apartments	311
Commercial	636m^2
Retail	1270m^2
Parking spaces	363

Work has also commenced on a number of building elements covered by the approved Concept Plan while others are subject to current approval processes. The applications for Stages 1 to 10 inclusive comprise:

- 1,142 apartments
- 4,655m^2 retail
- 1,129 parking spaces

A further 390 apartments were to be provided within the approved Concept Plan envelopes for future buildings 11, 12 and 13 in accordance with the original Indicative Design Scheme.

2.4 PROPOSED S75W MODIFICATION

The S75W Application proposes to:

- increase the total gross floor area by 10,000m^2 (i.e 132,000m^2 to 142,000m^2) to be provided as additional residential floorspace within the approved building envelopes for Buildings 11, 12 and 13

- provide 4 above ground levels of parking provided within the approved podium to be “wrapped” by residential apartments instead of 2 above ground levels

An indicative design scheme has been prepared for the future development of buildings 11, 12 and 13 in accordance with the proposed S75W application. The additional 10,000m^2 floorspace sought in the application would result in an additional 76 apartments as per the revised indicative design scheme, increasing the total number of apartments likely to be developed under the concept plan from 1,532 to 1,608 apartments.

The revised proposal will provide for the following potential development outcome:

	Existing buildings developed under former Masterplan	Estimated under Concept Plan approval (including S75W)	Total for Discovery Point
Apartments	311	1,608	1,919
Residential Parking	339	1,470	1,809
Commercial	636m^2	4,345m^2	4,981m^2
Commercial Parking	8	92	100
Retail	1,270m^2	4,655m^2	5,925m^2
Retail Parking	12	130	142
Visitor Parking	4	81 (within retail carpark and on street)	85
Total Parking			**2,055 spaces**

The envisaged 'make up' of apartments and carparking for the Concept Plan area is as follows:

567 x 1 Bed

875 x 2 Bed

166 x 3 Bed

Total: 1,608 Apartments

Residential Parking:	1,470 spaces
Non Residential:	222 spaces
Total:	**1,692 spaces**

Plans of the latest Indicative Car Parking Design Scheme for the site are provided with the application.

3. ROAD NETWORK AND TRAFFIC CONTROLS

3.1 ROAD NETWORK

The existing road network serving the area (Figure 3) comprises:

- the *M5 East* Motorway which passes in tunnel beneath Arncliffe with portals located to the east of West Botany Street and an off-load ramp to the Princes Highway

- the *Princes Highway* arterial route which crosses Cooks River just to the east of Discovery Point

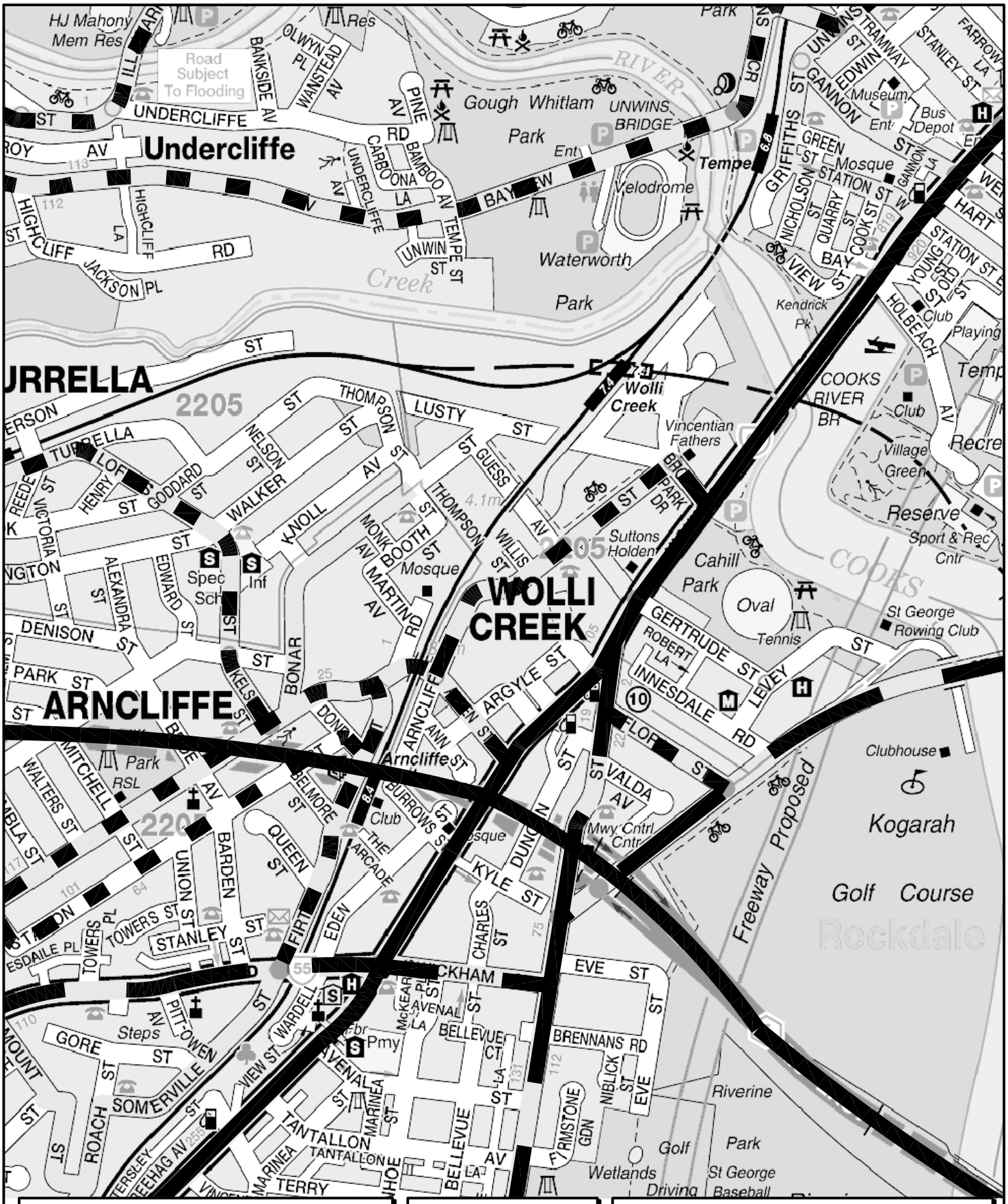
- the State Road and arterial route of *Forest Road, Wickham Street and Marsh Street*

