SYDNEY ADVENTIST HOSPITAL

PROPOSED COMMERCIAL DEVELOPMENT

172 FOX VALLEY ROAD, WAHROONGA

Assessment of Transport, Traffic and Parking Implications

June 2014
(Rev H)

Reference 12080

TRANSPORT AND TRAFFIC PLANNING ASSOCIATES
Transportation, Traffic and Design Consultants
Suite 502, Level 5
282 Victoria Avenue
CHATSWOOD 2067
Telephone (02) 9411 5660
Facsimile (02) 9904 6622
Email: info@ttpa.com.au

TABLE OF CONTENTS

1. INTRODUCTION 1

2. PROPOSED DEVELOPMENT SCHEME 2

2.1 Site, Context And Existing Circumstances 2
2.2 Concept Plan 3
2.3 Proposed Development 3

3. ROAD NETWORK AND TRAFFIC CONDITIONS 4

3.1 Road Network 4
3.2 Traffic Controls 5
3.3 Traffic Conditions 6
3.4 Future Circumstances 8
3.5 Transport Services 8

4. PARKING 10

5. TRAFFIC 13

6. ACCESS, INTERNAL CIRCULATION AND SERVICING 15

7. CONCLUSION 17

APPENDIX A EXISTING INTERSECTION PLANS
APPENDIX B TRAFFIC SURVEY RESULTS
APPENDIX C PROPOSED INTERSECTION WORKS
APPENDIX D BUS SERVICES
APPENDIX E TRAFFIC GENERATION CRITERIA
APPENDIX F TURNING PATH ASSESSMENT

LIST OF ILLUSTRATIONS

FIGURE 1 LOCATION
FIGURE 2 SITE
FIGURE 3 ROAD NETWORK
FIGURE 4 TRAFFIC CONTROLS
FIGURE 5 EXISTING PEAK TRAFFIC VOLUMES

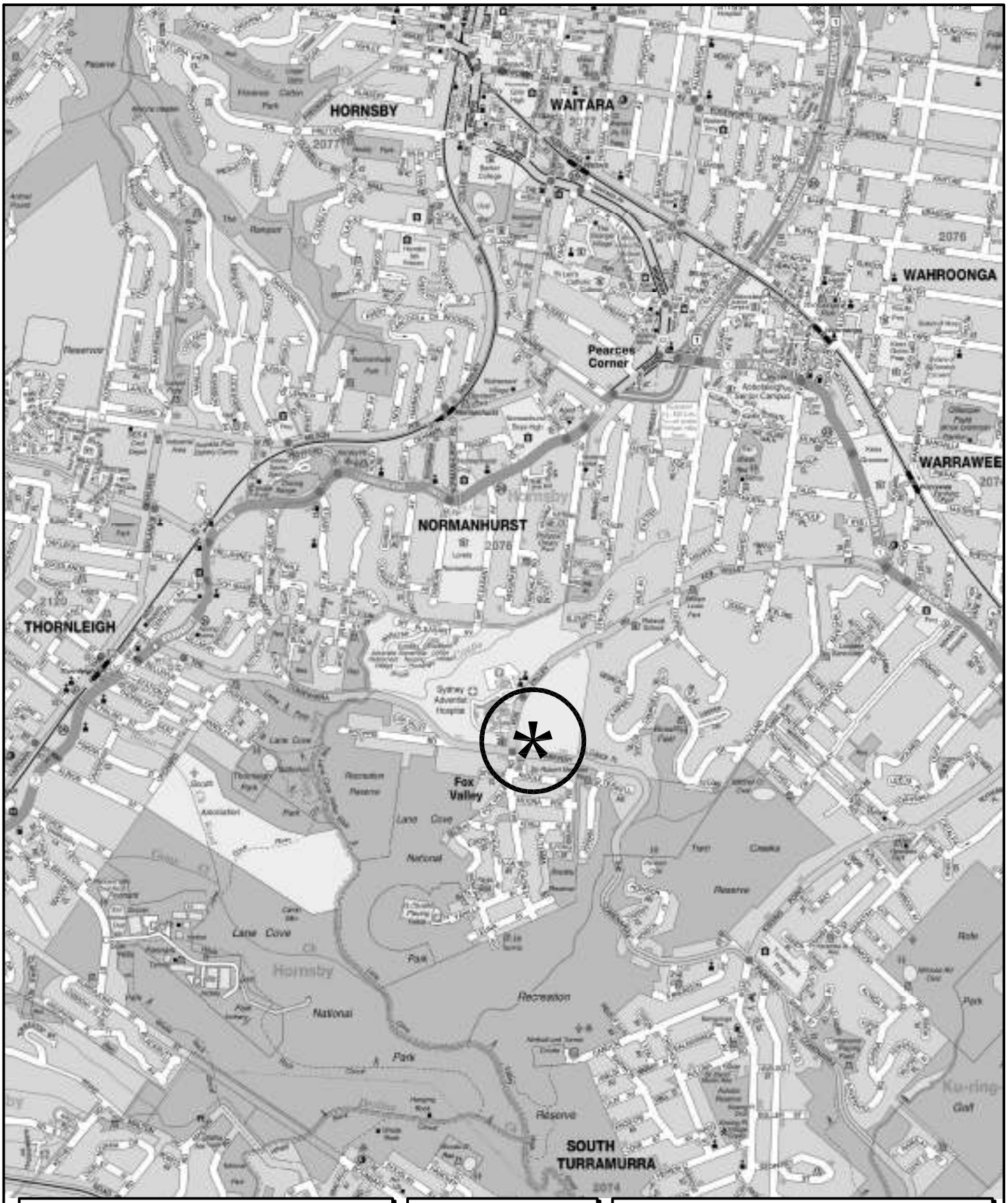
1. INTRODUCTION

This report has been prepared to accompany a Development Application to Ku-Ring-Gai Council for a proposed commercial development in the Fox Valley Road East Precinct within the approved Concept Plan for the redevelopment of the 'Wahroonga Estate' on Fox Valley Road at Wahroonga (Figure 1).

The proposed commercial development is subject to an approved Concept Plan (with amendments) and will comprise a commercial premises used for professional activities which will support the hospital services and community. The development will involve 3 building elements over basement carparking.

The purpose of this report is to:

* describe the site as well as details of the Concept Approval and the DG's Assessment
* describe the proposed development
* describe the road network serving the site and the prevailing traffic conditions as well as the projected circumstances as contained in the Final Preferred Project Report
* assess the potential traffic implications of the development scheme
* assess the appropriateness of the proposed parking provision
* assess the suitability of the proposed access, internal circulation and servicing arrangements



LEGEND

LOCATION

FIG 1

2. PROPOSED DEVELOPMENT SCHEME

2.1 SITE, CONTEXT AND EXISTING CIRCUMSTANCES

The site (Figure 2) is located in the southern part of the Wahroonga Estate landholding which occupies a total area of some 56 ha extending along the northern side of The Comenarra Parkway spanning Fox Valley Road. There are a number of diverse uses located throughout this Estate and the proposed site, which is located adjacent to The Comenarra Parkway and Fox Valley Road intersection, is currently occupied by the SDA Mission Hostel which has vehicle access on The Comenarra Parkway frontage.

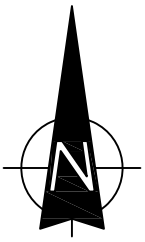
The Estate is located just to the south of the convergence of major road routes comprising the Pacific Highway, Pennant Hills Road and the Sydney – Newcastle Freeway. The expansive Lane Cove National Park extends to the south along the Lane Cove River, while the immediate adjoining areas largely comprise single residential dwellings.

The existing elements which surround the site comprise:

- Sydney Adventist Hospital
- churches
- SDA Pacific Regional Headquarters, media and administration
- dwelling houses
- student hostel
- lodge and hostel
- aged accommodation

The existing vehicle accesses for these elements are located along the frontages and include a traffic signal controlled intersection at the principal hospital access and secondary hospital precinct access located to the north of The Comenarra Parkway.

LEGEND



SITE

FIG 2

2.2 CONCEPT PLAN

The Final Preferred Project Report, Concept Plan and the Concept Approval along with the Director Generals Assessment Report identify that the Fox Valley Road East Precinct will include 15,000m^2 of floorspace.

The required road improvement works# relative to the development of the precinct include:

- upgrading of the intersection of The Comenarra Parkway and Fox Valley Road
- upgrading of the principal site access on Fox Valley Road
- provision of 2 traffic lanes in each direction along Fox Valley Road and part of The Comenarra Parkway
- upgrading of the Pacific Highway and Fox Valley Road intersection

 # Subject to current review of a draft deed with RMS

The required timing of these and the other road upgrade works for the Estate development were the subject of a report* prepared as a requirement of the Concept Plan approval. That report contains a detailed assessment of the traffic generation of all development elements within the Wahroonga Estate including those in the Fox Valley Road East Precinct.

2.3 PROPOSED DEVELOPMENT

The proposed development will involve 3/4 level building elements comprising a total of 6,575m^2 GFA of commercial floor space.

There will be a total of 247 parking spaces provided in 3 basement levels with vehicle accesses connecting to The Comenarra Parkway and Fox Valley Road.

Full details of the proposed development scheme are provided on the architectural plans prepared by MBMO Architects, which accompany the Development Application.

---

* *Wahroonga Estate – Traffic Report*
Timing of Upgrade Works
Halcrow Sept 2010

3. ROAD NETWORK AND TRAFFIC CONDITIONS

3.1 ROAD NETWORK

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

- *Sydney - Newcastle Freeway* – a major arterial route which terminates at the Pacific Highway and Pennant Hills Road interchange

- *Pacific Highway* – a State Highway and arterial route which extends between the Hornsby and the Harbour Crossing

- *Pennant Hills Road* – a State Road and part of the Cumberland Highway arterial route connecting between the Pacific Highway and the Hume Highway at Liverpool

- *The Comenarra Parkway* – a Regional Road and major collector route connecting between Ryde Road and Pennant Hills Road

- *Fox Valley Road* – a Regional Road and collector route connecting between Pacific Highway and The Comenarra Parkway

- *Kissing Point Road* – a Regional Road and minor collector route connecting between Pacific Highway and The Comenarra Parkway.

Barriers to the road network are presented by the Lane Cove River/ National Park, with its steep eroded valleys, and the railway lines. The other roadways in the area between The Comenarra Parkway, Pacific Highway and Pennant Hills are only local access roads although there is some through traffic infiltration along Lucinda Road and Roland Avenue.

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) include:

* traffic control signals at the intersection of The Comenarra Parkway and Fox Valley Road (see Appendix A details)

* traffic control signals at the intersection of Fox Valley Road and the Hospital Access (see Appendix A details)

* traffic signals at the intersection of the Pacific Highway and Fox Valley Road

* the general 60 kmph speed limit along The Comenarra Parkway and 50 kmph restriction along Fox Valley Way. A 40 kmph (school hours) speed zone is applied to sections of Fox Valley Road and The Comenarra Parkway in the vicinity of the school

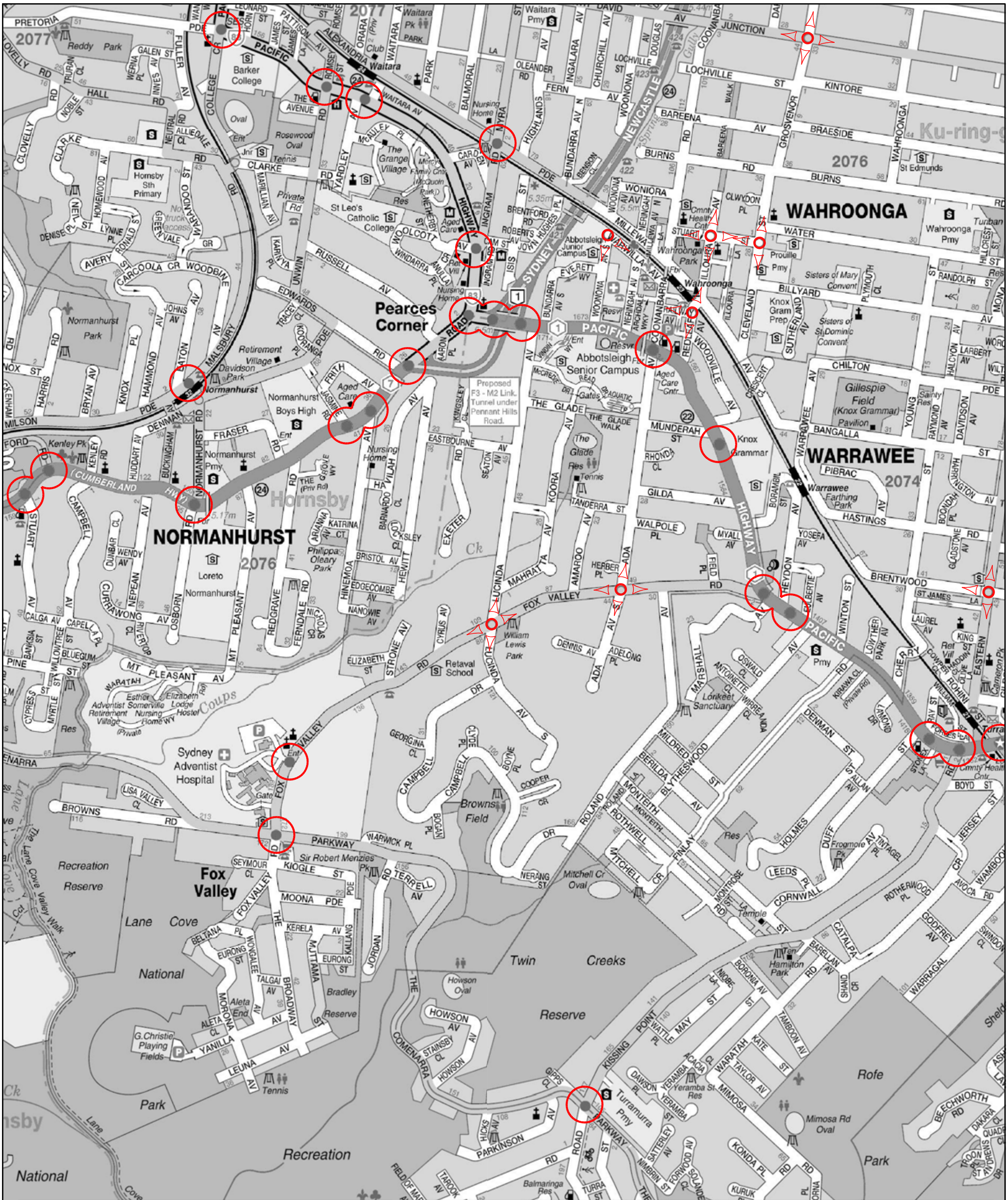
* the sections of NO STOPPING restrictions along The Comenarra Parkway and Fox Valley Road in the vicinity of the site

