SYDNEY ADVENTIST HOSPITAL
PROPOSED STAGED ALTERATIONS AND ADDITIONS
FOX VALLEY ROAD, WAHROONGA

Assessment of Transport, Traffic and Parking Implications

July 2010

Reference 0934

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EXECUTIVE SUMMARY

The project involves alterations and additions to the existing Sydney Adventist Hospital (SAH) to be undertaken on a staged basis over some 6½ years. The completed project will result in an increased total floorarea from 58,448m^2 to 86,441m^2 (plus 3,500m^2 Education Centre).

This report provides an assessment of the traffic, transport and parking implications of the project while separate documents accompanying the EA provide a Workplace Travel Plan and Transport Access Guide. The detailed design development process which has been undertaken has enabled a very clear identification of the 'hospital population' through each of the proposed stages to completion. The establishment of these details has enabled an accurate assessment (relative to the existing circumstances) in relation to the future traffic and parking outcomes.

A PEA was submitted for the project and the Director General's Requirements contain the following key issues to be addressed in the Environmental Assessment relevant to transport and traffic:

- ***Relevant EPI's Policies and Guidelines***
- ***Transport and Accessibility Impacts (Construction and Operational)***

  Provide a Transport and Accessibility Study prepared with reference to the Metropolitan Transport Plan – Connecting the City of Cities, the NSW State Plan, the NSW Planning Guidelines for Walking and Cycling, the Integrated Landuse and Transport Policy package and the RTA's Guide to Traffic Generating Development, considering the following:

  - *Demonstrate how users of the development will be able to make travel choices that support the achievement of relevant State Plan targets;*
  - *Detail the existing pedestrian and cycle movements within the vicinity of the site and determine the adequacy of the proposal to meet the likely future demand for increased public transport and pedestrian and cycle access;*
  - *Identify potential traffic impacts during the construction stage of the project, and measures to mitigate these impacts;*

- *Describe the measures to be implemented to promote sustainable means of transport including public transport usage and pedestrian and bicycle linkages in addition to addressing the potential for implementing a location specific sustainable travel plan;*
- *Daily and peak traffic movements likely to be generated by the proposed development, including the impact on nearby intersections and the need/associated finding for upgrading or road improvement works (if required). The traffic impact assessment should consider base models with future traffic generated by the Sydney Adventist Hospital; and*
- *Appropriate levels of on-site carparking for the proposed development having regard to the Concept Plan Approval (MP07_0166), local planning controls and RTA guidelines (note: the Department supports reduced parking provisions, if adequate public transport is available to access the site).*

The PEA was also referred to authorities and a copy of the response from the RTA is reproduced in Appendix A.

The assessment undertaken responds to the DG's requirements and the findings comprise:

- *the road infrastructure improvements required in relation to the traffic generation of Stages 1A, 1B and 2 and the subsequent improvements for Stage 3*

- *the appropriateness and adequacy of the proposed parking provision on completion of each of the stages*

- *the suitability of the proposed vehicle access and circulation arrangements including the design of the carpark and service vehicle areas*

- *the suitability of arrangements for public transport services, pedestrians and cyclists and the ability to encourage travel choices*

- *the suitability of arrangements which will be available for the traffic involved in the various construction processes.*

1. INTRODUCTION

This report has been prepared for Sydney Adventist Hospital Limited to accompany a Part 3A Major Project Application for the proposed staged upgrading and expansion of the existing Sydney Adventist Hospital (SAH) complex within the 'Wahroonga Estate' on Fox Valley Road at Wahroonga (Figure 1).

The SAH has been established for many years as a principal element of the 'Wahroonga Estate' and has been subject to a number of previous upgrade and expansion works in response to the increasing needs of both the SDA community as well as the broader community. A Part 3A process is underway in relation to the envisaged overall development of the Wahroonga Estate and a Concept Plan has been approved (MP08_0166). However, the proposed development of the SAH itself is the subject of a separate detailed application process.

The existing hospital is a contemporary multi-function health facility of some 58,448m^2 with:

548 beds
857 staff
100 doctors
430 nurses
1,308 parking spaces.

The proposed alterations and additions are planned to occur in 6 stages and completion in 2020 will comprise some 86,441m^2 (+ 3,500m^2 Education Centre) with:

848 beds
1,232 staff
266 doctors
666 nurses
2,155 parking spaces.

The purpose of this report is to:

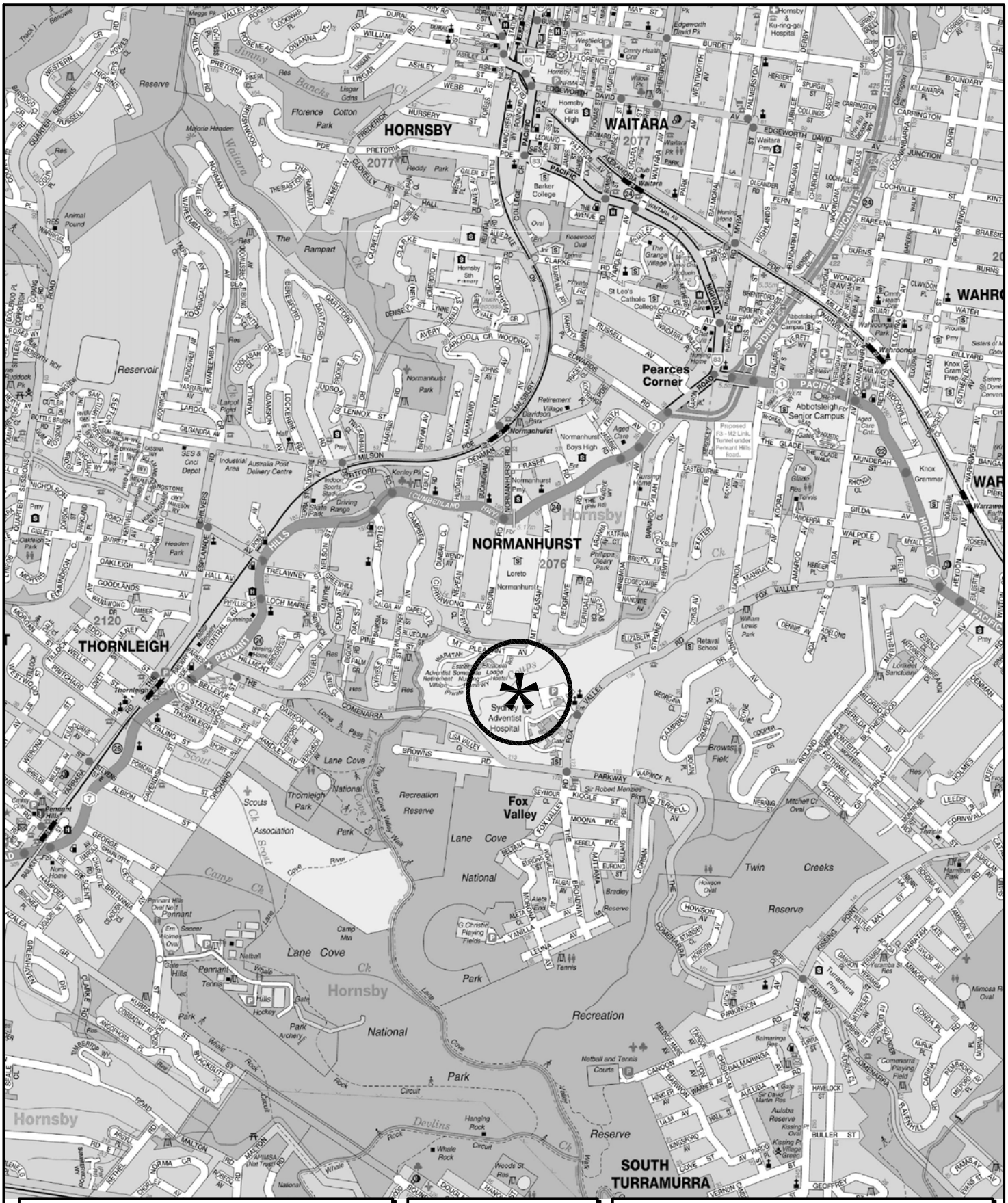
- describe the site and the proposed staged alterations and additions for the hospital

- describe the road network serving the site and the prevailing traffic conditions

- assess the potential traffic implications

- assess the adequacy of the proposed parking provision

- assess the suitability of the proposed vehicle access, internal circulation and servicing arrangements.



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LOCATION

FIG 1

2. PROPOSED DEVELOPMENT SCHEME

2.1 SITE AND CONTEXT

The Hospital site is located within the large landholding known as the Sydney Adventist Wahroonga Estate (Figure 2) which is a consolidation of numerous allotments occupying 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, however the SAH represents the most prominent use.