- the Regional Road and sub-arterial route of *West Botany Street*

- the Regional Road and collector route of *Wollongong Road, Arncliffe Street and Brodie Spark Drive* between *Forest Road and Princes Highway*

- the minor collector road route linking through Turrella and connecting to *Wollongong Road via Brodie Spark Drive and Arncliffe Street*

The access road system is constrained to some extent by the railway lines as well as the Cooks River and Wolli Creek systems.


WOLLI CREEK
ARNCLIFFE
Undercliffe
Road Subject To Flooding
Gough Whitlam Park
Waterworth Park
Velodrome
Tempe
Wolli Creek
Vincentian Fathers
Cahill Park
Oval
Tennis
Reserve
Sport & Rec Cntr
St George Rowing Club
Cooks River
Kogarah Golf Course
Clubhouse
Freeway Proposed
Riverine Golf Park
Wetlands
St George Baseball
Driving
Suttons Holden
Mosque
Spec Sch
Inf
Park RSL
Arncliffe
Bus Depot
Museum
Tramway
Stanley St
Unwins Bridge
Kendrick Pk
Playing
Village Green
Cooks River
Creek
RIVER
Underwood
Bellevue
Tantallon
Somerville
Gore
Steps
Pitt-Owen
Stanley
Towers
Barden
Union
Queen
Eden
Kyle
Valda
Innesdale
Gertrude
Levey
Denison
Park
Bonar
Keel
Alexandra
Edward
Walker
Knoll
Goddard
Thompson
Lusty
Guess
Nelson
Turrella
Highcliff
Jackson
Bamboo
Carboona
Pine
Wanstead
Olwyn
Bankside
Ill
Roy
Unwin
Tempe
Bay View
Griffiths
Green
Nicholson
Quarry
Cook
Station
Gannon
Edwin
Stanley
Farrow
Holbeach
Young
Old
Hart
Brennans
Niblick
Eve
Valda
Dunn
Charles
Mckeachie
Avenal
Marinea
Terry
Wardell
View
Firmstone
Gdn
Park Dr
Bridge
Willis
Monk
Booth
Martin
Ann
Argyle
Arncliffe
Burrows
Belmore
Mitchell
Walters
Towers Pl
Esdaile Pl
Mwy Cntrl
Cntr
Mosque
Club
Arcade
Bellevue Ct
Bellevue Av
Tantallon
Somerville
Roach
Mount
Wetlands
Driving
Golf
Park
Riverine
Clubhouse
Kogarah
Golf Course
Freeway Proposed
Rockdale
2205
2206
2207
4.1m
LEGEND
ARTERIAL
SUB-ARTERIAL
COLLECTOR
N
ROAD NETWORK
FIG 3

3.2 TRAFFIC CONTROLS

The existing traffic controls which have been applied to the road system in the vicinity of the site (Figure 4) comprise:

- the traffic signals at the Princes Highway and Brodie Spark Drive intersection. Details of this intersection arrangement are provided in Appendix D
- the other traffic signals along the Highway at the Gertrude Street, West Botany Street, M5 Ramp, Burrows Street and Forest Road intersections
- the large roundabout at the Brodie Spark Drive/Arncliffe Street/Magdalene Terrace intersection
- the roundabouts at the Allen Street/Arncliffe Street and Wollongong Road/Firth Street intersections
- the traffic signals at the Wollongong Road/Kelsey Street intersection
- the CLEARWAY and NO STOPPING restrictions along the Highway
- the NO STOPPING restrictions along Brodie Spark Drive
- the 60 kmph speed restriction on the Highway and 50 kmph restriction on the local and collector roads
- the central median islands along the Highway and Brodie Spark Drive

3.3 TRAFFIC CONDITIONS

An indication of the existing traffic conditions on the road system in the vicinity of the site is provided by data[1] published by RMS and traffic surveys undertaken as part of this assessment.