* the BUS ZONES located on Fox Valley Road

* the ('single lane') roundabouts on Fox Valley Road at the Lucinda Avenue and Ada Avenue intersections

* the traffic signals at The Comenarra Parkway/Kissing Point Road and The Comenarra Parkway/Pennant Hills Road intersections

* the traffic signals at the Pacific Highway/Ada Avenue/Coonabarra Road intersection



LEGEND

TRAFFIC SIGNAL CONTROL

ROUNDABOUT

RESTRICTED TURNING MOVEMENT

TRAFFIC CONTROLS

FIG 4

3.3 TRAFFIC CONDITIONS

An indication of the traffic conditions on the road system serving the Hospital is provided by data published by the RMS and traffic surveys undertaken for this study. The data published by the RMS is expressed in terms of Annual Average Daily Traffic (AADT) and the latest available volumes are provided in the following:

The Comenarra Parkway south of Fox Valley Way	14,137
The Comenarra Parkway north of Fox Valley Way	19,319
Fox Valley Way north of The Comenarra Parkway	16,535

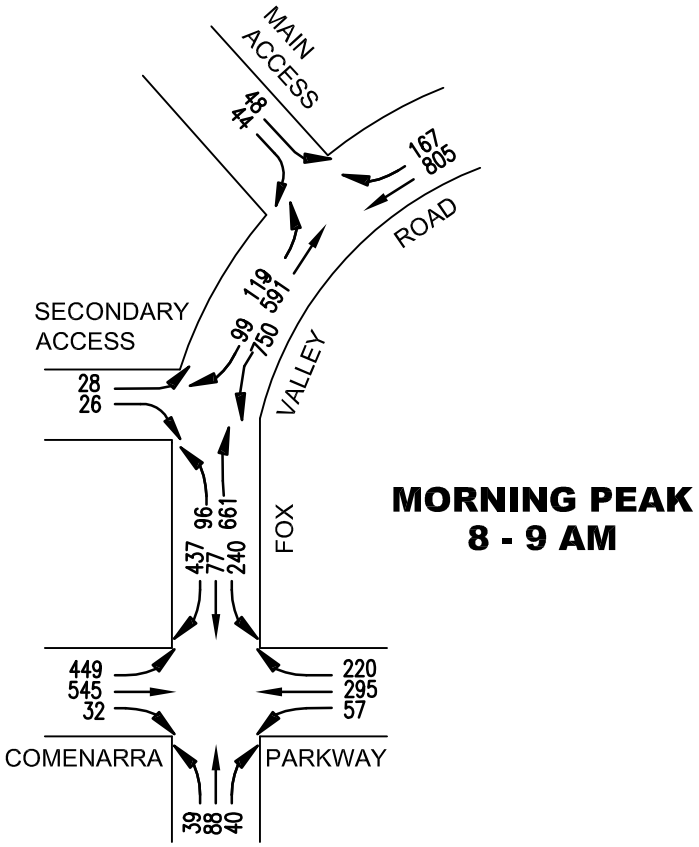
Traffic surveys have been recently been undertaken during the morning and afternoon peak periods at the intersections serving the site and the results of these surveys are provided in Appendix B and summarised on Figure 5. It is noted that the recently recorded volumes are relatively similar to those recorded for the various preceding traffic studies for the Estate and Hospital applications.

The operational performance of the intersections in the immediate vicinity of the site was assessed for the Concept Plan and Hospital traffic studies using the SIDRA modelling software. The results of that assessment are provided in the following while the criteria for assessing the modelling output are reproduced overleaf.

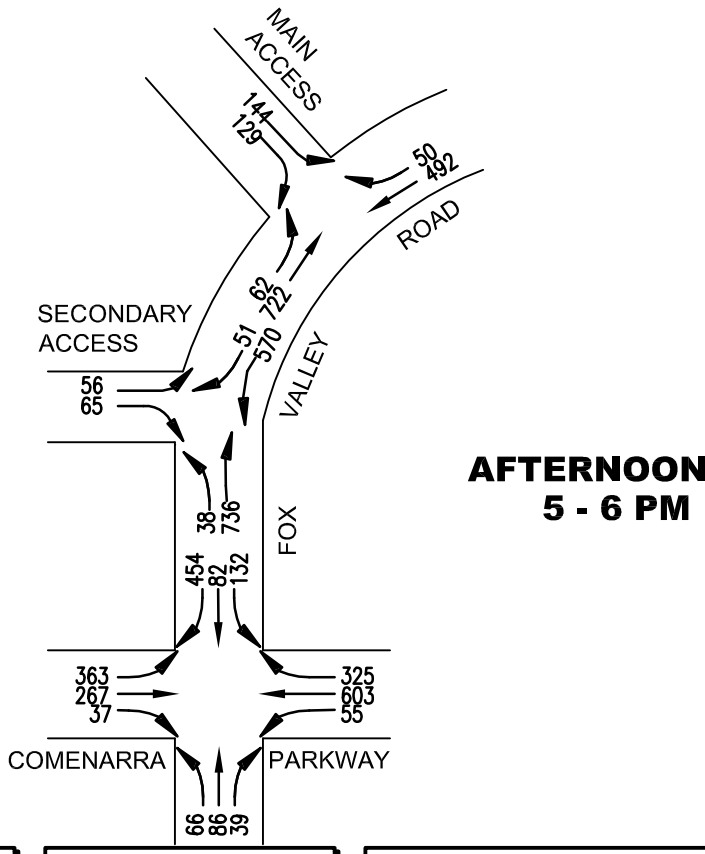
The Comenarra Parkway/Fox Valley Road	**AM Peak**	**PM Peak**
Level of service	F	E
Av Vehicle Delay	75	58

Fox Valley Road/Main Hospital Access	**AM Peak**	**PM Peak**
Level of service	C	B
Av Vehicle Delay	29.7	17.3

The results of this assessment indicate that the level of service at The Comenarra Parkway/Fox Valley Road is nearing capacity under the current peak traffic demands and constrained road geometry/signal phasing circumstances.

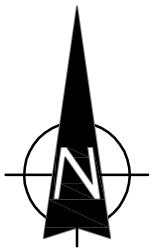


MORNING PEAK
8 - 9 AM



AFTERNOON PEAK
5 - 6 PM

LEGEND



2012 EXISTING PEAK TRAFFIC FLOWS

FIG 5

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

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

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

3.4 FUTURE CIRCUMSTANCES

This projected total additional traffic generation on completion of the Estate development is as follows:

AM			PM		
IN	**OUT**	**TOTAL**	**IN**	**OUT**	**TOTAL**
516	361	887	276	266	542

Whilst the FPPR, Concept Plan and Concept Approval and DG's Report identified the required road network improvements some design development and other changes have subsequently occurred. In particular the envisaged arrangement for the Comenarra Parkway/Fox Valley Road intersection has been upgraded to provide a better traffic outcome and the proposed upgrade of The Comenarra Parkway/Kissing Point Road intersection has been transferred to the Pacific Highway/Fox Valley Road intersection.

Details of the now proposed intersection upgrade works are provided on the plans reproduced in Appendix C including the Fox Valley Road/Hospital access intersection. It is accepted by RMS that the operational performance of the Comenarra/Fox Valley Road intersection under the revised arrangement and the projected future traffic flows will be significantly better than that assessed for the previous development processes.

3.5 TRANSPORT SERVICES

The existing public transport services relevant to the site comprise:

<u>Rail Services</u>

Thornleigh Railway Station on the Main Northern Line is located some 2 kms to the west along The Comenarra Parkway. Wahroonga, Warrawee and Turramurra Railway Stations on the North Shore Line are located some 3 kms to the east along Fox Valley Road.

Frequent high capacity rail services connecting to the metropolitan and Central Coast rail systems are accessed at these stations which are also connected to the site by the public bus services.

Bus Services

TransdevTSL-Shorelink operates two routes which provide access for the site:

- *Route 573* – this service along Fox Valley Road (loop) connects to Turramurra Railway Station.

- *Route 589* – this service operates along Pennant Hills Road and The Comenarra Parkway and connecting with Thornleigh, Waitara and Hornsby Railway Stations. SAH has provided funds for the purchase of the bus for the service provider to operate this service which runs through the hospital site.

Details of these bus services are provided in Appendix D.

The current level of usage of these services is only modest and there is significant spare seating and standing capacity.

4. PARKING

Issues were raised in the Stakeholder submissions for the Environmental Assessment included:

RMS

The proposed reduced on-site parking provision will impact on the competition for on-street parking and this needs assessment. A parking strategy plan is required to protect local streets in the vicinity of SAH and in particular those streets located just west from parking associated with the proposed development.

Ku-ring-gai Council

Parking provision should be in accordance with Council's DCP No. 43 with all parking to be provided for onsite.

Consent Condition B9 Car Parking contains the following:

"The consent authority is to have regard to the provisions of the relevant Council DCP regulating car parking at the time of the application, the PPR and any other relevant traffic, transport and car parking reports when determining car parking requirements for employment generating land uses.

Applications for non residential land uses must be accompanied by a traffic and parking assessment demonstrating that sufficient car parking has been provided having regard to the RTA's Guide to Traffic Generating Developments and Council's DCP requirements".

Council's DCP 43 specifies:

Office – 1 space per 33m^2 GFA
Medical Centre – 1 space per 25m^2 GFA

The RMS Guide to Traffic Generating Developments specifies:

Office – 1 space per 40m^2 GFA*

Medical Centre – 1 space per 25m^2 GFA

* *assumes mode share of 62% car with occupancy of 1.19 persons*

The February 2009 MWT assessment acknowledged Councils DCP 43 parking criteria, however it went on to surmise that "the development will provide ancillary services to the hospital and church operations. Accordingly many visits to these will be made by persons living or working in the area who would either not require parking or would park elsewhere (eg in the hospital carpark). The parking provided for existing buildings will be maintained and parking needs for each future building will be considered having regard to its particular needs".

Council has previously raised concern that if the use of the proposed development reflected activities which take place in a "medical centre" type use then on-site parking should be provided commensurate with that use. The proposed building is intended to be used for commercial office and medical suites, complementing its relationship with the existing and expanded hospital.

It is intended that that the current parking permitted along Fox Valley Road and The Comenarra Parkway will be removed, while it is inevitable that there will be a high demand (and critical need) for parking associated with the hospital element. Council has been rightly concerned with the consequence of any overflow parking and its impact directly onto the limited residential streets in the area.

Application of the Council and RMS parking criteria to a medical centre type use would indicate the following:

6,575m^2 @ 1 space per 25m^2 – 263 spaces

A total of 247 spaces will be provided within the 3 proposed basement levels including 9 disabled driver spaces and 1 car share space while there will also be at least 10 motor cycle spaces as well as bicycle store spaces.

The proposed parking provision will provide slightly more than that applicable to a commercial office use however the provision will:

- avoid any unnecessary demand on allocated “visiting professional” parking spaces within the hospital
- avoid any overflow parking on residential streets in the area
- provide for the needs of patients, particularly these with mobility/accessibility constraints

It is apparent that the proposed parking provision for the commercial building element will act to avoid these potential problems and will accord with the expressed view of RMS and Council.

5. TRAFFIC

The previous traffic assessments (Halcrow Sept 2010 and Masson and Wilson Feb 2009) that informed the FPPR and Concept Plan assessed a traffic generation rate for the proposed commercial development of 101vtph in the morning and afternoon peak periods.

The recently established revised traffic generation rates by RMS (TDT-2013/04) for "commercial office buildings" (generally without constrained parking provision), reflecting contemporary working hour characteristics (Appendix E), is as follows:

AM 1.6 vtph per 100m^2
PM 1.2 vtph per 100m^2

Application of this criteria to the proposed 6,575m^2 building would indicate a generation of 103 vtph in the morning and 77 vtph in the afternoon. If parking were provided at the DCP rate for office of 1 space per 33m^2 there would be some 194 spaces while with the proposed provision of 247 spaces some 10% of spaces would most likely be made available for visitors.