The estate is located in the north-easternmost part of the Ku-Ring-Gai LGA and Fox Valley Road intrudes along a high ridge line. The site falls away steeply to the east and west of Fox Valley Road while Coups Creek cuts across the middle of the Estate presenting a physical segregation.

The Estate is located just to the south of the convergence of major road routes comprising the Pacific Highway, Pennant Hills Road and the F3 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 of the Estate which surround the Hospital site comprise:

- churches
- a primary school
- SDA Pacific Regional Headquarters, media and administration
- dwelling houses
- student hostel
- lodge and hostel
- aged accommodation.

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WAHROONGA ESTATE

FIG 2

2.2 EXISTING DEVELOPMENT

The Hospital site (Figure 3) occupies a large irregular shaped area with frontage to the western side of Fox Valley Road just to the north of The Comenarra Parkway.

The Hospital has been subject to a number of modifications, upgrades and extensions over the years. It currently comprises some 58,448m^2 of floorarea with numerous elements as summarised in the following:

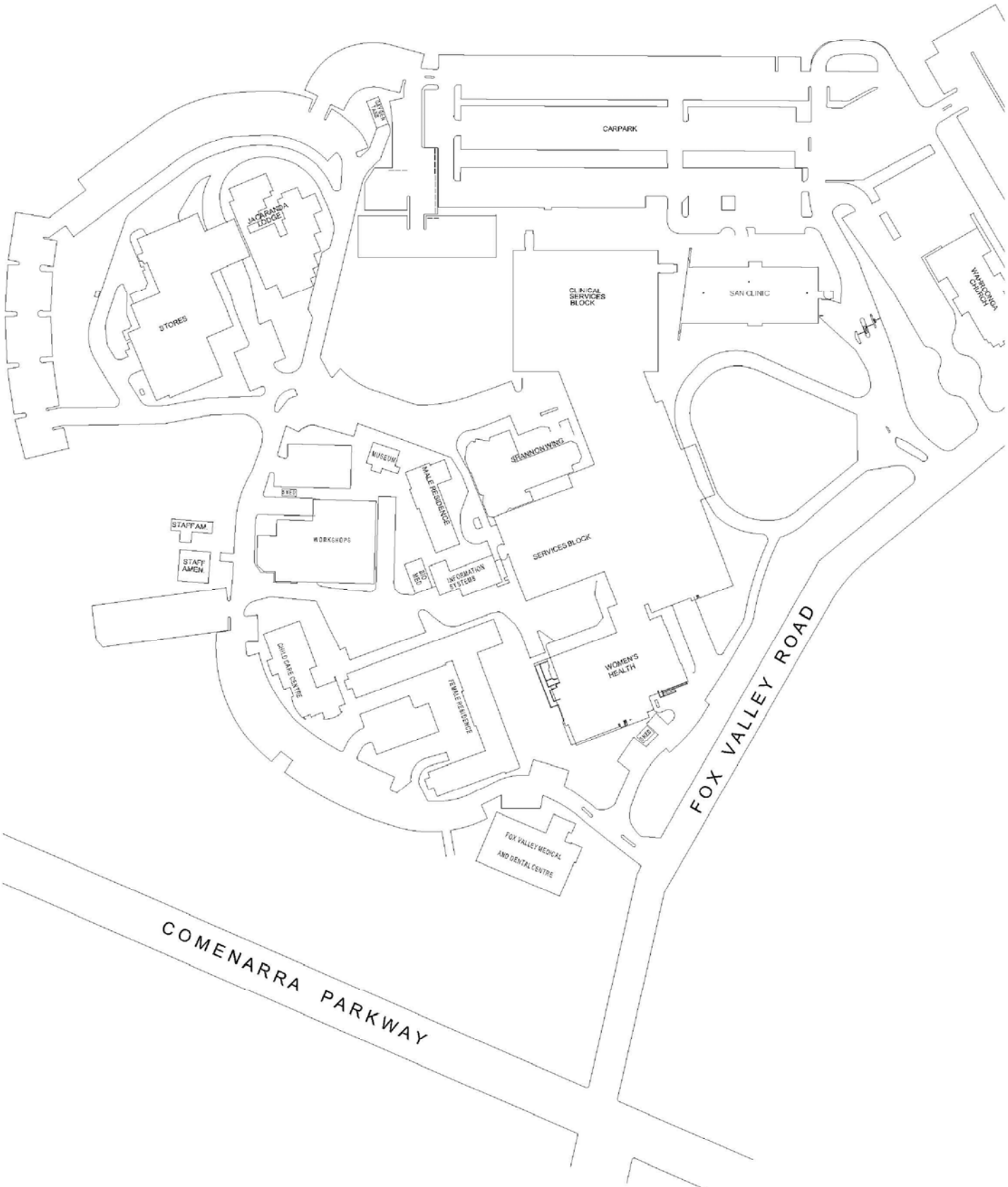
- Beds

Registered overnight	354
Registered day	114
Other	53
Total	**521 + 27 bed spaces**

- Renal Dialysis
- Birthing Suites
- Endoscopy Theatres
- Operating Theatres
- Cardiac Catheter Labs
- Clinical Activities (eg dental care)
- Facility of Nursing
- Australian Research Unit
- Child Care Centre
- Bio Med
- Chapel
- Staff Cafeteria and Amenities
- Pharmacy, Café and Bookshop
- Dental Centre
- Women's Health
- Museum
- Workshops
- Jacaranda Lodge
- Services and Stores

A detailed analysis has been undertaken to establish the existing 'population' circumstances on a normal busy weekday at the hospital and the details are as follows:

Staff	857
Doctors	100
Nurses	430
Patients	1,095
Visitors	789
Education Centre	90 students and 15 staff
Volunteers	70



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HOSPITAL SITE

FIG 3

In times past, hospitals operated with structured staff shifts, fixed visiting hours and limited hours for other services. This situation has fundamentally changed in response to contemporary lifestyles and the desire for flexibility for both hospital workers, patients and visitors.

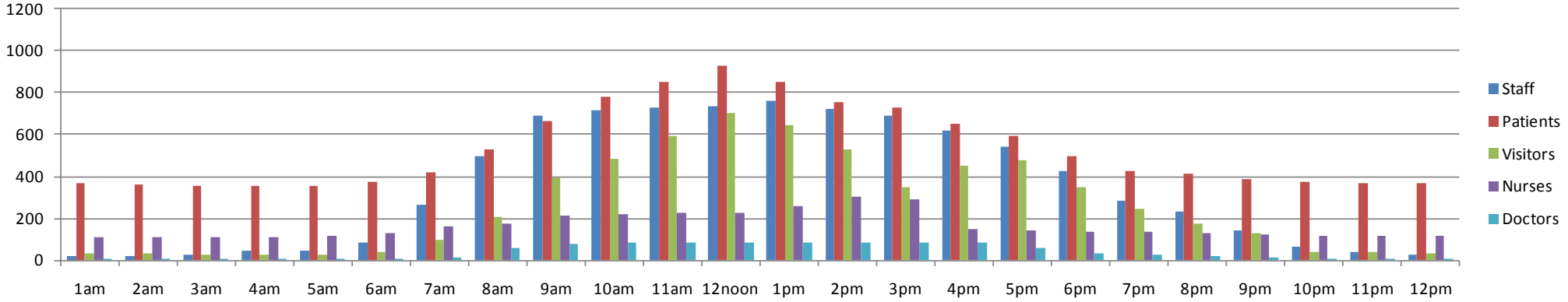
In order to establish an accurate and comprehensive profile of 'people movements' associated with the various hospital functions and activities the SAH Human Resources Department undertook a detailed analysis and the results are provided on the schedule contained in Appendix A while the 'population' by time are shown on the graph overleaf for the peak Tuesday circumstance.

There are some 1,308 parking spaces located in various areas throughout the site including specific allocations of some 670 spaces for staff, tenants and doctors with some 638 spaces operated as a public parking station for visitors, patients and others. Vehicle access comprises a main traffic signal controlled entrance on Fox Valley Road at the northern boundary and a secondary access (limited to staff and servicing) at the southern boundary.