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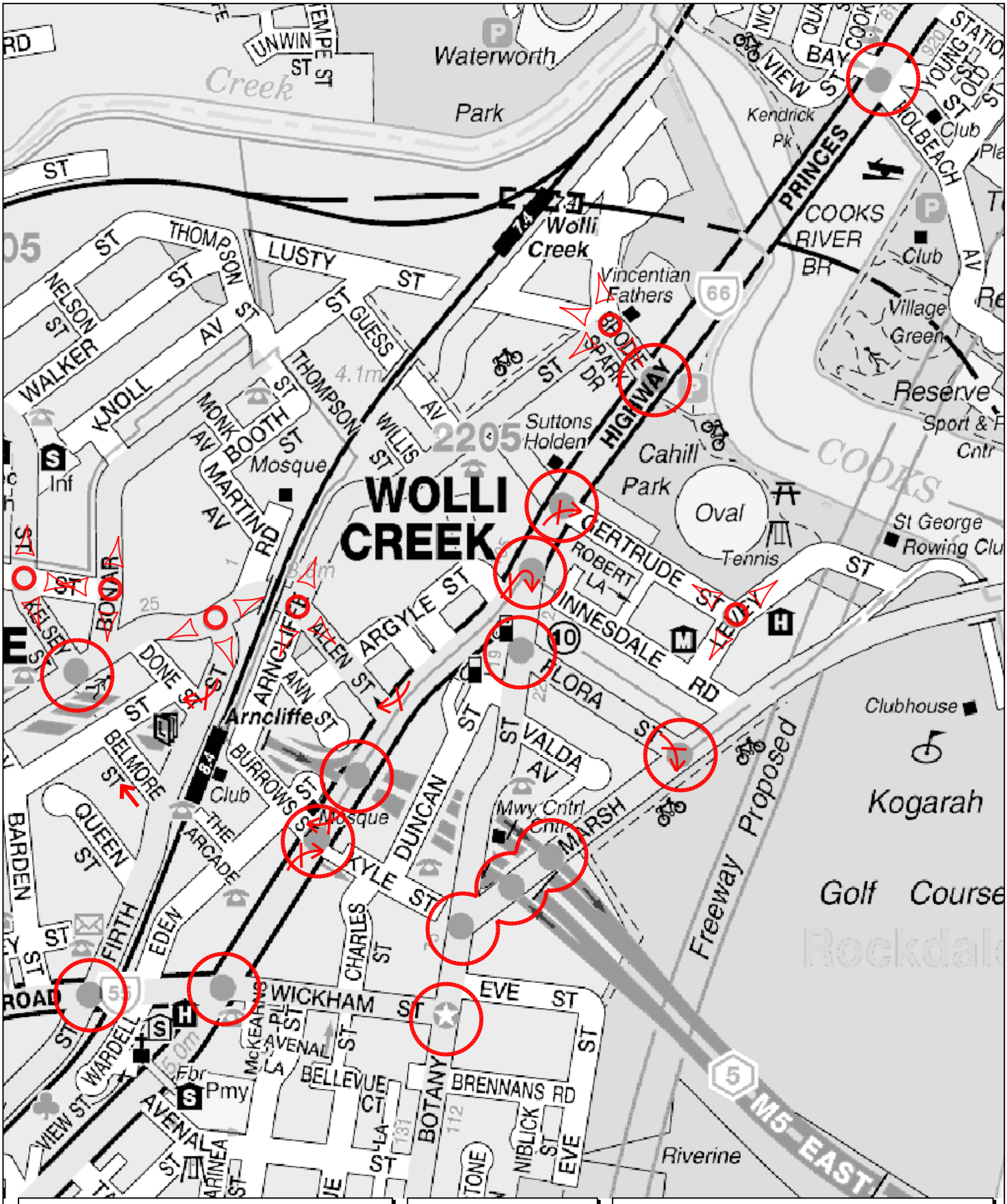
1 Traffic Volumes for Sydney Region
Roads and Maritime Services



LEGEND

- TRAFFIC SIGNAL CONTROL
- ROUNDABOUT
- RESTRICTED TURNING MOVEMENT

N

TRAFFIC CONTROLS

FIG 4

The data provided by RMS is expressed in terms of Annual Average Daily Traffic (AADT) and the latest recordings in the vicinity of the site are provided in the following:

	AADT
Princes Highway south of Allen Street	37,901
Forest Road west of Princes Highway	20,186
Wollongong Road east of Wolli Creek Road	7,535

Traffic surveys have been undertaken at intersections during peak weekday morning and afternoon periods. The results of those surveys are summarised in the following:

		AM	**PM**
Princes Highway	Northbound	4,186	1,315
	Left-turn	56	214
	Southbound	1,048	2,935
	Right-turn	89	556
Brodie Spark Drive	Right-turn	146	90
	Left-turn	509	163
Brodie Spark Drive	Westbound	31	208
	Right-turn	2	8
	Left-turn	107	523
	Southbound	-	2
	Right-turn	-	2
	Left-turn	6	2
Arncliffe Street	Northbound	4	2
	Right-turn	596	174
	Left-turn	17	19
Magdalene Terrace	Eastbound	205	67
	Right-turn	3	13
	Left-turn	1	1

The operational performance of these intersections under the prevailing peak traffic demands has been assessed using the SIDRA program. The results of that assessment indicating a satisfactory situation are provided in the following while criteria for interpretation of the modelling output is provided overleaf:

	AM			PM		
	LOS	**DS**	**AVD**	**LOS**	**DS**	**AVD**
Princes Highway/Brodie Spark	C	0.86	24.3	C	0.88	27.4
Brodie Spark/Arncliffe	A	0.35	9.2	A	0.20	6.8