It is also relevant that professionals will not occupy their suites 100% of the time for various reasons. However if there are some 200 spaces occupied by staff and the normal 'industry' standard arrival/departure rate of 60% of persons per hour occurs then the proposed car spaces will generate some 120 vtph (or 19 vtph more than that projected in the earlier traffic assessments for development of the Estate).

It is apparent therefore that:

* the earlier traffic generation assessments (ie 101 vtph) did not reflect the potential traffic generation outcome of 1 space per 100m^2 (eg 70 spaces for the then envisaged 7,000m^2 GFA).

- the projected additional generation consequential to the new proposed parking provision is only 19vtph

- the additional 19vtph (or even a potential larger quantum) will be largely imperceptible and have no adverse traffic implications particularly as:

  - the critical intersection of The Comenarra Parkway and Fox Valley Road will be upgraded with substantially more capacity than that previously approved

  - vehicles will be able to egress the site (left turn OUT) directly on The Comenarra Parkway without travelling through the intersection

On this basis it is apparent that:

- the traffic generation outcome for the development with the proposed parking provision will equate with that assessed for the current approved Concept Plan (and this is only relatively minor in the context of that of the overall Estate development)

- the Comenarra Parkway/Fox Valley Road intersection, which will provide a significant access point, will have a significantly improved level of service and improvements at the Pacific Highway/Fox Valley intersection are also included in the project commitments

6. ACCESS, INTERNAL CIRCULATION AND SERVICING

ACCESS

The site has an existing unconstrained vehicle access driveway on The Comenarra Parkway frontage and it was envisaged that the new development access would be located on Fox Valley Road opposite the secondary Hospital access. However the Traffic Report which underlies the Concept Plan Approval indicated that a central median island to be provided in Fox Valley Road at this location restricting access movements to left turn IN/OUT.

The road network In the area is very constrained by the topography and creek systems such that if access for the site is restricted to a single left IN/OUT on Fox Valley Road or The Comenarra Parkway, the consequences would be:

- very onerous circulation to approach and depart
- potential hazardous U-turn movements to avoid long unnecessary diversions
- use of local residential streets to the north and south of Fox Valley Road to circulate

Given the particular site access circumstances it is apparent that the appropriate flexible vehicle access arrangement will be to have accesses on both the Fox Valley Road and The Comenarra Parkway frontages restricted to left turn IN/OUT by median islands. This proposed access arrangement has been discussed with RMS as part of the consultation requirements of the DGRs.

The proposed access driveways are 5.5m wide on Fox Valley Road and 7.0m wide on The Comenarra Parkway and will accord with the design requirements of AS2890.1 & 2 with suitable and appropriate sight distances available.

INTERNAL CIRCULATION

The design of the carpark areas including bays, ramps, aisles etc will comply with the AS 2890.1 and AS 2890.6 criteria.

SERVICING

There will only be very minor requirements for service vehicles and these including refuse removal by contract vehicle and normal deliveries relevant to the use will be undertaken in the bay area provided. Details of the turning path assessment for the refuse vehicle are provided in Appendix F indicating a satisfactory provision.

7. CONCLUSION

The proposed commercial development is an element of the Wahroonga Estate development which is subject to Concept Approval. Assessment of the development scheme which is to be submitted to Council has concluded that:

* The proposed scheme is compliant with the provisions of the Concept Approval and DG's Assessment

* The proposed parking provision will be suitable/appropriate and is compatible with Councils DCP criteria

* The projected traffic generation will be entirely consistent with that which was identified in the assessment undertaken for the Concept Approval and there will not be any adverse traffic implications

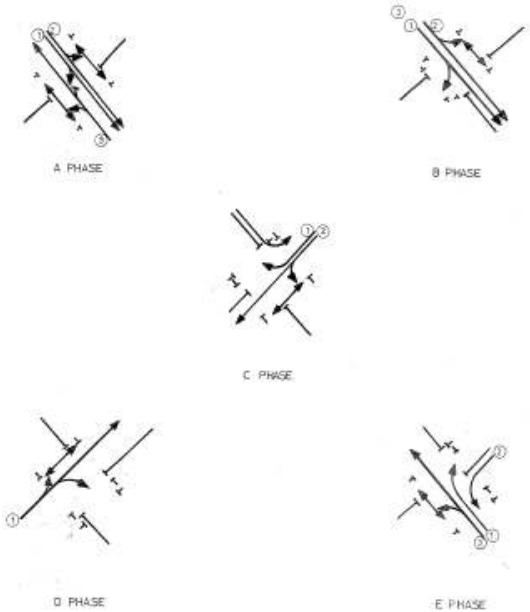
* The proposed access, internal circulation and servicing arrangements will be suitable and appropriate

* The now proposed upgrade of the intersection of the Comenarra Parkway and Fox Valley Road intersection will achieve a significantly better operational performance outcome than that identified for the Concept Approval

APPENDIX A

EXISTING INTERSECTION PLANS

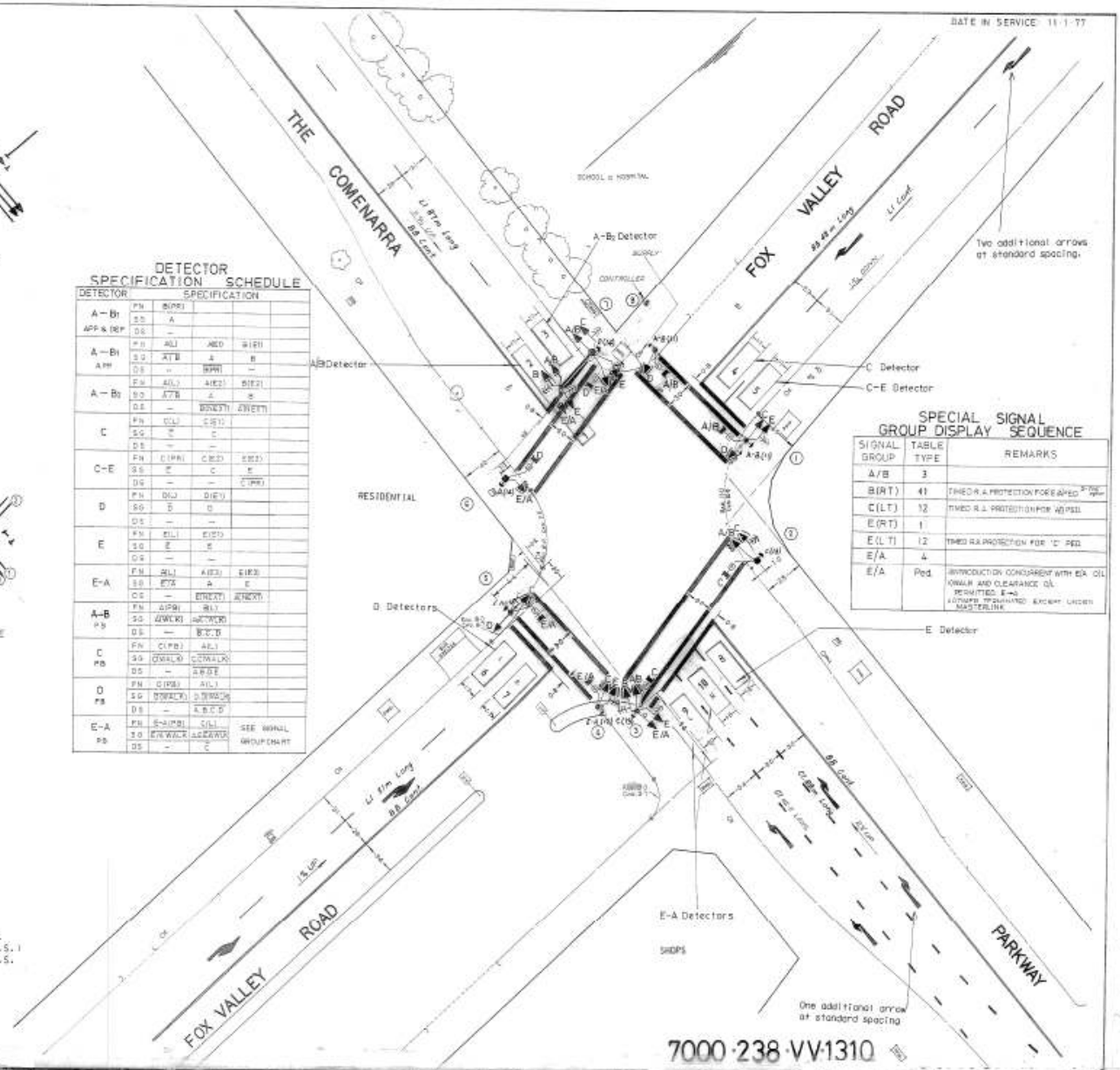
DATE IN SERVICE 11-1-77



MOVEMENT DIAGRAMS

DETECTOR SPECIFICATION SCHEDULE

DETECTOR		SPECIFICATION			
A – B1 APP & DEP	FN	B(PR)			
	SG	A			
	DS	–			
A – B1 APP	FN	A(L)	A(E2)	B(E2)	
	SG	A/B	A	B	
	DS	–	BDWKT(1)	ADWKT(1)	
A – B2	FN	A(L)	A(E2)	B(E2)	
	SG	A/B	A	B	
	DS	–	BDWKT(1)	ADWKT(1)	
C	FN	C(L)	C(E1)		
	SG	C	C		
	DS	–	–		
C–E	FN	C(PR)	C(E2)	E(E2)	
	SG	E	C	E	
	DS	–	–	C(PR)	
D	FN	D(L)	D(E1)		
	SG	D	D		
	DS	–	–		
E	FN	E(L)	E(E1)		
	SG	E	E		
	DS	–	–		
E–A	FN	A(L)	A(E2)	E(E2)	
	SG	E/A	A	E	
	DS	–	BDWKT(1)	ADWKT(1)	
A–B PB	FN	A(PR)	B(L)		
	SG	ADWCR	ADWCR		
	DS	–	B.C.D		
C PB	FN	C(PB)	A(L)		
	SG	CDWALK	CDWALK		
	DS	–	A.B.D.E		
D PB	FN	D(PB)	A(L)		
	SG	DDWALK	DDWALK		
	DS	–	A.B.C.D		
E–A PB	FN	E-A(PB)	E(L)	SEE SIGNAL GROUP CHART	
	SG	E/A WALK	ADEWALK		
	DS	–	C		



SPECIAL SIGNAL GROUP DISPLAY SEQUENCE

SIGNAL GROUP	TABLE TYPE	REMARKS
A/B	3	
B(RT)	41	TIMED R.A. PROTECTION FOR B APRED
C(LT)	12	TIMED R.A. PROTECTION FOR A(R) PSEL
E(RT)	1	
E(LT)	12	TIMED R.A. PROTECTION FOR 'C' PED
E/A	4	
E/A	Ped	INTRODUCTION CONCURRENT WITH E/A CIL (WALK AND CLEARANCE CIL PERMITTED. E→A EXTENDED REQUIRED EXCEPT UNDER MASTERLINK

POSTS

POST	TYPE	LENGTH	REMARKS
1	2	4.1	EXISTING
2	6	–	EXISTING
3	2	4.1	EXISTING
4	2	4.1	EXISTING
5	2	4.1	EXISTING
6	6	–	EXISTING
T	5½	–	EXISTING
8	2	4.1	EXISTING

NOTES

1. This site is S.C.A.T.S. linked.
2. All push buttons are audio tactile.
3. Special regulatory Stop Signs (R1-202) to be placed on posts 1&5.
4. For details of the Automatic Network Travel Time System (A.N.T.T.S.) installed at this site, refer to plan number VE542-13. The A.N.T.T.S. antennais mounted on post number 3.