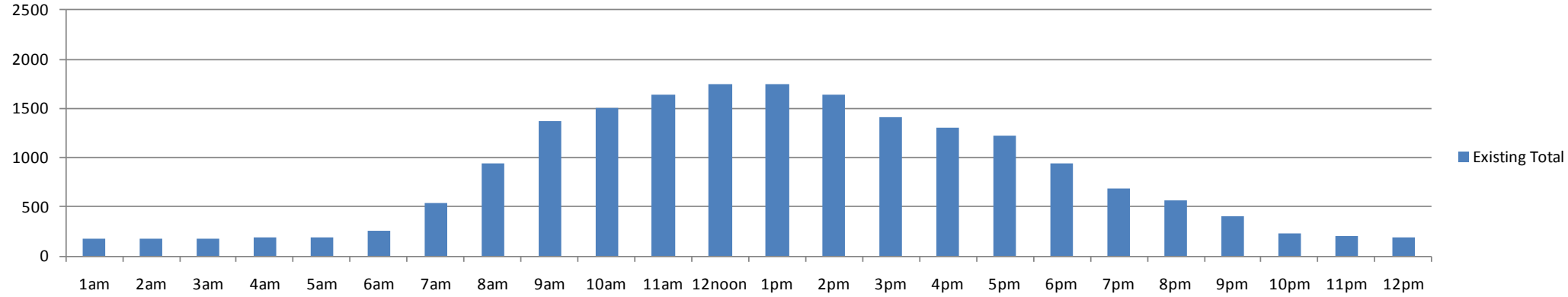
2.3 PRECINCT PLANNING

The proposed development of the Wahroonga Estate is identified in the Preferred Project Report and Concept Plan submitted to the Department of Planning and is split into 2 precincts separated by Coups Creek as indicated on the Concept Plan extract reproduced in Appendix C. The development will be staged over a significant period of time and each element will be subject to a detailed development application.

Existing Population Profile



Existing Total Population Profile



2.4 DEVELOPMENT PROPOSAL

The proposed staged development scheme for SAH is identified on the plan and schedule overleaf which provide precise details in relation to:

* increased floorspace
* increased beds
* increased carparking
* increased staff, doctors, nurses, patients and visitors (normal peak day).

The envisaged staging is also restated in the following:

Stage		Completion
Stage 1A	New carpark structure providing 647 additional spaces and a temporary carpark of 258 spaces	June 2012
Stage 1A	CSB and CCU (expansion) with an additional 12,166m^2 and 124 beds	December 2013
Stage 1B	CSB Stage1B, additional 6,652m^2 with 16 beds	June 2015
Stage 2	New Education Centre 3,500m^2 replacing existing	December 2015
Stage 2	Concourse, arrival, podium and roads	December 2017
Stage 3	Shannon Wing with additional 8,762m^2, 160 beds and 206 parking spaces	December 2020

Completion of the project in June 2020 will result in:

Hospital	-	86,441m^2
Education Centre	-	3,500m^2 (100 students and 20 staff)
Staff	-	1,232
Doctors*	-	266
Nurses*	-	666
Patients*	-	1,443
Visitors*	-	1,061
Beds	-	848
Nurses accommodation	-	175
Parking spaces	-	2,155

** Normal peak day*

	Existing	**Stage 1 Carpark June 2012**	**Stage 1A CSB & CCU Dec 2013**	**Stage 1B CSB June 2015**	**Stage 2 Education Centre Dec 2015**	**Stage 2 Concourse Roads Dec 2017**	**Stage 3 Shannon Wing Dec 2020**	**Comp Dec 2020**
m^2 GFA	58,448	-	12,166	6,652	3,490	413m^2 enclosed area not including open walkways	8,762 nett additional area after 3404m2 of demolition	Hospital 86,441m2 and Ed Centre3,500m^2
Staff	857	-	+160	+95	+20	-	+100	1,232
Doctors	100	-	+50	+50	-	-	+66	266
Nurses	430	-	+101	-	-	-	+135	666
Patients	1,095	-	+115	+80	-	-	+153	1,443
Visitors	789	-	+90	+62	-	-	+120	1,061
Beds	548	-	+124	+16	-	-	+160	848
Education Centre	15 staff and 90 students	-	-	-	+5 +25	-	-	20
Parking	1,308	+561	-	-33	+4	+12	+206	2,058

KEY:

Sydney Adventist Hospital
185 Fox Valley Road
Wahroonga NSW

SYDNEY ADVENTIST HOSPITAL

N

morrisbray architects

MASTERPLAN
Overall Staging Siteplan

1:1000 @A1 | 5857/2010
10001 | A/EA-3 | P03

3

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

3. ROAD NETWORK AND TRAFFIC CONDITIONS

3.1 ROAD NETWORK

The existing road network serving the site (Figure 4) comprises:

- *F3 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

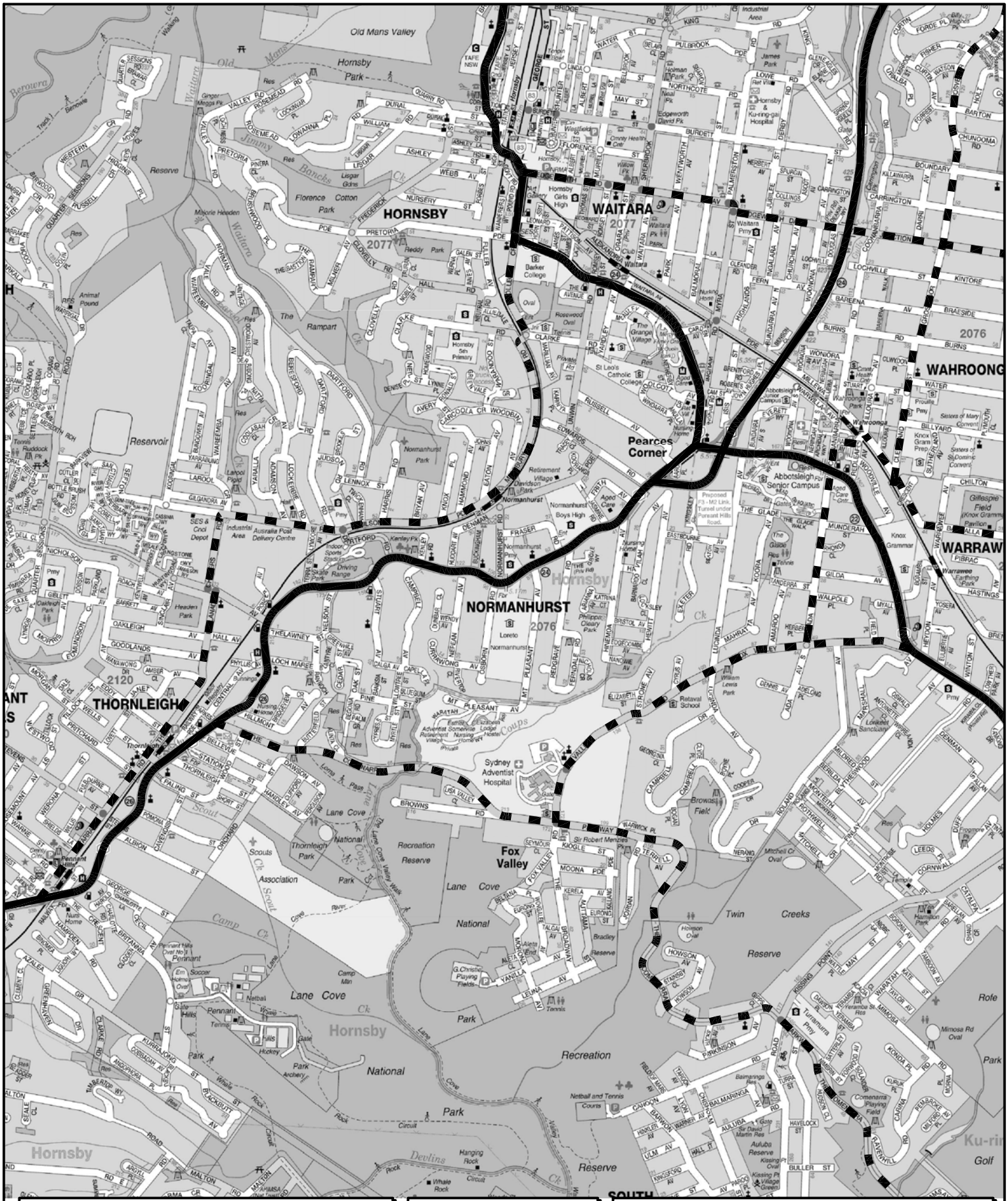
- *Pennant Hills Road* – a State Road and part of the Cumberland Highway arterial route connecting between the F3/Pacific Highway and the Hume Highway at Liverpool

- *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.