3.4 TRANSPORT SERVICES

The area is well served by the public transport services comprising:

* the Wolli Creek Railway Station which accesses the East Hills, Illawarra and New Southern rail lines

* the Arncliffe Railway Station on the Illawarra Line

* the State Transit Route 348 bus service which runs between Wolli Creek Railway Station and Bondi Junction with a 30 minute frequency between 7.00am and 7.00pm Monday - Friday

* the State Transit Route 471 bus service which runs along Wollongong Road, Bonar Street/Loftus Street and the Princes Highway connecting between Rockdale and Five Dock

* the State Transit Route 425 service which runs along the Highway connecting between Rockdale and Dulwich Hill via Sydenham

Criteria for Interpreting Results of SIDRA Analysis

1. Level of Service (LOS)

LOS	*TRAFFIC SIGNALS AND ROUNDABOUTS*	Give Way and Stop Signs
'A'	Good	Good
'B'	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
'C'	Satisfactory	Satisfactory but accident study required
'D'	Operating near capacity	Near capacity and Accident Study required
'E'	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity and requires other control mode
'F'	Unsatisfactory and requires additional capacity	Unsatisfactory and requires other control mode

2. Average Vehicle Delay (AVD)

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

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

3. Degree of Saturation (DS)

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

For intersections controlled by **traffic signals**[2] both queue length and delay increase rapidly as DS approaches 1, and it is usual to attempt to keep DS to less than 0.9. Values of DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceeds 0.9 queues can be anticipated.

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

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[2] *the values of DS for intersections under traffic signal control are only valid for cycle length of 120 secs*

3.5 FUTURE CIRCUMSTANCES

The prescribed upgrading of the road network and traffic controls to suitably accommodate the ultimate redevelopment of WCRA are identified in the diagram and the schedule in Appendix A.

A number of these elements, particularly the construction of Magdalene Terrace and part of Brodie Spark Drive, have already been completed however major elements which are unlikely to be achieved for many years (due to reliance on redevelopment of sites) include:

* construction of Gertrude Street between Princes Highway and Arncliffe Street

* construction of a new access road parallel to and between the Highway and Arncliffe Street

* widening of the Highway and Arncliffe Street

Council have recently completed the Wolli Creek and Bonar Street Precinct Traffic Study and issued a final draft of the Wolli Creek Traffic and Transport Study (Strategic Implementation Plan). The implications of these documents are addressed in Section 8 of this report.

4. ROAD NETWORK AND VEHICLE ACCESS

ROAD NETWORK

The Concept Plan road network involves the peripheral road circuit of Brodie Spark Drive, Magdalene Terrace, Spark Lane and the two east-west streets (Discovery Point Place and Chisholm Street) connecting between Brodie Spark Drive and Spark Lane. A large roundabout was constructed at the intersection of Magdalene Terrace, Brodie Spark Drive and Arncliffe Street as part of a cooperation agreement between Council and the developer to facilitate the Discovery Point development.

The principal vehicular ingress and egress to residential apartments within the site is via this intersection. Access to the public carpark and secondary access to the site is via Spark Lane which is designed with a more service lane function.

Brodie Spark Drive accommodates bicycle lanes and the eastern part of Discovery Point Place is narrowed to facilitate pedestrians crossing to/from the railway station. Kerbside parking will be provided along Brodie Spark Drive, Magdalene Terrace and Chisholm Street at the northern part of the site.

The S75W development outcome will not change any details of the road network as identified in the approved Concept Plan.

VEHICLE ACCESS

Access for the integrated basement carpark areas will be located on Brodie Spark Drive, Spark Lane and Chisholm Street. The accesses, including the use by service vehicles, will therefore generally avoid any conflict with significant pedestrian or cyclist movements. The accesses will be located on sections of road which are straight and relatively level and appropriate sight distances will be available.

The proposed accesses will comply with the design criteria of AS 2890.1 and 2 and will accommodate all vehicles requiring access to the sites. The S75W development outcome will not change any details of the vehicle access arrangements as identified in the approved Concept Plan and subsequent detailed project and development application approvals.

5. TRAFFIC

Earlier planning processes incorporating development schemes for the Discovery Point site, including the previously approved Masterplan, have been accompanied by various traffic generation assessments as follows:

	AM	PM
1998 (MWT) Medium scenario	2,305 vtph	2,585 vtph
2000 (Stapleton)	1,589 vtph	1,589 vtph
2004 (Project Planning)	1,450 vtph	1,910 vtph
2006 (TTPA)	1,400 vtph	1,680 vtph

The approved Concept Plan represented a significant change to the development outcome with:

* reduced retail and commercial floorspace and carparking
* increased residential apartments
* reduced parking provisions consistent with sustainable development outcomes

The traffic generation of the residential apartments was established by application of RMS Development Guideline criteria which existed at that time. The traffic generation of the retail and commercial floorspace was derived from an assessed parking space turnover due to the constrained parking provision.