DESIGN LAYOUT

7000-238-VV-1310

THIS PLAN HAS BEEN TAKEN TO THE SITE OF THE WORK AND COMPARED WITH THE SITUATION. V.H. 88-8-26

REFERENCE		PLUS	
Cons. Plan(s)	21-260-2	LED Ref.	153 110
Signal Dwg.	21-260-1		
Surveyed Alig.	2000-1-2		
Standard Alig.	2000-1-3		
Signal Plans	2000-1-7	Cols. 1/4	
Signal Schd.	2000-1-8	Cols. 1/4	
Type 3 Pref.	PM102	Col. 1	
Signal Cir. Data	21-260-6	Fld. Book 180	Pag No 20
AUTHORITY TO COST		SUP. Man 27 Ref. L9	

DEPT. MOTOR TRANSPORT, N.S.W.
TRAFFIC PLANNING & MANAGEMENT BRANCH

THE COMENARRA PARKWAY, FOX VALLEY ROAD

WAHROONGA

TCS 1310

SCALE	1 : 200
Supersedes	
Design	
Drawn	
Checked	
Passed	
Approved	Chief Traffic Planner
ISSUE	A B C D E F G H J K L M N
SHEET No	1
FILE No	238-75-265

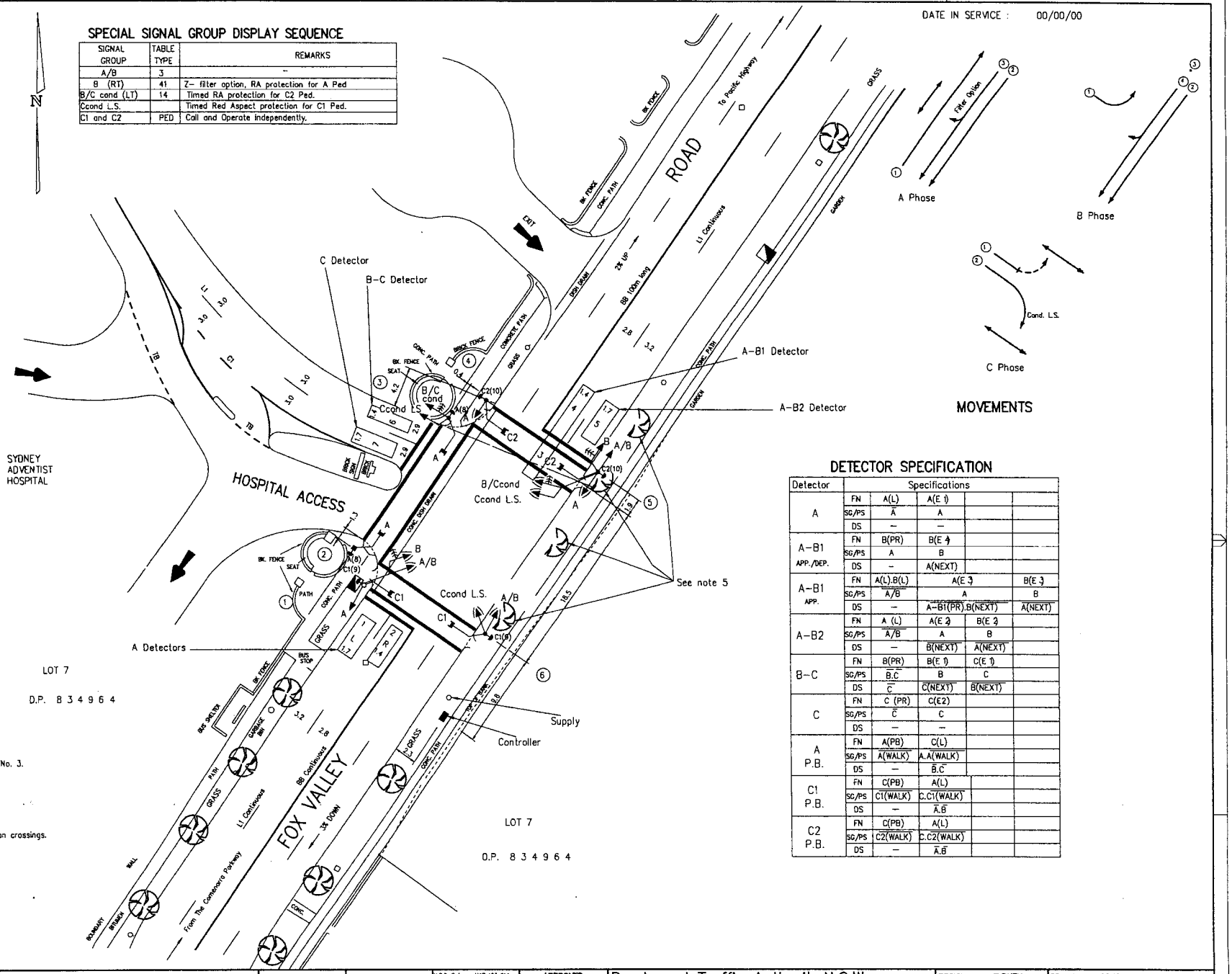
DRAWN USING CAD
DO NOT AMEND MANUALLY

DATE IN SERVICE : 00/00/00

7000.238.VV.3210

SPECIAL SIGNAL GROUP DISPLAY SEQUENCE

SIGNAL GROUP	TABLE TYPE	REMARKS
A/B	3	–
B (RT)	41	Z– filter option, RA protection for A Ped
B/C cond (LT)	14	Timed RA protection for C2 Ped.
Ccond L.S.		Timed Red Aspect protection for C1 Ped.
C1 and C2	PED	Call and Operate independently.



POSTS

POST	TYPE	LENGTH	REMARKS
1	ELP	—	EXIST
2	6	—	EXIST
3	2	4.1	EXIST
4	2	4.1	EXIST
5	2	4.1	EXIST
6	2	4.1	EXIST

DETECTOR SPECIFICATION

Detector	Specifications				
A	FN	A(L)	A(E 1)		
	SG/PS	$\overline{A}$	A		
	DS	–	–		
A–B1 APP./DEP.	FN	B(PR)	B(E 4)		
	SG/PS	A	B		
	DS	–	A(NEXT)		
A–B1 APP.	FN	A(L).B(L)	A(E 3)		B(E 3)
	SG/PS	$\overline{A/B}$	A		B
	DS	–	$\overline{A–B1(PR)}$.$\overline{B(NEXT)}$		A(NEXT)
A–B2	FN	A (L)	A(E 2)	B(E 2)	
	SG/PS	$\overline{A/B}$	A	B	
	DS	–	$\overline{B(NEXT)}$	$\overline{A(NEXT)}$	
B–C	FN	B(PR)	B(E 1)	C(E 1)	
	SG/PS	$\overline{B.C}$	B	C	
	DS	$\overline{C}$	$\overline{C(NEXT)}$	$\overline{B(NEXT)}$	
C	FN	C (PR)	C(E2)		
	SG/PS	$\overline{C}$	C		
	DS	–	–		
A P.B.	FN	A(PB)	C(L)		
	SG/PS	$\overline{A(WALK)}$	$\overline{A.A(WALK)}$		
	DS	–	$\overline{B.C}$		
C1 P.B.	FN	C(PB)	A(L)		
	SG/PS	$\overline{C1(WALK)}$	$\overline{C.C1(WALK)}$		
	DS	–	$\overline{A.B}$		
C2 P.B.	FN	C(PB)	A(L)		
	SG/PS	$\overline{C2(WALK)}$	$\overline{C.C2(WALK)}$		
	DS	–	$\overline{A.B}$		

NOTES.

1. This site is SCATS linked.
2. Special Regulatory Stop Signs (R1–202) placed on post No. 3.
3. All Push Buttons are audio–tactile type.
4. Civil Work:
   (i) Roadworks in accordance with plan 9471RD.
   (ii) Developer shall construct kerb ramps at all pedestrian crossings.
5. Council to remove trees.

A	ORIGINAL ISSUE
B	ISSUE 23–08–95 DESIGN ALTERED TO SUIT WAE P. W. KIRBY
C	ISSUE WAE MOVED POSTS 5,6 & CONTROLLER TUPA 10/01/95

PUBLIC UTILITY LEGEND	
HYDRANT	
STOP VALVE	
GAS VALVE	
SEWER MANHOLE	
TELECOM PIT	
ELECT LIGHT POLE	
POWER POLE	
STAY POLE	
TELEPHONE BOX	
TELECOM PILLAR	

REFERENCE PLANS	
SYMBOLS/ABBS.	VD003–8
STD POSIT	VD001–5
DET SCHED EXP	VD018–10
PRES. DETECT	VC005–17
SSG DIS. SEQ.	VD018–8

Surveyor: Brunelli McClanahan Associates P/L Date: 1995

U.B.D. Ref. MAP 153 G14
I.S.G. E 309182
CO-ORDS N 1365671
DESIGNED R.N.
CHECKED R.N.
R.N. SITE CHECKED
R.N. RECOMMENDED

APPROVED
R. Mettle
Transport & Traffic Planning Associates
DATE

ACCEPTED
DATE

Roads and Traffic Authority, N.S.W

MUNICIPALITY OF KU RING GAI
FOX VALLEY ROAD AND
SYDNEY ADVENTIST HOSPITAL ACCESS
WAHROONGA

DESIGN LAYOUT TCS No 3210

REGION: SYDNEY
BRANCH: CONSULTANT SERVICES
LOGIN: TCSB
DGGS DRAWING FILE: VV3210_1C.DGG
SCALE 5 0 (1:200) 5 10
ISSUE C
FILE 238.TS.298
SUPERSEDES SHEET/ISSUE –
REGN. 7000.238.VV.3210
SHEET 1

© COPYRIGHT ROADS AND TRAFFIC AUTHORITY

E:\WORKGROUP\... SYDNEY ADVENTIST HOSPITAL\DRAWING\SIG\0C2210_1C.dwg, 26/05/2009 7:58:19 AM

APPENDIX B

TRAFFIC SURVEY RESULTS

R.O.A.R. DATA

Reliable, Original & Authentic Results

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

Client : T.T.P.A.
Job No/Name : 4219 Wahroonga SAN Hospital
Day/Date : Monday 6th August 2012

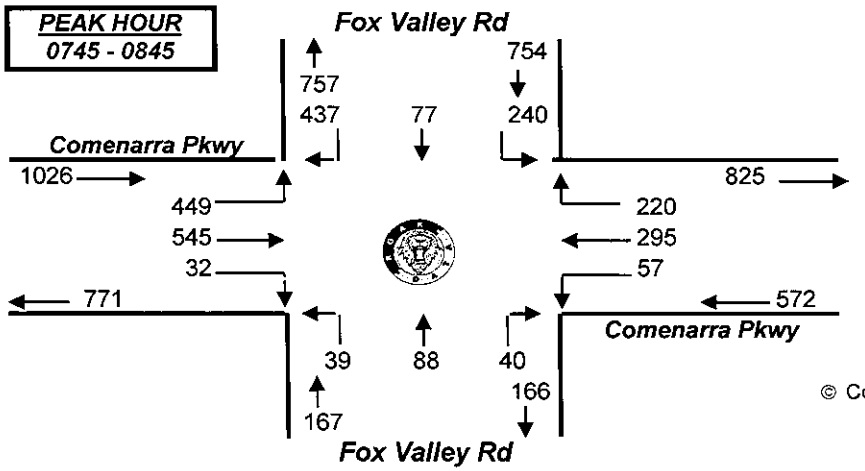
All Vehicles	NORTH Fox Valley Rd			WEST Comenarra Pkwy			SOUTH Fox Valley Rd			EAST Comenarra Pkwy			
Time Per	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0600 - 0615	15	2	30	60	62	4	4	1	6	0	15	8	**207**
0615 - 0630	21	3	29	84	99	1	1	4	6	4	22	21	**295**
0630 - 0645	18	4	47	110	122	7	1	1	5	0	29	40	**384**
0645 - 0700	22	7	59	169	136	5	7	18	8	5	28	39	**503**
0700 - 0715	25	17	97	96	147	8	5	7	12	5	48	28	**495**
0715 - 0730	48	15	120	88	118	3	11	14	15	3	57	44	**536**
0730 - 0745	62	16	132	112	138	7	8	27	20	7	76	45	**650**
0745 - 0800	62	8	108	111	152	4	10	23	11	15	56	53	**613**
0800 - 0815	78	17	96	105	128	10	12	21	11	15	88	54	**635**
0815 - 0830	43	20	106	102	124	9	7	17	9	8	77	46	**568**
0830 - 0845	57	32	127	131	141	9	10	27	9	19	74	67	**703**
0845 - 0900	27	30	87	110	118	14	8	23	10	12	61	32	**532**
Period End	**478**	**171**	**1038**	**1278**	**1485**	**81**	**84**	**183**	**122**	**93**	**631**	**477**	**6121**

All Vehicles	NORTH Fox Valley Rd			WEST Comenarra Pkwy			SOUTH Fox Valley Rd			EAST Comenarra Pkwy			
Time Per	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1515	50	29	181	99	87	17	18	24	10	15	127	77	**734**
1515 - 1530	32	10	75	73	46	9	12	6	3	8	76	43	**393**
1530 - 1545	40	14	120	89	61	9	14	20	6	13	132	89	**607**
1545 - 1600	26	16	99	78	52	10	17	21	10	13	130	77	**549**
1600 - 1615	42	13	100	96	73	13	9	14	9	15	132	95	**611**
1615 - 1630	41	21	125	71	58	5	9	13	8	4	141	81	**577**
1630 - 1645	30	28	125	96	69	9	14	24	8	16	164	96	**679**
1645 - 1700	28	11	106	79	58	5	11	19	9	20	145	88	**579**
1700 - 1715	37	26	93	95	56	9	20	25	10	7	115	63	**556**
1715 - 1730	37	17	130	93	84	14	21	18	12	12	179	78	**695**
1730 - 1745	32	9	122	70	74	7	9	12	4	8	164	65	**576**
1745 - 1800	17	23	119	83	63	8	11	16	10	5	146	56	**557**
Period End	**412**	**217**	**1395**	**1022**	**781**	**115**	**165**	**212**	**99**	**136**	**1651**	**908**	**7113**