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- ARTERIAL
- SUB-ARTERIAL
- COLLECTOR

ROAD NETWORK

FIG 4

3.2 TRAFFIC CONTROLS

The existing traffic controls which have been applied to the road system in the vicinity of the site (Figure 5) include:

* the traffic control signals at the intersection of The Comenarra Parkway and Fox Valley Road. Details of the arrangement and phasing of these signals are, shown on the design plan reproduced in Appendix D indicating the 'awkward' offset geometry of the intersection which acts to constrain the signal phasing/ capacity

* traffic signals at the intersection of the Pacific Highway and Fox Valley Road. Details of the arrangement and phasing of these signals are shown on the design plan reproduced in Appendix D

* traffic control signals at the intersection of Fox Valley Road and the Hospital Access. Details of the arrangement and phasing of these signals is shown on the design plan reproduced in Appendix D

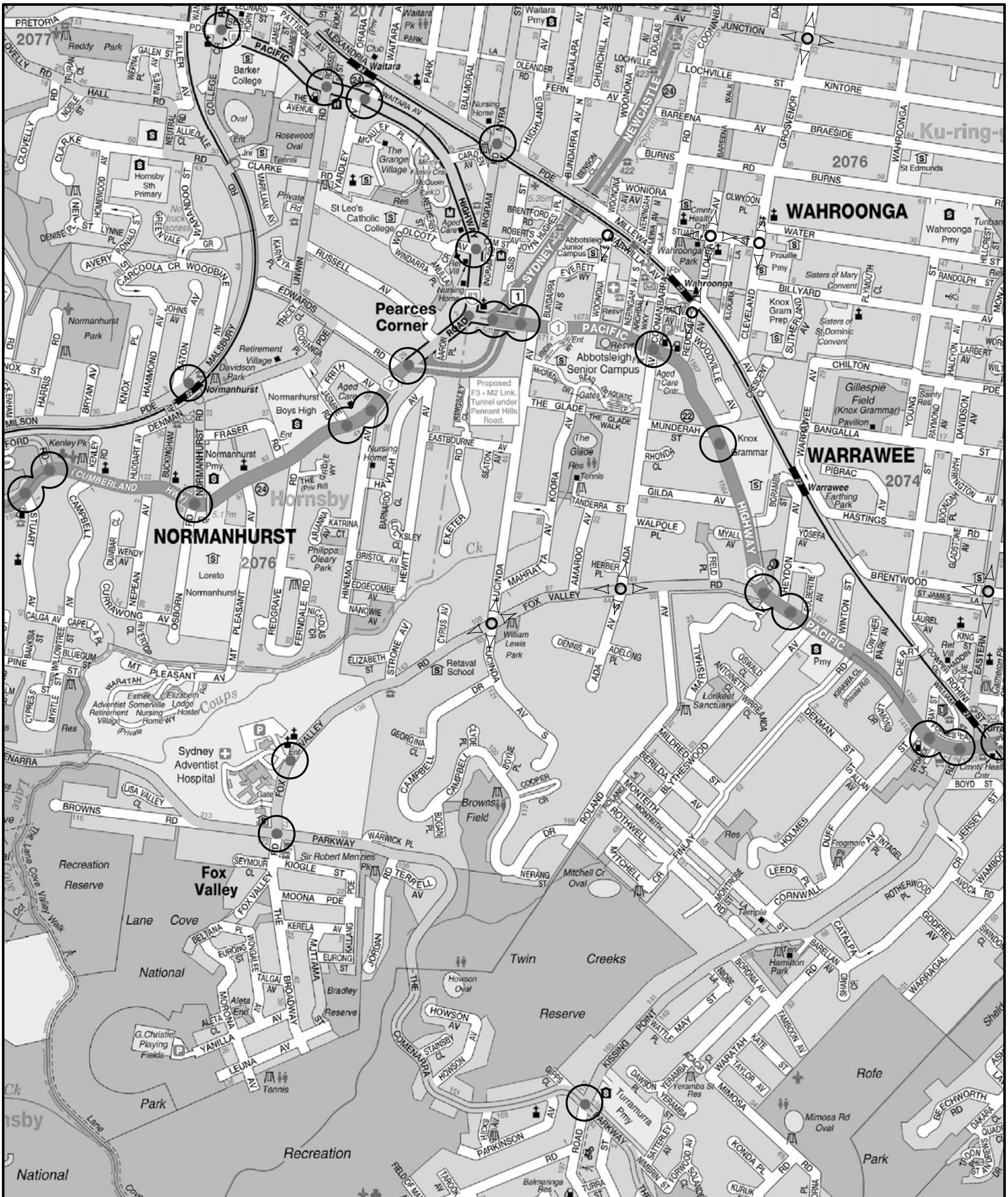
* the general 60 kmph speed limit along The Comenarra Parkway and 50 kmph restriction along Fox Valley Way. A 40 kmph (school hours) speed zone is applied to sections of Fox Valley Road and The Comenarra Parkway in the vicinity of the school

* the sections of NO STANDING 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



Legend

TRAFFIC SIGNAL CONTROL

ROUNDABOUT

RESTRICTED TURNING MOVEMENT

Traffic Controls

Fig 5

- the 'light traffic' restrictions on the local roadways in the area north of Fox Valley Way

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

- the traffic signals at the Pacific Highway/F3/Pennant Hills Road complex

- the median island in Pacific Highway at the Lucinda Avenue intersection preventing right-turn movements.

3.3 TRAFFIC CONDITIONS

An indication of the traffic conditions on the road system serving the Hospital is provided by data published by the RTA and traffic surveys undertaken for this study. The data published by the RTA is expressed in terms of Annual Average Daily Traffic (AADT) and the volumes recorded by the Authority in recent years (latest available 2005) is provided in the following:

	1999	**2002**	**2005**
The Comenarra Parkway south of Fox Valley Way	13,467	13,594	14,137
The Comenarra Parkway north of Fox Valley Way	20,473	19,352	19,319
Fox Valley Way north of The Comenarra Parkway	16,195	16,442	16,535
Pacific Highway south of Fox Valley Road	67,717	71,842	64,181
Pennant Hills Road south of F3	61,461	61,105	61,798

Comparison of this data indicates that the daily traffic flows on the various major routes in the vicinity of the site have remained relatively stable in recent years with some notable decreases particularly on the Pacific Highway.

The volume variations relative to the site frontage roads are shown in the following and are somewhat less than the annual growth trend generally experienced on the metropolitan road system:

The Comenarra Parkway		
North of Fox Valley Road	-	- 0.05% pa
South of Fox Valley Road	-	+ 0.13% pa
Fox Valley Road		
North of The Comenarra Parkway	-	+ 0.18% pa

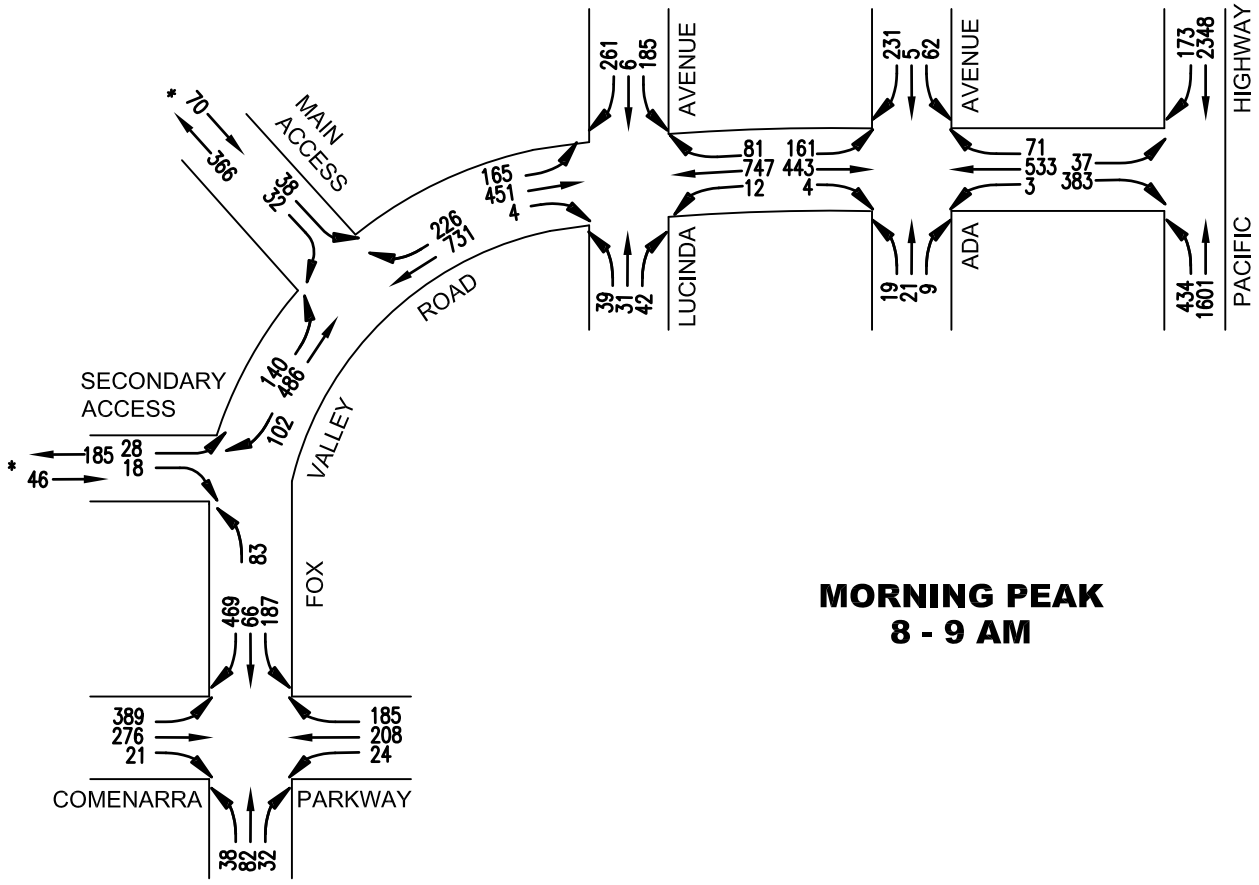
The traffic volumes along the arterial roadways in the area experience fluctuations related to normal peak periods, weekend periods and holiday periods. The latter influence is relatively significant in this area as a consequence of the F3 route and its usage in relation to travel to/from the Central Coast.