The projected total generation resultant to development under the existing Concept Plan is as follows:

1,778 (311 + 1,467) apartments @ 0.29 vtph *NOTE: 233 apartments already occupied = 65 vtph*	516 vtph
120 (8 + 112)commercial parking spaces @ 0.34 vtph per space	41 vtph
157 (26 + 125) retail/visitor spaces @ 2 vtph per space	302 vtph
44 on-street spaces @ 2 vtph per space	88 vtph
Kiss'n'ride, taxis, service etc (say)	50 vtph
Total:	**997 vtph**

Thus, the projected traffic generation under the approved Concept outcome was significantly less than that of the previous traffic assessments.

RMS have recently undertaken a study to review the traffic generation of the High Density Residential land use as part of the process of revising its Development Guidelines. The RMS Technical Direction TDT 2013 04a provides the updated traffic generation for residential apartments with good access to public transport services. This criteria is reproduced in Appendix B and summarised in the following:

AM Peak	- 0.19 vtph per apartment
PM Peak	- 0.15 vtph per apartment

Application of this and the previous other criteria to the proposed S75W outcome reveals the following:

	AM	**PM**
1,919 Apartments (311 + 1,608)		
@ 0.19 vtph	347 vtph	
@ 0.15 vtph		288 vtph
92 Commercial parking spaces (Future Building 14) @ 0.34 vtph per space	32 vtph	32 vtph
150 Retail/visitor spaces (20 + 130)		
@ 1 vtph per space	150 vtph	
@ 2 vtph per space		300 vtph
Onstreet/Kiss-n-Ride etc 27 visitors, 5 loading, 4 car share, 3 taxi and 7 Kiss'N'Ride	120 vtph	120 vtph
Total :	649 vtph	740 vtph
Approved Concept Plan	(997 vtph)	(997 vtph)

Thus the assessed total traffic generation outcome for the development of Discovery Point under the S75W application will only be some 65% of that for the morning peak under the current approved Concept Plan and some 74% in the afternoon peak. What is more the revised projection is only some 50% of the projected traffic generation under the former Master Plan.

It is very apparent that the development outcome under the S75W application will not result in any adverse traffic implications. In fact the traffic circumstances will be significantly better than that previously envisaged.

6. PARKING

The parking provision for residential apartments under the Concept Plan, which was considered to reflect a 'balanced' and 'flexible' outcome, is as follows:

	Average Across Completed Development	
	Minimum	**Maximum**
Studio/One-bed	0 space	1.0 space
Two-bed	1.0 space	2.0 spaces
Three-bed+	2.0 spaces	2.0 spaces

The Concept Plan provides for 1 residential visitor space per 20 apartments (having regard to the excellent public transport services available) and these spaces will be available within the public carpark (shared with retail spaces) and on-street provisions. The principle of constrained parking provision will be applied to worker parking (ie commercial floorspace) of some 1 space per 50m^2 while the provision for retail parking is some 1 space per 35m^2.

A calculation of parking provision range for the Concept Plan under the S75W application (taking into account the revised Indicative Design Scheme for future Buildings 11 to 13 and the detailed designs completed for Stages 1 to 10 inclusive) is provided in the following for both the minimum and maximum parking rates:

	Minimum Outcome		Maximum	
567x one-bedroom apartments	@ 0	0 spaces	@ 1.0	567 spaces
875 x two-bedroom apartments	@ 1.0	875 spaces	@ 2.0	1750 spaces
166 x three-bedroom apartments	@ 2.0	332 spaces	@ 2.0	332 spaces
Total:		**1,207 spaces**		**2,649 spaces**
Commercial 4,345m^2	@ 1 per 50m^2	87 spaces	@ 1 per 50m^2	87 spaces
Retail 4,655m^2	@ 1 per 35m^2	133 spaces	@ 1 per 35m^2	133 spaces
Visitor	@ 1 per 20 apts	81 spaces	@ 1 per 20 apts	81 spaces
Total:		**301 spaces** (including 27 on-street)		**301 spaces**
Total:		**1,508 spaces**		**2,950 spaces**

The assessed parking provision outcome for development of the Concept Plan area under the S75W application is 1,692 spaces (with an overall total of 2,055 spaces including the 363 spaces provided in buildings constructed under the Master Plan) as follows:

Building	1 bed	2 bed	3 bed	Total Apts	Residential Parking	Non-Residential Parking
1	52	64	10	126	111	68
2	60	120	20	200	190	22
3	36	54	9	99	81	23
4	29	41	0	70	62	0
5	66	80	16	162	120	17
6	30	52	6	88	79	0
7	34	30	10	74	70	0
8 to 10	97	189	37	323	286	0
11 to 13	163	245	58	466	471	0
14	0	0	0	0	0	92
TOTAL:	**567**	**875**	**166**	**1,608**	**1,470**	**222**

It is apparent that the parking provision outcome will be compliant with the Concept Plan criteria. In fact the number will be somewhat less than the midway between minimum and maximum and represents a desirable “constrained” parking provision outcome.

7. PUBLIC TRANSPORT, WALKING AND CYCLING

Pedestrians

The proposed development will make provision for pedestrians with:

* pedestrian corridors connecting north-south to the station and east-west through the site to/from the park
* reduced road crossing widths at intersections and along Discovery Point Place adjacent to the bus/rail interchange
* numerous 'vehicle free' plaza areas
* continuous footways along the block frontages with numerous 'set back' widening
* a high level of surveillance, lighting and urban design/landscaping
* minimal conflicts at vehicle accesses
* access integration with Discovery Point Park and the external pedestrian network

Cyclists

The proposed development will make provision for cyclists with:

* the bicycle lanes along the riverbank and Brodie Spark Drive allowing for connection to shared footway facilities on the internal network
* basement bike parking for residents
* bicycle stands for staff and shoppers
* 'end of trip' facilities for staff

- allowance for connection to the external network including the Regional Cycle Route (Kurnell to Homebush Bay) pending future bridge connections by others.