	NORTH Fox Valley Rd			WEST Comenarra Pkwy			SOUTH Fox Valley Rd			EAST Comenarra Pkwy			
Peak Time	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0600 - 0700	76	16	165	423	419	17	13	24	25	9	94	108	**1389**
0615 - 0715	86	31	232	459	504	21	14	30	31	14	127	128	**1677**
0630 - 0730	113	43	323	463	523	23	24	40	40	13	162	151	**1918**
0645 - 0745	157	55	408	465	539	23	31	66	55	20	209	156	**2184**
0700 - 0800	197	56	457	407	555	22	34	71	58	30	237	170	**2294**
0715 - 0815	250	56	456	416	536	24	41	85	57	40	277	196	**2434**
0730 - 0830	245	61	442	430	542	30	37	88	51	45	297	198	**2466**
0745 - 0845	240	77	437	449	545	32	39	88	40	57	295	220	**2519**
0800 - 0900	205	99	416	448	511	42	37	88	39	54	300	199	**2438**
PEAK HOUR	**240**	**77**	**437**	**449**	**545**	**32**	**39**	**88**	**40**	**57**	**295**	**220**	**2519**

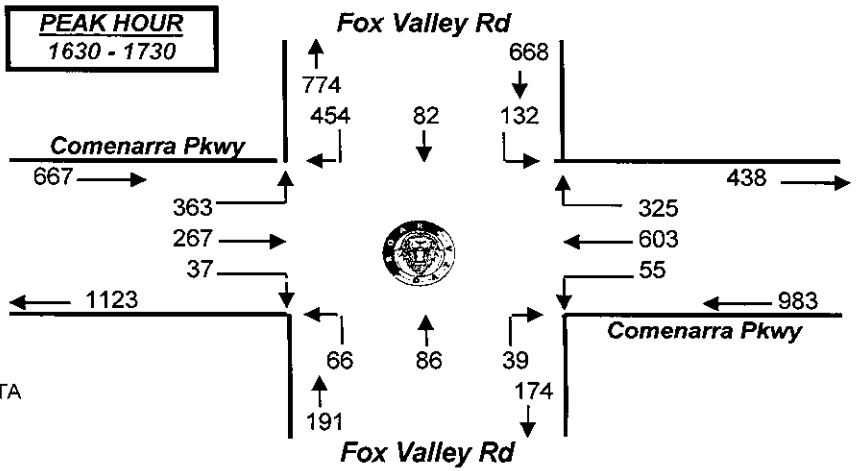
	NORTH Fox Valley Rd			WEST Comenarra Pkwy			SOUTH Fox Valley Rd			EAST Comenarra Pkwy			
Peak Time	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1600	148	69	475	339	246	45	61	71	29	49	465	286	**2283**
1515 - 1615	140	53	394	336	232	41	52	61	28	49	470	304	**2160**
1530 - 1630	149	64	444	334	244	37	49	68	33	45	535	342	**2344**
1545 - 1645	139	78	449	341	252	37	49	72	35	48	567	349	**2416**
1600 - 1700	141	73	456	342	258	32	43	70	34	55	582	360	**2446**
1615 - 1715	136	86	449	341	241	28	54	81	35	47	565	328	**2391**
1630 - 1730	132	82	454	363	267	37	66	86	39	55	603	325	**2509**
1645 - 1745	134	63	451	337	272	35	61	74	35	47	603	294	**2406**
1700 - 1800	123	75	464	341	277	38	61	71	36	32	604	262	**2384**
PEAK HOUR	**132**	**82**	**454**	**363**	**267**	**37**	**66**	**86**	**39**	**55**	**603**	**325**	**2509**

PEAK HOUR
0745 - 0845



N

PEAK HOUR
1630 - 1730



© Copyright ROAR DATA

R.O.A.R. DATA

Reliable, Original & Authentic Results

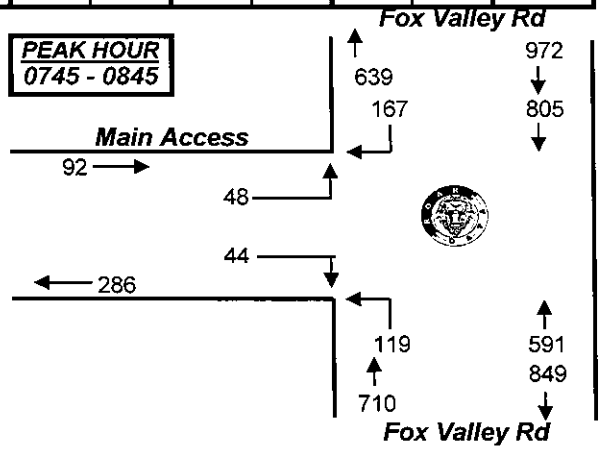
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : T.T.P.A.
Job No/Name : 4219 Wahroonga SAN Hospital
Day/Date : Monday 6th August 2012

All Vehicles

	NORTH		WEST		SOUTH		
	Fox Valley Rd		*Main Access*		*Fox Valley Rd*		
Time Per	**R**	**T**	**L**	**R**	**L**	**T**	**TOTAL**
0600 - 0615	4	32	0	3	6	48	**93**
0615 - 0630	21	63	4	1	16	85	**190**
0630 - 0645	33	69	11	5	24	106	**248**
0645 - 0700	30	89	10	11	38	134	**312**
0700 - 0715	22	155	6	5	20	98	**306**
0715 - 0730	37	181	11	6	23	112	**370**
0730 - 0745	28	210	7	13	20	117	**395**
0745 - 0800	50	190	13	12	26	139	**430**
0800 - 0815	34	191	15	6	19	143	**408**
0815 - 0830	45	223	8	14	36	143	**469**
0830 - 0845	38	201	12	12	38	166	**467**
0845 - 0900	56	172	11	7	37	146	**429**
Period End	**398**	**1776**	**108**	**95**	**303**	**1437**	**4117**

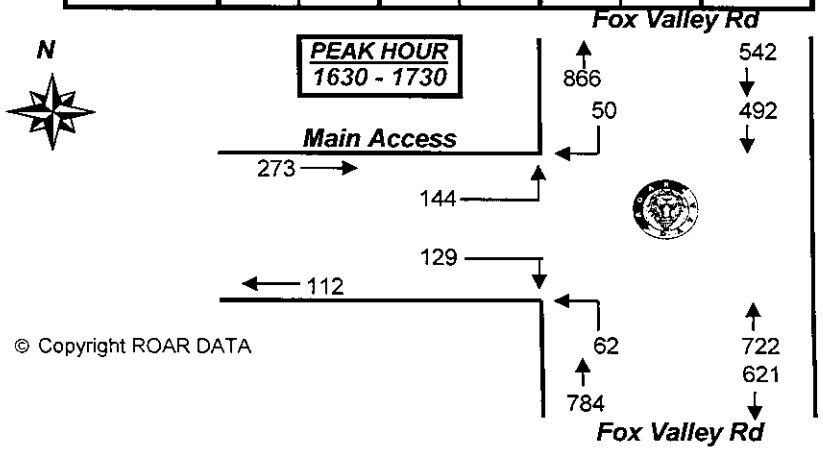
	NORTH		WEST		SOUTH		
	Fox Valley Rd		*Main Access*		*Fox Valley Rd*		
Peak Per	**R**	**T**	**L**	**R**	**L**	**T**	**TOTAL**
0600 - 0700	88	253	25	20	84	373	**843**
0615 - 0715	106	376	31	22	98	423	**1056**
0630 - 0730	122	494	38	27	105	450	**1236**
0645 - 0745	117	635	34	35	101	461	**1383**
0700 - 0800	137	736	37	36	89	466	**1501**
0715 - 0815	149	772	46	37	88	511	**1603**
0730 - 0830	157	814	43	45	101	542	**1702**
0745 - 0845	167	805	48	44	119	591	**1774**
0800 - 0900	173	787	46	39	130	598	**1773**
PEAK HR	**167**	**805**	**48**	**44**	**119**	**591**	**1774**



All Vehicles

	NORTH		WEST		SOUTH		
	Fox Valley Rd		*Main Access*		*Fox Valley Rd*		
Time Per	**R**	**T**	**L**	**R**	**L**	**T**	**TOTAL**
1500 - 1515	15	158	23	31	32	151	**410**
1515 - 1530	15	143	29	23	18	163	**391**
1530 - 1545	12	106	34	35	20	164	**371**
1545 - 1600	23	133	22	16	20	161	**375**
1600 - 1615	17	143	30	21	20	162	**393**
1615 - 1630	20	118	26	35	19	153	**371**
1630 - 1645	17	115	31	36	14	200	**413**
1645 - 1700	17	115	31	30	16	168	**377**
1700 - 1715	6	128	39	33	18	181	**405**
1715 - 1730	10	134	43	30	14	173	**404**
1730 - 1745	13	128	27	31	14	137	**350**
1745 - 1800	7	145	22	20	7	182	**383**
Period End	**172**	**1566**	**357**	**341**	**212**	**1995**	**4643**

	NORTH		WEST		SOUTH		
	Fox Valley Rd		*Main Access*		*Fox Valley Rd*		
Peak Per	**R**	**T**	**L**	**R**	**L**	**T**	**TOTAL**
1500 - 1600	65	540	108	105	90	639	**1547**
1515 - 1615	67	525	115	95	78	650	**1530**
1530 - 1630	72	500	112	107	79	640	**1510**
1545 - 1645	77	509	109	108	73	676	**1552**
1600 - 1700	71	491	118	122	69	683	**1554**
1615 - 1715	60	476	127	134	67	702	**1566**
1630 - 1730	50	492	144	129	62	722	**1599**
1645 - 1745	46	505	140	124	62	659	**1536**
1700 - 1800	36	535	131	114	53	673	**1542**
PEAK HR	**50**	**492**	**144**	**129**	**62**	**722**	**1599**



© Copyright ROAR DATA

R.O.A.R. DATA

Reliable, Original & Authentic Results

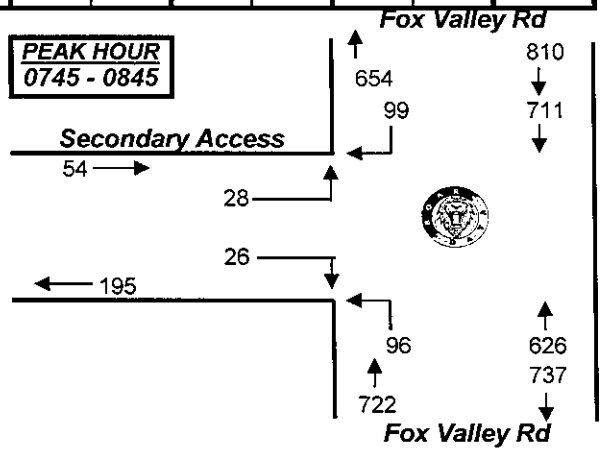
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : T.T.P.A.
Job No/Name : 4219 Wahroonga SAN Hospital
Day/Date : Monday 6th August 2012

All Vehicles

	NORTH		WEST		SOUTH		
	Fox Valley Rd		*Secondary*		*Fox Valley Rd*		
Time Per	R	T	L	R	L	T	**TOTAL**
0600 - 0615	4	40	0	4	7	61	**116**
0615 - 0630	11	49	3	2	11	100	**176**
0630 - 0645	11	63	3	4	25	126	**232**
0645 - 0700	20	84	1	3	44	180	**332**
0700 - 0715	16	136	6	2	15	111	**286**
0715 - 0730	16	167	3	6	17	136	**345**
0730 - 0745	23	198	10	8	48	135	**422**
0745 - 0800	30	167	10	4	24	161	**396**
0800 - 0815	10	189	7	9	21	153	**389**
0815 - 0830	12	158	5	8	16	128	**327**
0830 - 0845	47	197	6	5	35	184	**474**
0845 - 0900	22	132	7	6	20	138	**325**
Period End	**222**	**1580**	**61**	**61**	**283**	**1613**	**3820**

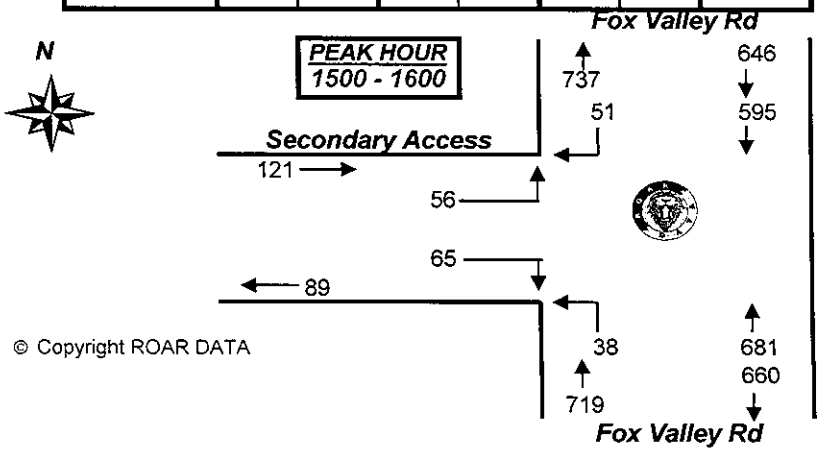
	NORTH		WEST		SOUTH		
	Fox Valley Rd		*Secondary*		*Fox Valley Rd*		
Peak Per	R	T	L	R	L	T	**TOTAL**
0600 - 0700	46	236	7	13	87	467	**856**
0615 - 0715	58	332	13	11	95	517	**1026**
0630 - 0730	63	450	13	15	101	553	**1195**
0645 - 0745	75	585	20	19	124	562	**1385**
0700 - 0800	85	668	29	20	104	543	**1449**
0715 - 0815	79	721	30	27	110	585	**1552**
0730 - 0830	75	712	32	29	109	577	**1534**
0745 - 0845	99	711	28	26	96	626	**1586**
0800 - 0900	91	676	25	28	92	603	**1515**
PEAK HR	**99**	**711**	**28**	**26**	**96**	**626**	**1586**