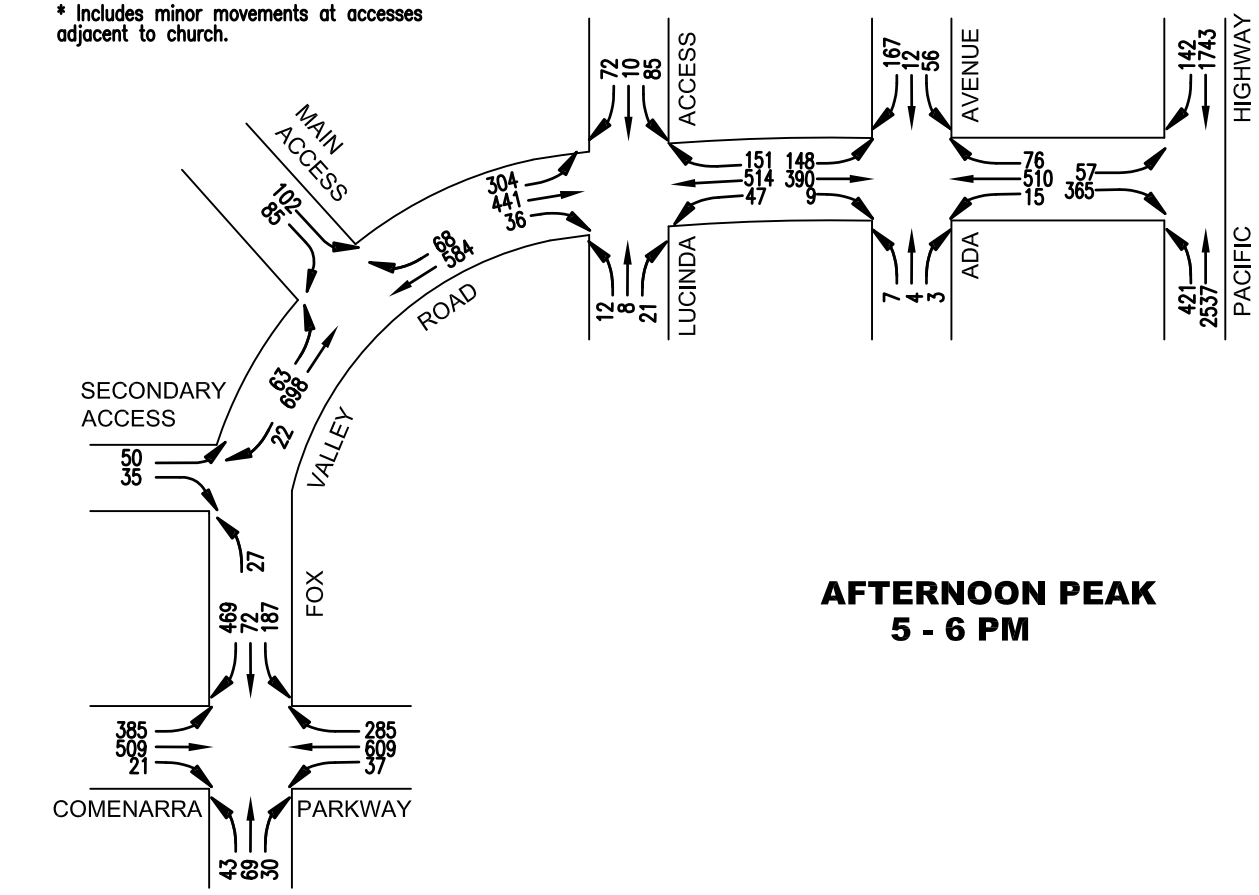
Traffic surveys have been undertaken during the morning and afternoon peak at the intersections and access points serving the Hospital and the results of these traffic surveys are provided on Figure 6 for the 'on-street' peak periods. It is noted that the recorded volumes are relatively similar to those recorded for the Wahroonga Precinct Masterplan Traffic Study.

The vehicle activity associated with the Hospital does not exhibit volatile site peaks which conflict with the normal on-street morning and afternoon peaks due to:

- the start and finish times of the hospital shifts
- the nurses accommodation on-site
- the times at which day patients and visitors arrive and depart.

The operational performance of the intersections in the immediate vicinity of the site has been assessed using the SIDRA modelling software. The results of this assessment are provided in the following while the criteria for assessing the modelling output are reproduced overleaf.





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EXISTING PEAK TRAFFIC FLOWS

FIG 6

The Comenarra Parkway/Fox Valley Road	**AM Peak**	**PM Peak**
Level of service	C	F
Av Vehicle Delay	42.4	75.3

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

Fox Valley Road/Secondary Hospital Access	**AM Peak**	**PM Peak**
Level of Service	NA	NA
Av Vehicle Delay	5.2	6.4

Fox Valley Road/Lucinda Avenue	**AM Peak**	**PM Peak**
Level of service	A	A
Av Vehicle Delay	12.5	8.9

Fox Valley Road/Ada Avenue	**AM Peak**	**PM Peak**
Level of service	A	A
Av Vehicle Delay	10.1	9.4

Pacific Highway/Fox Valley Road	**AM Peak**	**PM Peak**
Level of service	B	D
Av Vehicle Delay	19.4	53.2

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.

Traffic conditions along the principal routes to the east and west (ie Pacific Highway and Pennant Hills Road) also display a level of service at the low ‘end of the scale’ (ie LOS ‘D’ to ‘E’) due largely to the confluence of substantial arterial flows.

3.4 FUTURE CIRCUMSTANCES

The only significant element of road network development relevant to the SAH is the envisaged connection between the F3 Freeway and M2 Motorway. This project is the subject of ongoing planning studies (joint State and Federal Governments), however there is no proposed timeframe for the work.

A preliminary strategic traffic assessment indicated that provision of this connection would result in a significant reduction in traffic flows along Pennant Hills Road and to some lesser extent along the Pacific Highway and The Comenarra Parkway.

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

4. TRANSPORT SERVICES

4.1 EXISTING SERVICES

The existing public transport services relevant to the SAH comprise:

Rail Services

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.

4.2 FUTURE CIRCUMSTANCES

There are general strategic initiatives which have been identified to improve rail and bus servicing which would reflect on the SAH area. However, there are no current or specific proposals which are considered to benefit the existing commuter, patient or visitor travel needs.

5. TRAFFIC

5.1 EXISTING TRAFFIC GENERATION

The existing total traffic generation of the Hospital during the 'peak' Tuesday circumstance (Figure 6) for the 'on-street' morning and afternoon peak periods is as follows:

AM (8-9)		PM (5-6)	
IN	**OUT**	**IN**	**OUT**
551	116	180	272

The peak directional movements are split 40% to/from the west and 60% to/from the east while the non-peak directional movements are fairly evenly split (west and east).

Extrapolation of the 'population' movements (Appendix A) reveals the following person trips during the morning and afternoon peak periods:

	AM (8-9)		PM (5-6)	
	IN	**OUT**	**IN**	**OUT**
Doctors	55	10	10	40
Staff	275	39	30	105
Nurses	55	40	22	30
Patients*	116 (50)	10 (4)	20 (8)	45 (18)
Visitors	139	30	136	105
Total	**640**	**129**	**218**	**325**

**includes other persons (car drivers)*

There is a relatively high 'car driver' mode and a low car occupancy and adjustments for these characteristics indicates a close correlation to the recorded peak vehicle

movement shown in the foregoing allowing for day to day fluctuation (ie the traffic survey was one peak day 'in time').