Public Transport

The proposed development will make provision for public transport services with:

- provision to satisfactorily maintain access, standing and interchange for bus services during the staged construction process
- provision for taxi to stand along Discovery Point Place and for short stay parking along Brodie Spark Drive (Kiss'N'Ride) to stand
- provision for buses to suitably access via Magdalene Terrace, Spark Lane and Discovery Point Place and depart via Brodie Spark Drive with the completed development
- provision of appropriate segregated bus standing (2 spaces) on Discovery Point Place adjacent to the Discovery Point Place entrance including appropriate shelter, lighting and other facilities with the completed development
- provision of footways and internal links to facilitate travel to/from the convenient bus and rail services
- reducing the need for nearby residents to travel by car in order to shop for essential needs (ie residents will be more inclined to travel to/from work by public transport when they are not reliant on car travel in order to shop as part of the work trips)

8. WOLLI CREEK TRAFFIC AND TRANSPORT STUDY

Rockdale City Council recently engaged Bitzios Consulting to undertake a Traffic and Transport Study of the Wolli Creek and Bonar Street Precinct having regard for Councils principal concerns in regard to:

- the perceived level of "through traffic" in Wolli Creek, and
- the effects on pedestrian and cyclist amenity as the precinct develops

The study identified, considered and assessed (by traffic modelling) a number of options for traffic management and road works. The principal proposal to arise from this study is the scheme to introduce a One-way clockwise traffic flow along Arncliffe Street, Guess Avenue and Mount Olympus Drive (Magdalene Terrace to remain two-way). Consideration had been given to the removal of the existing roundabout at the Brodie Spark Drive/Arncliffe Street/Magdelene Terrace intersection however it is understood that this element of the scheme has been abandoned, one of the principal reasons being the difficulty that this would have created for Discovery Point access.

An implication of the proposed one-way scheme in relation to the Discovery Point development is that traffic departing along Spark Lane will now be required to travel along Magdelene Terrace and Arncliffe Street rather than along Mount Olympus Boulevard. Previous assessments for Discovery Point development★ were that some 20% of departing traffic would travel from Spark Lane to Mount Olympus Boulevard. On the basis of the revised traffic generation outcome (661 vtph two way in the AM and 744 vtph in the PM) the volume of vehicles which will be required to divert through the Brodie Spark Drive/ Arncliffe Street intersection will be some 40 to 50 vtph. This diverted volume will however be substantially less than the reduction in overall movements through this intersection consequential to the revised traffic assessment for the S75W application.

★ *Discovery Point*
Revised Transportation Report
TTPA November 2006

A further implication of the proposed one-way scheme is that it would result in some operational changes to the roundabout at the Broadie Spark Drive/Magdalene Terrace/Arncliffe Street intersection. As roundabouts typically require turning conflicts to create gaps which enable ingress movement opportunities, the proposed one-way scheme could potentially disadvantage the ability for vehicles to egress out of Discovery Point.

Australand has recently met with Council's officers and representatives of Bitzios and it was resolved at that meeting to undertake further consultation and analysis of potential impacts to ensure a mutually satisfactory outcome to the changes that Council are proposing (which will be subject to necessary concurrences from RMS and STA etc).

9. CONCLUSION

The assessment in relation to the S75W application concludes that development under the revised Concept Scheme will:

- not have any adverse traffic implications and will in fact have a traffic generation outcome which is significantly less than that with development under the previous planning and approvals due to the revisions to the RMS Development Guideline criteria
- comply with the objective of providing sufficient parking to adequately service the development while at the same time managing the supply of parking to discourage excessive private car usage
- comply with the objective of providing for and facilitating pedestrian and cyclist movements and end of trip facilities
- have suitable and appropriate vehicle access, internal circulation and servicing arrangements for the term of the development
- provide vehicle free pedestrian corridors