All Vehicles

	NORTH		WEST		SOUTH		
	Fox Valley Rd		*Secondary*		*Fox Valley Rd*		
Time Per	R	T	L	R	L	T	**TOTAL**
1500 - 1515	18	173	16	16	13	165	**401**
1515 - 1530	20	156	11	10	9	163	**369**
1530 - 1545	4	145	17	26	6	175	**373**
1545 - 1600	9	121	12	13	10	178	**343**
1600 - 1615	5	147	20	19	9	172	**372**
1615 - 1630	13	158	10	10	12	141	**344**
1630 - 1645	8	148	29	15	11	181	**392**
1645 - 1700	4	135	10	17	6	176	**348**
1700 - 1715	12	162	16	14	7	180	**391**
1715 - 1730	8	149	17	12	8	150	**344**
1730 - 1745	12	136	17	9	5	129	**308**
1745 - 1800	10	165	16	12	5	187	**395**
Period End	**123**	**1795**	**191**	**173**	**101**	**1997**	**4380**

	NORTH		WEST		SOUTH		
	Fox Valley Rd		*Secondary*		*Fox Valley Rd*		
Peak Per	R	T	L	R	L	T	**TOTAL**
1500 - 1600	51	595	56	65	38	681	**1486**
1515 - 1615	38	569	60	68	34	688	**1457**
1530 - 1630	31	571	59	68	37	666	**1432**
1545 - 1645	35	574	71	57	42	672	**1451**
1600 - 1700	30	588	69	61	38	670	**1456**
1615 - 1715	37	603	65	56	36	678	**1475**
1630 - 1730	32	594	72	58	32	687	**1475**
1645 - 1745	36	582	60	52	26	635	**1391**
1700 - 1800	42	612	66	47	25	646	**1438**
PEAK HR	**51**	**595**	**56**	**65**	**38**	**681**	**1486**



© Copyright ROAR DATA

APPENDIX C

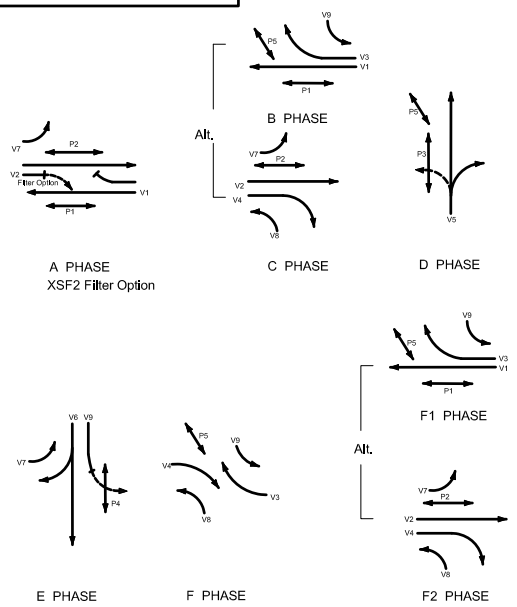
PROPOSED INTERSECTION WORKS

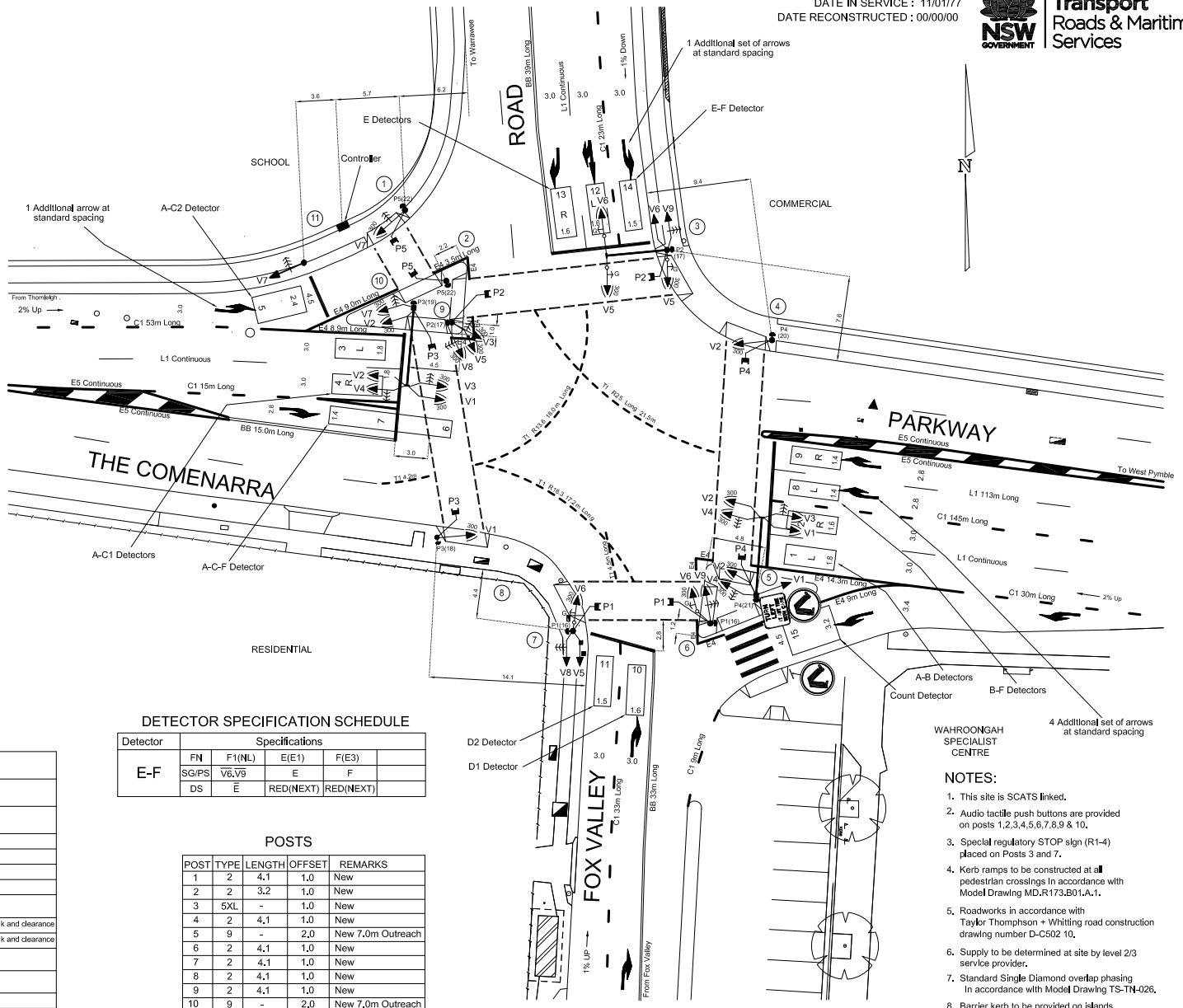
7000.238.VV.1310

DRAWN BY CADD
DO NOT AMEND MANUALLY

DATE IN SERVICE : 11/01/77
DATE RECONSTRUCTED : 00/00/00

NSW GOVERNMENT Transport Roads & Maritime Services





SIGNAL GROUP PHASE CHART

SIGNAL GROUP	PHASE DURING WHICH GREEN DISPLAYED								OVERLAPS PERMITTED	TABLE	
	A	B	C	D	E	F	F1	F2			
V1	X	X					X		F1/A/B, B/A, A/F1	TS-TN-026	
V2	X		X					X	F2/A/C, C/A, A/F2	TS-TN-026	
V3		X				X	X		F/F1, B/F	TS-TN-026	
V4			X			X		X	F/F2, C/F	TS-TN-026	
V5				X						1	
V6					X					1	
V7	X		X		X			X	F2/A/C, C/A, A/F2	160	
V8			X			X		X	F/F2, C/F	145 *	Timed RA protection for P3 walk and clearance
V9		X			C	X	X		F/F1, B/F	146 #	Timed RA protection for P4 walk and clearance
P1	X	X					X		F1/A/B	109	Automatic introduction with V1 in the presence of XSF9
P2	X		X					X	F2/A/C	107	Automatic Introduction with V2 in the presence of XSF10
P3				X						2	
P4					X					2	
P5		X		X		X	X			-	Automatic introduction with V3 and V5 in the presence of XSF11

* PB on post 10 extends RA.
# PB on post 5 extends RA.

DETECTOR SPECIFICATION SCHEDULE

Detector	Specifications				
	FN	F1(NL)	E(E1)	F(E3)	
E-F	SG/PS	V6.V9	E	F	
	DS	E	RED(NEXT)	RED(NEXT)	

POSTS

POST	TYPE	LENGTH	OFFSET	REMARKS
1	2	4.1	1.0	New
2	2	3.2	1.0	New
3	5XL	-	1.0	New
4	2	4.1	1.0	New
5	9	-	2.0	New 7.0m Outreach
6	2	4.1	1.0	New
7	2	4.1	1.0	New
8	2	4.1	1.0	New
9	2	4.1	1.0	New
10	9	-	2.0	New 7.0m Outreach
11	2	4.1	1.0	New

NOTES:

1. This site is SCATS linked.
2. Audio tactile push buttons are provided on posts 1,2,3,4,5,6,7,8,9 & 10.
3. Special regulatory STOP sign (R1-4) placed on Posts 3 and 7.
4. Kerb ramps to be constructed at all pedestrian crossings in accordance with Model Drawing MD.R173.B01.A.1.
5. Roadworks in accordance with Taylor Thompson + Whitting road construction drawing number D-C502 10.
6. Supply to be determined at site by level 2/3 service provider.
7. Standard Single Diamond overlap phasing in accordance with Model Drawing TS-TN-026.
8. Barrier kerb to be provided on islands housing mast arms.

A ORIGINAL ISSUE

PUBLIC UTILITY LEGEND	
HYDRANT	
STOP VALVE	
GAS VALVE	
SEWER MANHOLE	
TELECOM PIT	
ELECT LIGHT POLE	
POWER POLE	
STAY POLE	
TELEPHONE BOX	
TELECOM PILLAR	

REFERENCE PLANS	
SYMBOLS/ABBS.	VD003-6
STD POSIT	VD001-5
PRES. DETECT	VC005-17
VEH. GROUP OP	TS-TN-019
DET. LOGIC OP	TS-TN-020
PED. MOVEMNT OP	TS-TN-021
SURVEYOR : INSITES	
DATE : 26.03.2012	

U.B.D. Ref. Map 153 H15
I.S.G. E: 309 182
CO-ORDS N: 1 265 671
DESIGNED CT
CHECKED JS
CT
SITE CHECKED
JS
RECOMMENDED

DESIGN APPROVAL
APPROVED
R. NETTLE
POSITION DIRECTOR
DATE 15.08.2013
DESIGN PREPARED BY
TRANSPORT AND TRAFFIC PLANNING ASSOCIATES

RMS ACCEPTANCE
RECOMMENDED
POSITION
DATE
ACCEPTED
POSITION
DATE

ROADS AND MARITIME SERVICES
KU-RING-GAI COUNCIL AREA
TRAFFIC SIGNALS AT THE INTERSECTION OF THE COMENARRA PARKWAY AND FOX VALLEY ROAD
WAHROONGA
DESIGN LAYOUT
TCS No 1310

EXISTING ☐ PROPOSED ☒
CADD FILE: VV1310_12A.dgn
SCALE 5 0 (1:200) 5 10
ISSUE A
FILE 238 TS 265
SUPERSEDES SHEET/ISSUE 4A
REGN. 7000.238.VV.1310
SHEET 12