5.2 FUTURE TRAFFIC GENERATION

The Traffic Study[2] undertaken for the Wahroonga Estate development Part 3A Application adopted projected traffic generation characteristics comprising:

- a 4% increase of Hospital activity per annum to 2020 (ie +60% peak hour traffic generation over existing)

- a 9% reduction due to applied travel demand management measures

- a reduction of recorded trips by 45 vtph to account for 60% of hostel trips using this access (ie the hostel was not considered to be part of the hospital site).

It is apparent that this methodology was adopted in the absence of a detailed awareness of:

- the nature of the Hospital development and particularly the Staged development

- the 'make up'/time frame of staff, patient and visitor etc arrivals and departures.

The pre-eminent traffic impact during the on-street peak traffic periods of the Hospital is the staff movements as patient and visitor movements are subdued at these times. In the case of the SAH the movements are also mitigated by the on-site accommodation for nurses (student and working).

It is also apparent that the future traffic generation circumstance will not in any way represent a pro-rata increase in floorspace because:

- there will be no parallel increase in administration staff or ancillary staff (kitchen and maintenance etc)

[2] Wahroonga Estate Traffic Report
Masson Wilson Twiney February 2010

- there will generally be no increase in clinical services (day patients etc) or other ancillary activities

- the Estate development will include housing within easy walking distance of the hospital which will provide accommodation for nurses, doctors and staff

- the projected population of the completed hospital is compared with that of the existing hospital on the graph overleaf.

The projected 'person trip' (ptph) movements as a consequence of the various relevant stages of the development scheme during the morning and afternoon on-street peak periods are as follows:

Person Trips Per Hour

Stage 1A CSB & CCU December 2013

	AM		PM	
	IN	**OUT**	**IN**	**OUT**
Staff	333	48	36	127
Doctors	83	15	15	45
Nurses	68	50	28	37
Patients	128	12	22	50
Visitors	156	34	154	117
Total	**768**	**159**	**255**	**376**

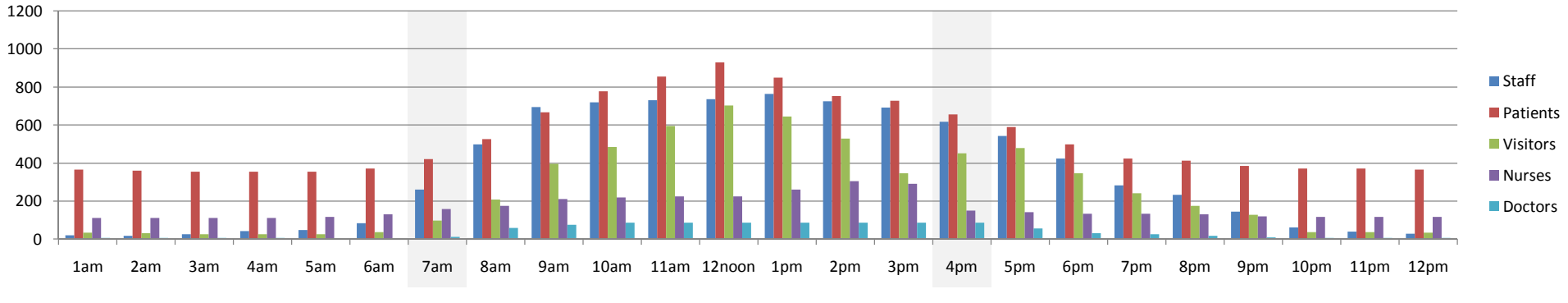
Stage 1B CSB December 2015

	AM		PM	
	IN	**OUT**	**IN**	**OUT**
Staff	363	51	40	139
Doctors	110	20	20	80
Nurses	68	50	28	37
Patients	137	12	24	53
Visitors	166	36	162	126
Total	**844**	**169**	**274**	**435**

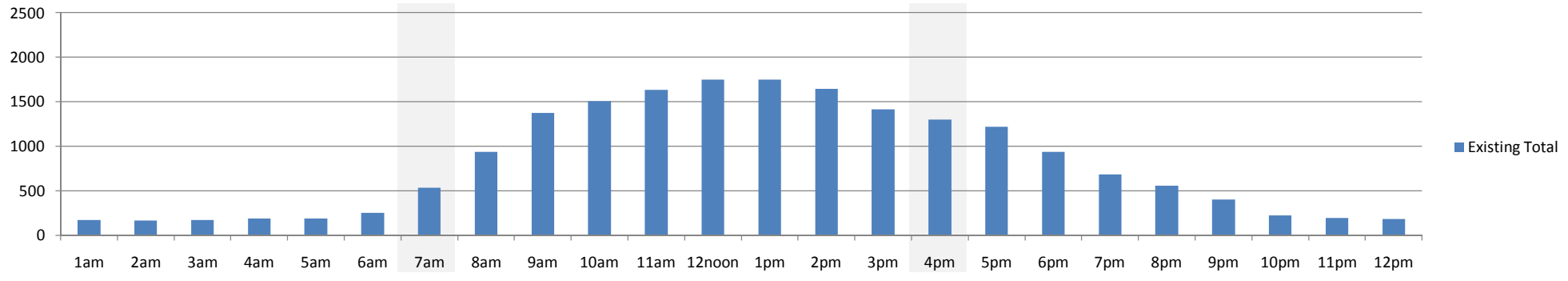
Stage 3 December 2020

	AM		PM	
	IN	**OUT**	**IN**	**OUT**
Staff	395	48	44	166
Doctors	144	27	27	91
Nurses	85	62	35	47
Patients	153	25	26	55
Visitors	188	43	167	130
Total	**965**	**205**	**299**	**489**

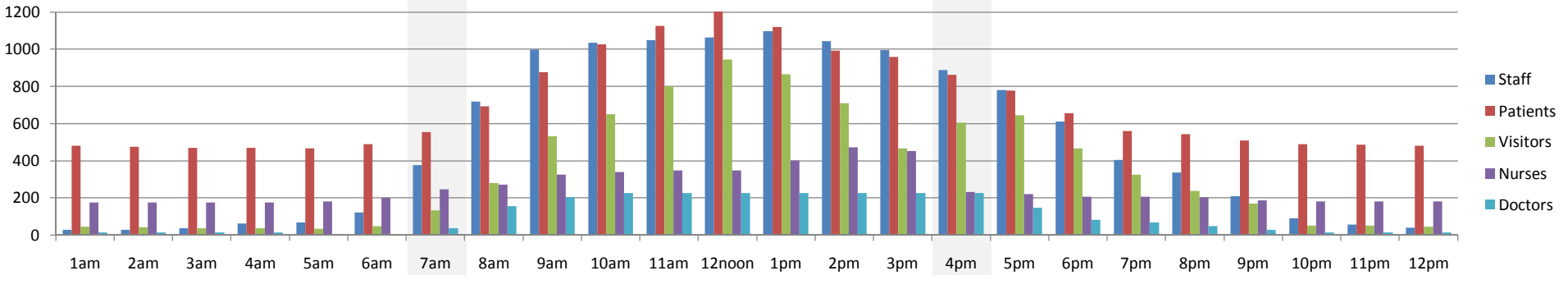
Existing Population Profile



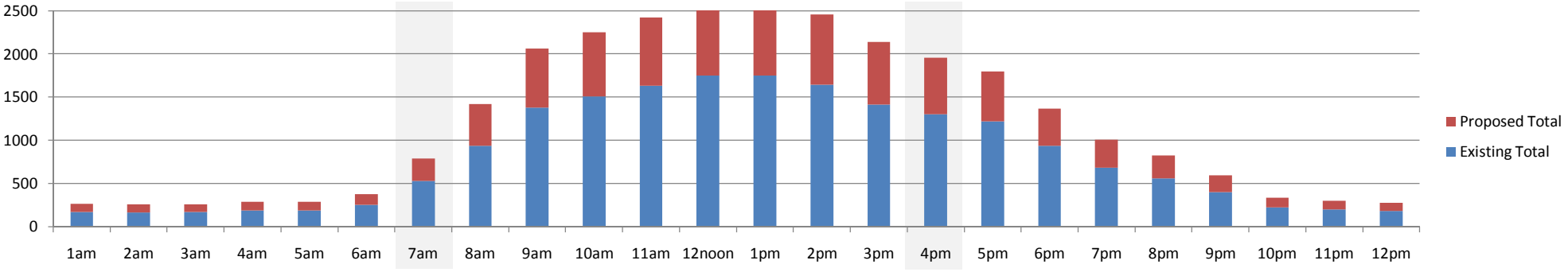
Existing Total Population Profile



Population Profile with Post Development



Total Population Profile with Post Development



The current travel mode split for the hospital 'population' is as follows:

Car Driver	84%
Car Passenger	10%
Bus	2%
Other	4%

This characteristic will change over time as additional accommodation housing is provided in the precinct and travel behaviour changes as a result of initiatives to encourage and facilitate the use of public transport, walking and cycling. However, if the existing characteristics are applied to provide a worst case sensitivity assessment the projected future traffic movements generated by the staged hospital development would be as follows:

	AM		PM	
	IN	**OUT**	**IN**	**OUT**
Stage 1A	645 (+94)	133 (+17)	214 (+34)	316 (+44)
Stage 1B	709 (+158)	142 (+26)	230 (+50)	366 (+94)
Stage 3	810 (+259)	179 (+56)	251 (+71)	411 (+139)

The movements have been distributed (to accord with the existing directional pattern) to give the traffic movement outcomes for the various stages of change.