Appendix A

S94 SCHEDULE

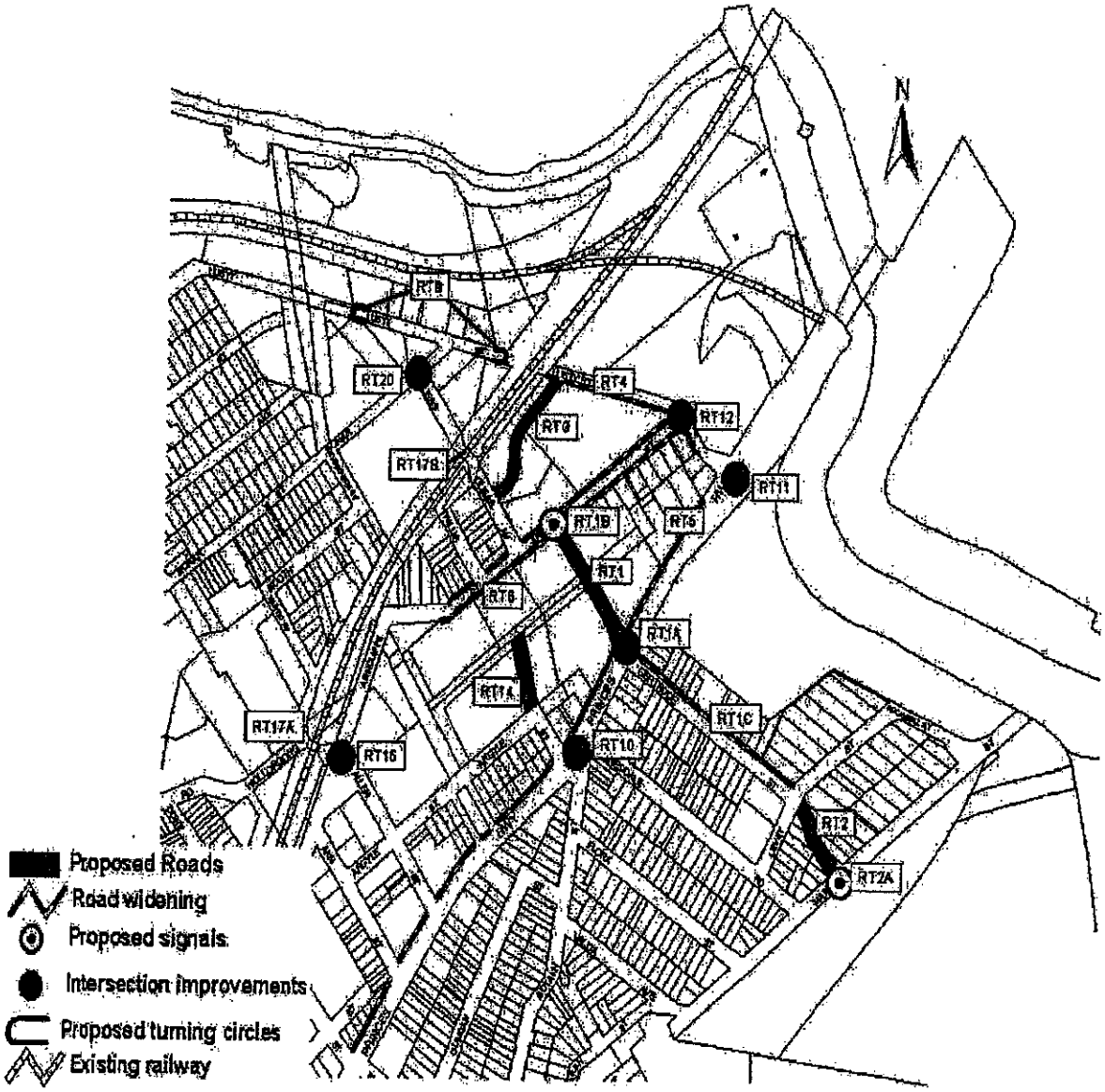

Fig. 3.2 Roads & Traffic Management in Wolli Creek

TABLE A s94 funded roads, traffic management and parking facilities

[illegible]	[illegible]	Description of proposed works
RT1	New link road from Princes Highway (opposite Gertrude Street) to Arncliffe Street	Land acquisition and road construction
RT1A	Intersection improvements at Princes Highway and Gertrude Street	Amplify traffic signals
RT1B	Intersection improvements at Gertrude Street (west extension) and Arncliffe Street	Install traffic signals
RT1C	Widening of Gertrude Street, northern side between Princes Highway and Levey Street	Land acquisition and road construction
RT2	New link road from Levey Street (opposite Gertrude Street) to Marsh Street	Land acquisition and road construction
RT2A	Intersection improvements at Gertrude Street (east extension) and Marsh Street	Install traffic signals
RT3	New link road from Lusty Street to Guess Avenue	Land acquisition and road construction
RT4	Widening and reconstruction of Lusty Street, west of Arncliffe Street	Land acquisition on southern side and road construction
RT5	Widening of Brodie Spark Drive between Lusty Street and Princes Highway	Land acquisition on both sides and road construction
RT6	Widening of Arncliffe Street between Lusty Street and SWSOOS	Land acquisition on both sides and road construction
RT9	Improvements to Lusty Street on west side of the Illawarra Railway Line	Construct turning bays at west and east ends
RT10	Widening of Princes Highway, west side between Burrows Street and Brodie Spark Drive	Land acquisition and road construction
RT11	Intersection improvements at Princes Highway and Brodie Spark Drive	Widening of east side of highway, reconstruct intersection to include turning lanes and installation of traffic signals
RT12	Intersection improvements at Lusty Street, Arncliffe Street and Brodie Spark Drive	Installation of roundabout
RT13	Upgrading of intersection at Princes Highway, West Botany Street and future link road (RT14)	Modify intersection for improved traffic facilities
RT14	Future link road from Princes Highway (opposite West Botany Street) to new mid-block access road	Land acquisition and road construction
RT15	Intersection improvements at Arncliffe Street, Allen Street and Wollongong Road	Modify intersection for improved traffic facilities
RT16	Other traffic management facilities in the area	Includes supplementary management devices and signage
RT17A	Safety improvements to Wollongong Road railway underpass	Reduction of road width, construction of new footpath and straighten/realign intersection
RT17B	Safety improvements to Guess Avenue railway underpass	Construct new pavement, kerb and gutter and footpath, provide signage
RT18	Traffic management facilities in Wollongong Road system	Includes management devices and signage
RT19	On street parking management facilities on roads within and adjacent to area	Signage
RT20	Intersection improvements at Bonar Street and Guess Avenue	Construct median islands and roundabout
PT1	Public transport improvements on roads within area	Bus shelters and signage, bus lanes within carriageways