$DATES $TIMES $FILES

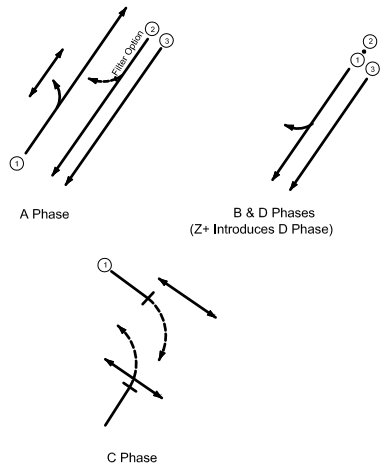
© COPYRIGHT ROADS AND MARITIME SERVICES

7000.238.VV.3210

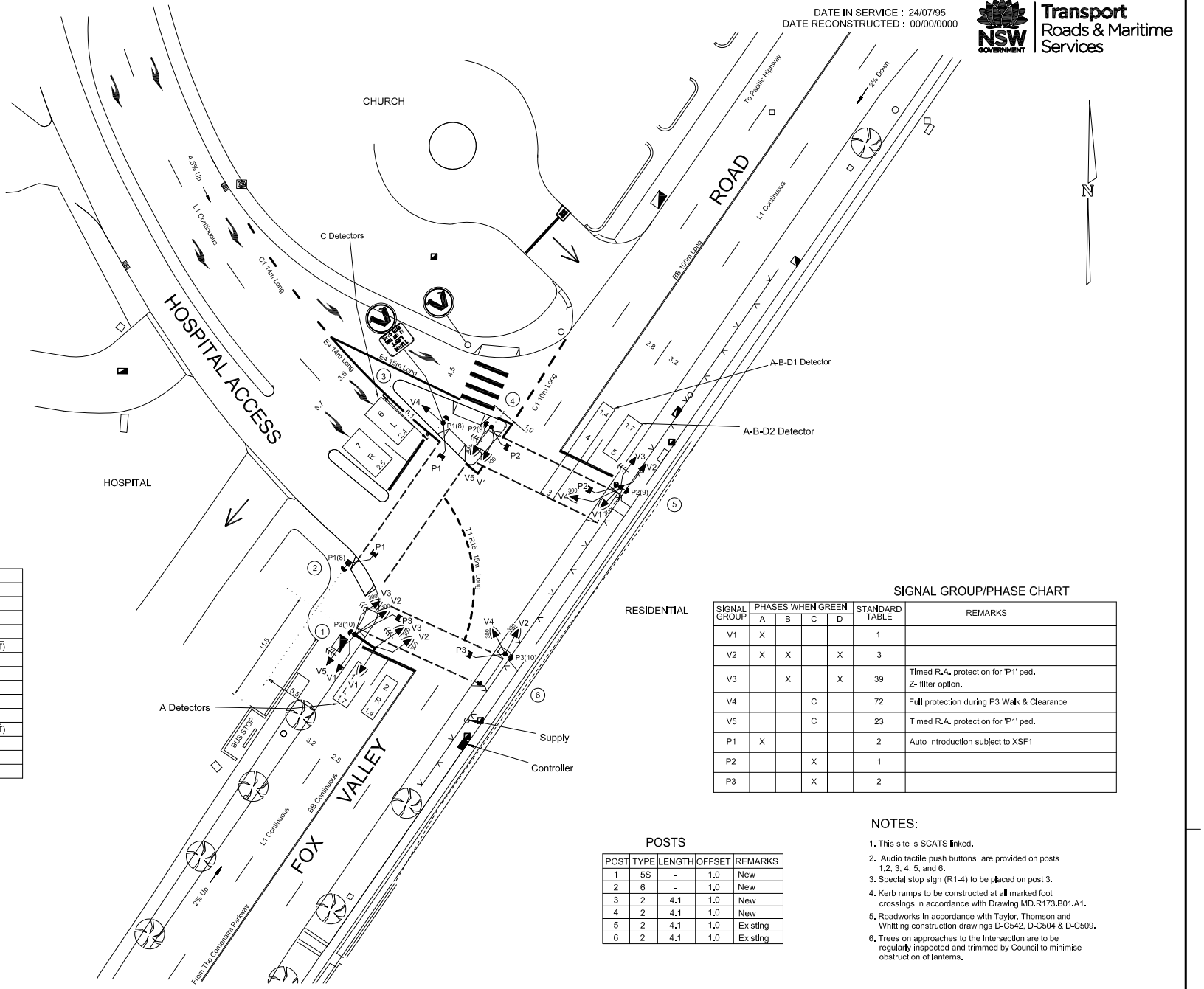
DRAWN BY CADD
DO NOT AMEND MANUALLY

DATE IN SERVICE : 24/07/95
DATE RECONSTRUCTED : 00/00/0000

Transport Roads & Maritime Services



MOVEMENTS



DETECTOR SPECIFICATION

Detector					
A	FN	A(L)	A(E1)		
	SG/PS	$\overline{A}$	A		
	DS				
A-B-D1 Depart. & Approach	FN	B(PR)	D(PR)	B(E1)	D(E1)
	SG/PS	A	A	B	D
	DS	-	Z+	A(NEXT)	A(NEXT)
A-B-D1 Approach	FN	A(L).B(L)	D(L)	A(E2)	
	SG/PS	$\overline{V2}$	$\overline{V2}$	A	
	DS	-	Z+	A-B-D1(PR).B($\overline{NEXT}$).D($\overline{NEXT}$)	
cont. A-B-D1 Approach	FN	B(E2)		D(E2)	
	SG/PS	B		D	
	DS	A($\overline{NEXT}$).D($\overline{NEXT}$)		A($\overline{NEXT}$).B($\overline{NEXT}$)	
A-B-D2	FN	A(L)	A(E3)	B(E3)	
	SG/PS	$\overline{V2}$	A	B	
	DS	$\overline{B}.\overline{D}$	B($\overline{NEXT}$).D($\overline{NEXT}$)	A($\overline{NEXT}$).D($\overline{NEXT}$)	
cont. A-B-D2	FN	D(E3)			
	SG/PS	D			
	DS	A($\overline{NEXT}$).B($\overline{NEXT}$)			
C	FN	C(L)	C(E1)		
	SG/PS	$\overline{C}$	C		
	DS	—	—		
P1 PB	FN	A(PB)	C(L)		
	SG/PS	P1(WALK)	A.P1($\overline{WALK}$)		
	DS	—	$\overline{B}.\overline{C}.\overline{D}$		
P2 PB	FN	C(PB)	A(L)		
	SG/PS	P2(WALK)	C.P2($\overline{WALK}$)		
	DS	—	$\overline{A}.\overline{B}.\overline{D}$		
P3 PB	FN	C(PB)	A(L)		
	SG/PS	P3(WALK)	C.P3($\overline{WALK}$)		
	DS	—	$\overline{A}.\overline{B}.\overline{D}$		

SIGNAL GROUP/PHASE CHART

RESIDENTIAL

SIGNAL GROUP	PHASES WHEN GREEN				STANDARD TABLE	REMARKS
	A	B	C	D		
V1	X				1	
V2	X	X		X	3	
V3		X		X	39	Timed R.A. protection for 'P1' ped. Z- filter option.
V4			C		72	Full protection during P3 Walk & Clearance
V5			C		23	Timed R.A. protection for 'P1' ped.
P1	X				2	Auto Introduction subject to XSF1
P2			X		1	
P3			X		2	

POSTS

POST	TYPE	LENGTH	OFFSET	REMARKS
1	5S	-	1.0	New
2	6	-	1.0	New
3	2	4.1	1.0	New
4	2	4.1	1.0	New
5	2	4.1	1.0	Existing
6	2	4.1	1.0	Existing

NOTES:

1. This site is SCATS linked.
2. Audio tactile push buttons are provided on posts 1,2, 3, 4, 5, and 6.
3. Special stop sign (R1-4) to be placed on post 3.
4. Kerb ramps to be constructed at all marked foot crossings in accordance with Drawing MD.R173.B01.A1.
5. Roadworks in accordance with Taylor, Thomson and Whitting construction drawings D-C542, D-C504 & D-C509.
6. Trees on approaches to the Intersection are to be regularly inspected and trimmed by Council to minimise obstruction of lanterns.

A ORIGINAL ISSUE

PUBLIC UTILITY LEGEND	
HYDRANT	□
STOP VALVE	△
GAS VALVE	#
SEWER MANHOLE	●
TELECOM PIT	◪
ELECT LIGHT POLE	♂
POWER POLE	○
STAY POLE	⊘
TELEPHONE BOX	☎
TELECOM PILLAR	▪

REFERENCE PLANS	
SYMBOLS/ABBS.	VD003-6
STD POSIT	VD001-5
PRES. DETECT	VC005-17
VEH. GROUP OP	TS-TN-019
DET. LOGIC OP	TS-TN-020
PED. MOVEMNT OP	TS-TN-021
SURVEYOR: TTW	
DATE : 2011	

U.B.D. Ref. MAP 153 H14
I.S.G. CO-ORDS E: 309 230 N: 1 265 950
DESIGNED CT
CHECKED JS
RW
SITE CHECKED
JS
RECOMMENDED

DESIGN APPROVAL
APPROVED
R. NETTLE
POSITION DIRECTOR
DATE 25.03.2013
DESIGN PREPARED BY
TRANSPORT AND TRAFFIC PLANNING ASSOCIATES

RMS ACCEPTANCE
RECOMMENDED
POSITION
DATE
ACCEPTED
POSITION
DATE

ROADS AND MARITIME SERVICES

KU RING GAI COUNCIL AREA
TRAFFIC SIGNALS AT INTERSECTION OF
FOX VALLEY ROAD AND
SYDNEY ADVENTIST HOSPITAL ACCESS
WAHROONGA

DESIGN LAYOUT TCS No 3210

EXISTING ☐ PROPOSED ☒
CADD FILE: VV3210_4A.dgn
SCALE (1:200)
FILE 238.TS.298
SUPERSEDES SHEET/ISSUE 1C
ISSUE A
REGN. 7000.238.VV.3210
SHEET 4

$DATES $TIMES $FILES

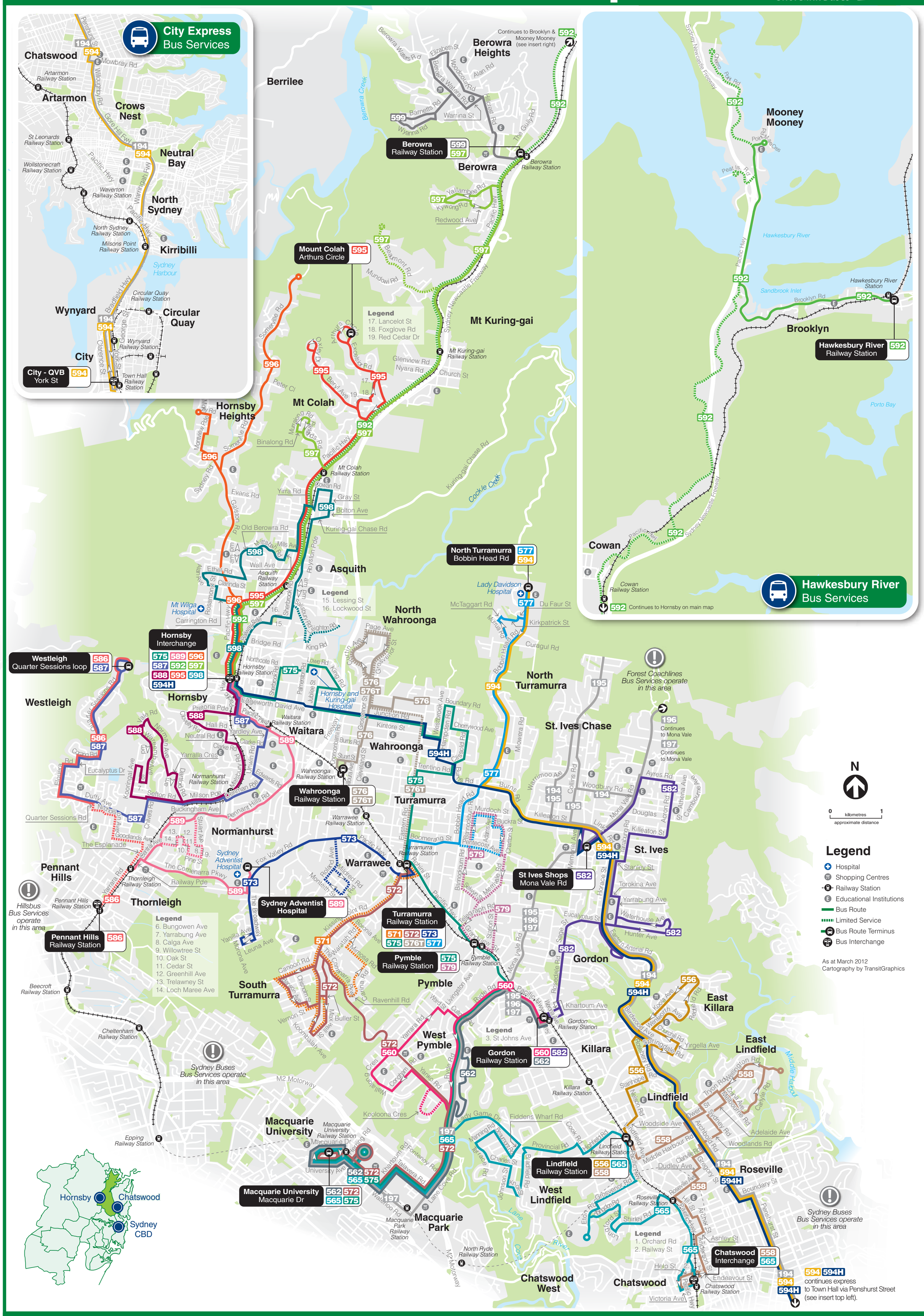
© COPYRIGHT ROADS AND MARITIME SERVICES

APPENDIX D

BUS SERVICES

Bus Network Map

TRANSDEV
Shorelink Buses



www.shorelink.com.au

Monday to Friday

Fox Valley loop

map ref	Monday to Friday	♿			♿	♿	♿		♿	♿	♿	♿
	Route Number	573	573	573	573	573	573	573	573	573	573	573
A	Turramurra Station Rohini Street	05:56	06:11	06:26	06:41	06:56	…	07:30	08:05	08:47	09:50	10:48
B	Warrawee Valley Finlay Road	…	…	…	…	…	…	…	…	…	…	…
C	Roland Avenue & Fox Valley Road	06:02	06:17	06:32	06:48	07:07	07:26	07:36	08:15	08:51	09:54	10:52
D	SAN Sydney Adventist Hospital	06:05	06:20	06:35	06:51	07:10	07:29	07:39	08:18	08:54	09:57	10:55
E	Fox Valley Leuna Avenue	06:09	06:24	06:39	06:55	07:14	07:33	...	...	08:58	10:01	10:59
D	SAN Sydney Adventist Hospital	06:12	06:27	06:42	06:59	07:17	07:36	...	...	09:01	10:04	11:02
C	Roland Avenue & Fox Valley Road	06:15	06:30	06:45	07:02	07:22	07:39	...	...	09:04	10:07	11:05
B	Warrawee Valley Finlay Road	06:18	06:33	06:48	07:05	07:25	07:43	...	...	09:07	...	11:08
A	Turramurra Station Rohini Street	06:28	06:43	06:58	07:17	07:34	07:55	...	...	09:16	10:17	11:17