5.3 ASSESSMENT

The only significant traffic increases resultant to the development will occur with the completion of Stage 1A, Stage 1B and Stage 3.

The operational performance of the Comenarra Parkway/Fox Valley Road is poor at the present time and traffic modelling with the additional traffic volumes generated subsequent to the Stage 1A development resulted in the Level of Service 'F' performance. The 'offset' arrangement of the intersection is difficult and there are major Telstra pits while the existing school building is close to the Comenarra

Parkway boundary. Numerous options were identified and assessed in order to identify an upgrade scheme which was practical, feasible and effective.

The iterative assessment process resolved that the upgrade works could be undertaken in 2 stages namely:

- Initial scheme for Stages 1A, 1B and 2
- Ultimate scheme for Stage 3.

A similar assessment process was undertaken for the Pacific Highway/Fox Valley Road intersection and this resolved that upgrade works would only be required as a result of the traffic demands of Stage 3. Details of the proposed upgrade works at these 2 intersections are provided in Figures 7, 8 and 9.

The results of the operational performance assessment of the intersections and accesses using SIDRA are summarised in the following:

	Stage 1A		**Stage 1B**		**Stage 3**	
The Comenarra Parkway/ Fox Valley Road	**AM***	**PM**	**AM**	**PM**	**AM****	**PM**
Level of service	D	E	D	E	C	D
Av Vehicle Delay	49.7	58.9	51.7	60.7	39.2	48.5

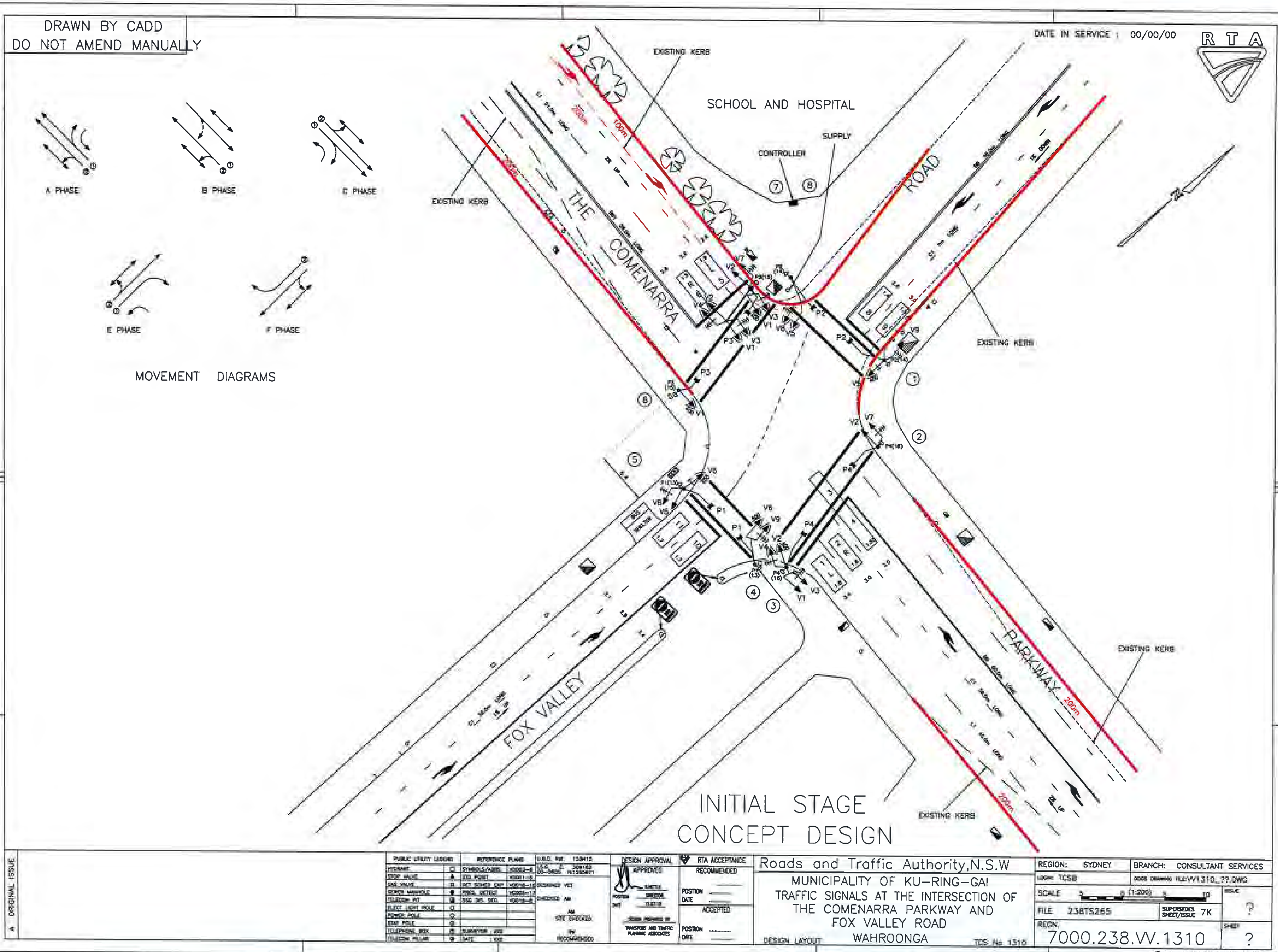
** with 'Initial Upgrade Works*
*** with 'Ultimate Upgrade Works*

Fox Valley Road/ Main Hospital Access	**AM**	**PM**	**AM**	**PM**	**AM***	**PM**
Level of service	B	B	B	B	B	B
Av Vehicle Delay	17.8	15.4	19.4	16.1	21.5	16.0

** with 'Initial Upgrade Works*

Fox Valley Road/ # Secondary Hospital Access	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Level of service	NA	NA	NA	NA	NA	NA
Av Vehicle Delay	3.5	5.3	4.2	9.1	5.6	18.9

 # gaps provided by traffic signals each way and platooned traffic cannot be modelled with SIDRA for 'uncontrolled' intersection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RTA
A PHASE
B PHASE
C PHASE
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F PHASE
MOVEMENT DIAGRAMS
SCHOOL AND HOSPITAL
SUPPLY
CONTROLLER
EXISTING KERB
THE COMENARRA
ROAD
PARKWAY
FOX VALLEY
100m
200m
INITIAL STAGE
CONCEPT DESIGN
Roads and Traffic Authority, N.S.W
MUNICIPALITY OF KU-RING-GAI
TRAFFIC SIGNALS AT THE INTERSECTION OF
THE COMENARRA PARKWAY AND
FOX VALLEY ROAD
WAHROONGA
DESIGN LAYOUT
TCS No 1310
REGION: SYDNEY
BRANCH: CONSULTANT SERVICES
FILE 238TS265
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FIG 7

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FIG 8

MOVEMENT DIAGRAMS

SCHOOL AND HOSPITAL

EXISTING KERB

CONTROLLER

SUPPLY

THE COMENARRA ROAD

EXISTING KERB

EXISTING KERB

FOX VALLEY PARKWAY

EXISTING KERB

EXISTING KERB

ULTIMATE
CONCEPT DESIGN

PUBLIC UTILITY LEGEND		REFERENCE PLANS
HYDRANT		
STOP VALVE		
GAS VALVE		
SEWER MANHOLE		
TELECOM PIT		
TRAFFIC LIGHT POLE		
POWER POLE		
SIGN POLE		
TELEPHONE BOX		
TELECOM PILLAR		

DESIGN APPROVAL
APPROVED
TRANSPORT AND TRAFFIC PLANNING ASSOCIATES

RTA ACCEPTANCE
RECOMMENDED
POSITION
DATE
ACCEPTED
POSITION
DATE

Roads and Traffic Authority, N.S.W

MUNICIPALITY OF KU-RING-GAI
TRAFFIC SIGNALS AT THE INTERSECTION OF
THE COMENARRA PARKWAY AND
FOX VALLEY ROAD
WAHROONGA

DESIGN LAYOUT TCS No. 1310

REGION: SYDNEY BRANCH: CONSULTANT SERVICES
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REGN. 7000.238.VV.1310 SHEET ?