Appendix B

RMS DOCUMENT

Technical Direction

For traffic, safety and transport practitioners

OPERATIONAL POLICY – GUIDELINES – ADVICE

Transport Roads & Maritime Services

Published August 2013

Supersedes/Amends TDT 2013/04

TDT 2013/ 04a

Guide to Traffic Generating Developments

Updated traffic surveys

Introduction

The *Guide to Traffic Generating Developments* was first released in 1991. It was revised in 2001 and is in the process of being further revised. It provides guidance on a number of matters related to the traffic impacts of land use developments, most notably on matters relating to traffic generation and parking. Its audience extends beyond that of traffic authorities (RMS and Councils) and is widely used throughout Australia.

Over the past few years a number of surveys have been undertaken to update trip generation and parking information as part of the *Guide*. This Technical Direction provides a summary of the updated information. The information herein should be used to supplement the current Guide and replace those sections of the *Guide* indicated. The information is provided in two parts; (i) a very brief summary below and (ii) more extended summaries in Appendices A-H. More detailed information may be obtained by referral to the RMS Library where reports on each land use may be found.

Summaries of land use traffic generation

Low density residential dwellings

Eleven surveys were conducted in 2010, six within the Sydney urban area and five within regional NSW. The results of the surveys were as follows:

Rates

Daily vehicle trips = 10.7 per dwelling in Sydney, 7.4 per dwelling in regional areas
Weekday average evening peak hour vehicle trips = 0.99 per dwelling in Sydney (maximum 1.39), 0.78 per dwelling in regional areas (maximum 0.90).
Weekday average morning peak hour vehicle trips = 0.95 per dwelling in Sydney (maximum 1.32), 0.71 per dwelling in regional areas (maximum 0.85).
(The above rates do **not** include trips made internal to the subdivision, which may add up to an additional 25%).

Distribution List:

Director, Infrastructure Development; RMS Development Managers; RMS Land use/Planning Officers; Councils; Land & Environment Court Officers and Consultants.

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Amendment: Required Action (Pg 3) amended.
Approved: R O'Keefe, Mgr Traffic Policy, Guidelines & Legislation
RMS. 13.298

High density residential flat dwellings

Ten surveys were conducted in 2012, eight within Sydney, and one each in the Hunter and Illawarra. All developments were (i) close to public transport, (ii) greater than six storeys and (iii) almost exclusively residential in nature. The weekday trip generation rates were as follows:

Weekday Rates	Sydney Average	Sydney Range	Regional Average	Regional Range
AM peak (1 hour) vehicle trips per unit	0.19	0.07-0.32	0.53	0.39-0.67
AM peak (1 hour) vehicle trips per car space	0.15	0.09-0.29	0.35	0.32-0.37
AM peak (1 hour) vehicle trips per bedroom	0.09	0.03-0.13	0.21	0.20-0.22
PM peak (1 hour) vehicle trips per unit	0.15	0.06-0.41	0.32	0.22-0.42
PM peak (1hour) vehicle trips per car space	0.12	0.05-0.28	0.26	0.11-0.40
PM peak (1 hour) vehicle trips per bedroom	0.07	0.03-0.17	0.15	0.07-0.22
Daily vehicle trips per unit	1.52	0.77-3.14	4.58	4.37-4.78
Daily vehicle trips per car space	1.34	0.56-2.16	3.22	2.26-4.18
Daily vehicle trips per bedroom	0.72	0.35-1.29	1.93	1.59-2.26

Housing for seniors

Ten surveys were conducted in 2009, five within the Sydney urban area and five in regional New South Wales. Summary trip generation rates were as follows:

Weekday daily vehicle trips = 2.1 per dwelling
Weekday peak hour vehicle trips = 0.4 per dwelling
(Note that morning site peak hour does not generally coincide with the network peak hour)

Office blocks

Ten surveys were conducted in 2010. Eight of the surveys were conducted within the Sydney urban area and one each in Newcastle and Wollongong. The Sydney sites provided a range of locations with two inner ring sites, four middle ring sites and two outer ring sites. Most had access to the rail network. Summary trip generation rates were as follows:

Daily vehicle trips = 11 per 100 m^2 gross floor area
Morning peak hour vehicle trips = 1.6 per 100 m^2 gross floor area.
Evening peak hour vehicle trips = 1.2 per 100 m^2 gross floor area.

Business parks and industrial estates

In 2012 eleven of these two types of sites were surveyed, four within the Sydney urban area, four within the Lower Hunter, one in the Illawarra and one in Dubbo. Summary vehicle trip generation rates were as follows:

Weekday Rates	Sydney Average	Sydney Range	Regional Average	Regional Range
AM peak (1 hour) vehicle trips per 100 m^2 of GFA.	0.52	0.15-1.31	0.70	0.32-1.20
PM peak (1 hour) vehicle trips per 100 m^2 of GFA.	0.56	0.16-1.50	0.78	0.39-1.30
Daily total vehicle trips	4.60	1.89-10.47	7.83	3.78-11.99