	Monday to Friday (continued...)	♿	♿	♿		♿	♿		♿	♿		♿
map ref	Route Number	573	573	573	573	573	573	573	573	573	573	573
A	Turramurra Station Rohini Street	11:50	12:42	13:42	14:42	15:44	16:26	16:53	17:24	17:43	18:17	18:39
B	Warrawee Valley Finlay Road	…	12:47	…	14:47	15:51	16:33	17:00	17:31	…	18:24	18:46
C	Roland Avenue & Fox Valley Road	11:54	12:50	13:47	14:50	15:54	16:36	17:03	17:34	17:48	18:27	18:49
D	SAN Sydney Adventist Hospital	11:57	12:53	13:49	14:53	15:57	16:39	17:06	17:37	17:51	18:30	18:52
E	Fox Valley Leuna Avenue	12:01	12:57	13:54	14:57	16:01	16:43	17:10	17:41	17:55	18:34	18:56
D	SAN Sydney Adventist Hospital	12:04	13:00	13:57	15:00	16:05	16:47	17:14	17:45	17:59	18:38	19:00
C	Roland Avenue & Fox Valley Road	12:07	13:03	14:00	15:06	16:08	16:50	17:17	17:48	18:02	18:41	19:03
B	Warrawee Valley Finlay Road	…	...	...	...	...	...	...	...	...	...	...
A	Turramurra Station Rohini Street	12:17	13:13	14:10	15:13	16:18	17:00	17:27	17:58	18:12	18:51	19:13

	Monday to Friday (continued...)			
map ref	Route Number	573	573	573
A	**Turramurra Station** Rohini Street	18:57	19:30	20:12
B	**Warrawee Valley** Finlay Road	…	19:37	20:19
C	Roland Avenue & Fox Valley Road	19:02	19:40	20:22
D	**SAN Sydney Adventist Hospital**	19:05	19:43	20:25
E	**Fox Valley** Leuna Avenue	19:09	19:46	20:28
D	**SAN Sydney Adventist Hospital**	19:13	19:50	20:32
C	Roland Avenue & Fox Valley Road	19:16	19:53	20:35
B	**Warrawee Valley** Finlay Road	…	…	…
A	**Turramurra Station** Rohini Street	19:24	20:03	20:45

	Saturday	♿	♿	♿	♿	♿	♿	♿	♿	♿	♿
map ref	Route Number	573	573	573	573	573	573	573	573	573	573
A	Turramurra Station Rohini Street	08:50	09:50	10:50	11:50	12:50	13:50	14:50	15:50	16:50	17:50
C	Roland Avenue & Fox Valley Road	08:54	09:54	10:54	11:54	12:54	13:54	14:54	15:54	16:54	17:54
D	SAN Sydney Adventist Hospital	08:56	09:56	10:56	11:56	12:56	13:56	14:56	15:56	16:56	17:56
E	Fox Valley Leuna Avenue	08:59	09:59	10:59	11:59	12:59	13:59	14:59	15:59	16:59	17:59
D	SAN Sydney Adventist Hospital	09:02	10:02	11:02	12:02	13:02	14:02	15:02	16:02	17:02	18:02
C	Roland Avenue & Fox Valley Road	09:05	10:05	11:05	12:05	13:05	14:05	15:05	16:05	17:05	18:05
A	Turramurra Station Rohini Street	09:10	10:10	11:10	12:10	13:10	14:10	15:10	16:10	17:10	18:10

Monday to Friday

Hornsby to Sydney Adventist Hospital

map ref	Monday to Friday	♿	♿	♿	♿	♿	♿			♿
	Route Number	589	589	589	589	589	589	589	589	589
A	Hornsby Station Interchange Stand A	06:30	07:30	08:30	12:30	13:30	14:30	15:30	16:30	17:30
B	Normanhurst Boys High School	06:39	07:39	08:39	12:39	13:39	14:39	15:39	16:39	17:39
C	Pennant Hills Road & Stuart Avenue	06:41	07:41	08:41	12:41	13:41	14:41	15:41	16:41	17:41
D	Woodlands Estate Oak Street	...	...	...	12:43	...	...	15:43	...	17:43
E	Thornleigh Station Bellevue St & Railway Pde	06:46	07:46	08:46	12:47	13:46	14:46	15:47	16:46	17:47
F	SAN Sydney Adventist Hospital	06:55	07:55	08:55	12:57	13:55	14:55	15:57	16:55	17:57

	Saturday	♿	♿	♿	♿
map ref	Route Number	589	589	589	589
A	Hornsby Station Interchange Stand A	09:16	11:16	14:26	16:26
B	Normanhurst Boys High School	09:24	11:24	14:34	16:34
C	Pennant Hills Road & Stuart Avenue	09:26	11:26	14:36	16:36
D	Woodlands Estate Oak Street	09:29	11:29	14:39	16:39
E	Thornleigh Station Bellevue St & Railway Pde	09:33	11:33	14:43	16:43

Monday to Friday

Sydney Adventist Hospital to Hornsby

map ref	Monday to Friday	♿		♿			♿	♿	♿	♿			♿
	Route Number	589	589	589	589	589	589	589	589	589	589	589	589
F	SAN Sydney Adventist Hospital	07:00	...	08:00	...	...	09:00	13:00	14:00	15:00	16:00	17:00	18:00
E	Thornleigh Station Bellevue St & Railway Pde	07:10	07:52	08:10	...	08:31	09:08	13:10	14:10	15:10	16:10	17:10	18:10
D	Woodlands Estate Oak Street	...	07:57	...	...	08:36	09:11	...	...	...	...	...	...
C	Pennant Hills Road & Stuart Avenue	07:14	08:02	...	...	J08:41	09:14	13:14	14:14	15:14	16:14	17:14	18:14
B	Normanhurst Boys High School	07:17	Y08:04	08:17	08:46	J08:49	09:20	13:17	14:17	15:17	16:17	17:17	18:17
A	Hornsby Station Interchange Stand A	07:25	08:17	08:25	08:58	09:06	09:27	13:25	14:25	15:25	16:25	17:25	18:25

	Saturday	♿	♿	♿	♿
map ref	Route Number	589	589	589	589
E	Thornleigh Station Bellevue St & Railway Pde	09:34	11:34	14:44	16:44
D	Woodlands Estate Oak Street	09:38	11:38	14:48	16:48
C	Pennant Hills Road & Stuart Avenue	09:42	11:42	14:52	16:52
B	Normanhurst Boys High School	09:44	11:44	14:54	16:54
A	Hornsby Station Interchange Stand A	09:55	11:55	15:04	17:04

APPENDIX E

TRAFFIC GENERATION CRITERIA

3.5 Office and commercial

3.5.1 Office blocks

Rates
Daily vehicle trips = 11 per 100 m² gross floor area Morning peak hour vehicle trips = 1.6 per 100 m² gross floor area. Evening peak hour vehicle trips = 1.2 per 100 m² gross floor area.

Discussion

The above rates are based on 10 surveys 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.

Full details of the surveys may be obtained from the reports prepared for the RTA – *Trip Generation and Parking Generation Surveys (Office Blocks) – Analysis Report and Data Report.*

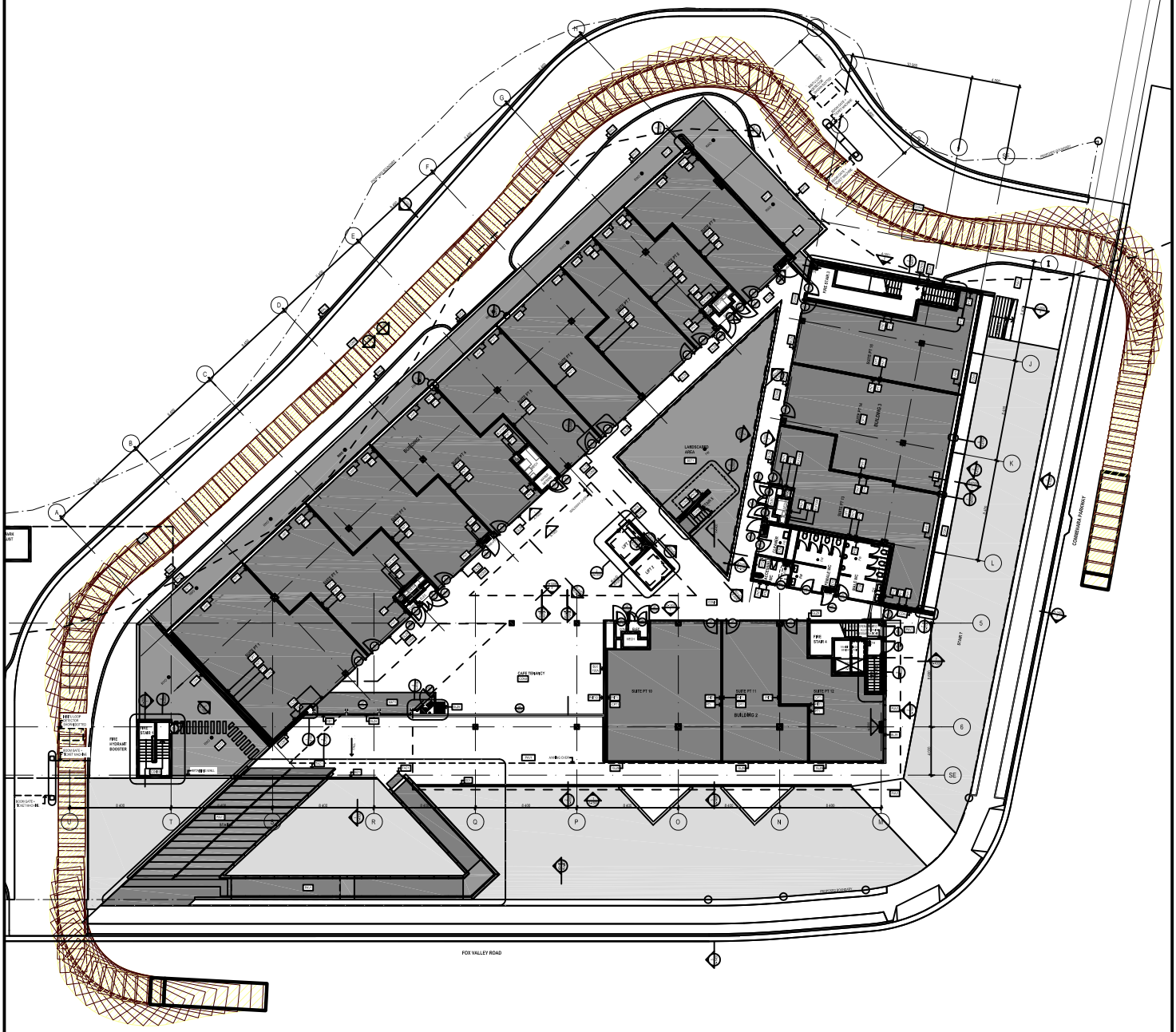
In general, the 2010 surveys indicate an increase in daily vehicle trip generation for this type of land use compared with older surveys reported in previous versions of this document. However, peak hour trip generation appears to be reduced somewhat, possibly as a result of more flexible working hours.

The bulk of sites (7 out of 10) surveyed displayed a car driver mode share for all trips of between 60% and 98%, although one site (North Sydney) had 74% of trips with public transport use. In general there appears to be little correlation between the accessibility of surveyed sites to public transport and the car driver mode share. This is not unexpected given the predominant location of office blocks – generally near rail links. What does appear to be a significant factor is the nature of the rail and bus service. Sites near rail and bus hubs, with commensurately high levels of public transport service, do appear to have low car driver mode splits.

The daily and peak hour trip generation data reported above appear to be lower than that reported in New Zealand (The NZ Trips Database Bureau) and the United Kingdom (Trip Rate Information Computer Systems). Peak hour trip generation rates appear to be comparable to those reported in the United States (The Institution of Transportation Engineers (ITE) Trip Generation Manual, 8th Edition.

APPENDIX F

TURNING PATH ASSESSMENT



LEGEND

This drawing has been prepared using vehicle modelling computer software AutoTrack V9.21 in conjunction with AutoCAD 2013. The vehicle used is based upon vehicle data provided by Austroads and incorporates a reasonable degree of tolerance. However, it is not possible to account for all vehicle types/characteristics and/or driver ability.

N

SWEPT PATH ANALYSIS OF A 9.4m REFUSE VEHICLE ENTERING AND EXITING THE SITE

SP 1