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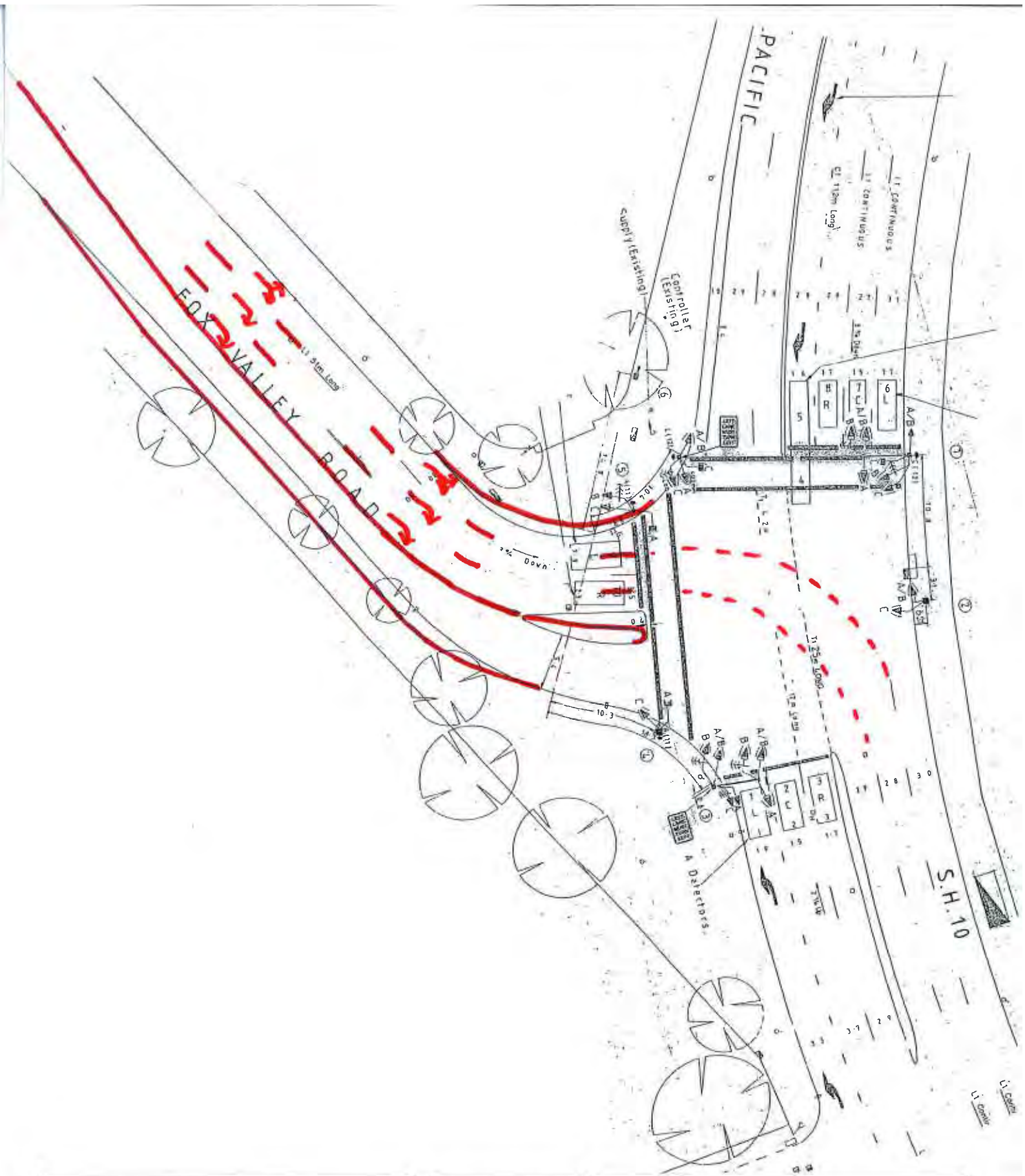

LEGEND

N

UPGRADE SCHEME

FIG 9

Fox Valley Road/ Lucinda Avenue	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Level of service	A	A	B	A	E	A
Av Vehicle Delay	13.9	9.0	20.5	9.2	67.7	9.9

Fox Valley Road/ Ada Avenue	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Level of service	A	A	A	A	B	A
Av Vehicle Delay	10.5	9.4	11.4	9.4	15.2	9.5

Pacific Highway/ Fox Valley Road	**AM**	**PM**	**AM**	**PM**	**AM***	**PM**
Level of service	B	D	B	E	B	D
Av Vehicle Delay	19.8	55.9	22.2	62.3	21.8	51.9

** with upgrade works*

5.4 INTERACTION WITH ESTATE DEVELOPMENT

Recent detail design development for the SAH project has enabled a much clearer understanding of the traffic implications. This detailed planning has enabled the various elements of the hospital population to be identified in terms of number and timeframe relative to the various stages which span a projected 6½ year timeframe. It is understood that the development of the Estate could occur over a 20 year (or more) timeframe. The proposed road upgrade works relative to the stages of the hospital development are as follows:

- Stage 1A
  - initial upgrade at The Comenarra Parkway/Fox Valley Road intersection
  - install NO PARKING along Fox Valley Road. The extent of this signposting and whether it will be full time or peak period would be determined by Ku-Ring-Gai Traffic Committee and Council.

- Stage 2
  - upgrade the hospital access intersection with additional egress lane (LT 'slip lane').

* Stage 3
  - ultimate upgrade at The Comenarra Parkway/Fox Valley Road intersection
  - upgrade scheme at Pacific Highway/Fox Valley Road intersection.

The Concept Approval for the Estate development identified some upgrade works which differ from that now established for accommodating the hospital traffic and some additional works which are not shown as being necessary for the hospital traffic. The basis adopted for assessing the hospital traffic demand was also entirely different and did not take account of staging.

The envisaged staging program of the Estate development is not know at this time and would appear to be very largely dependent on the 'market' for residential dwellings. It has not been possible (nor is it considered necessary) to attempt to integrate the Hospital staging with the Estate staging.

The works proposed for The Comenarra Parkway/Fox Valley Road intersection are 'all that can be done' and the ultimate scheme reflects the capacity improvements identified in the Estate assessment (albeit with some geometrical differences). Similarly, the works proposed at the Pacific Highway/Fox Valley Way intersection achieve the same identified capacity needs as the Estate assessment.

6. PARKING

6.1 EXISTING PARKING PROVISION

There is an existing parking provision on the site of some 1,308 spaces whilst there are generally some 100 cars parked along Fox Valley Road many of which can largely be attributed to the Hospital (ie visitors).

The Hospital staff have access to all of the on-site spaces while the public (patients and visitors) only have access to some 638 spaces. Staff and visiting doctors are not required by pay parking fees while it is apparent that there is also a significant element of parking space use by persons not associated with the hospital activities (ie adjacent uses). Parking surveys have previously been undertaken (day/date unknown) revealing the following peak occupancy:

Mid morning weekday	1,026 spaces (78.4%)
Mid afternoon weekday	916 spaces (70%)

The activity at the Hospital varies from day to day with Tuesdays and Thursdays representing the peak days while other fluctuations occur seasonally (eg Winter influenza etc) and there is anecdotal evidence that indicates that on some peak days the parking accumulation nears the capacity of the total parking spaces available.

6.2 FUTURE PARKING PROVISION

Due to the current high level of parking space occupancy, the disruption caused by construction of the new multi-level parking structure, the increased demands by construction workers and the need to absorb cars displaced from parking along Fox Valley Road it is proposed as the initial phase of work to:

- construct a temporary carpark of 258 spaces in the open area on the eastern part of the site

- construct a new carpark structure and adjacent open carpark

- construct 86 additional spaces as an extension of the open carparking on the western part of the site.

At the completion of this initial stage there will be 1,955 spaces plus the 258 temporary spaces while on completion there will be a total of 2,058 spaces (ie an increase of 750 spaces) when the temporary carpark will be removed. Details of the proposed staged provision of carparking are provided in Appendix F.

Completion of the project will result in the following population increase on a normal peak day:

Staff	+375
Doctors	+166
Nurses	+236
Patients	+348
Visitors	+272

Parking at hospitals presents some unique characteristics with:

- significant 'overlap' of shifts of some 30 minutes to provide for briefing/updating on patients

- significant day-to-day and week-to-week patient admissions (range 200 per week to over 600).

In the case of SAH there is essentially very little on-street or alternative parking available (none in the future with parking prohibited on Fox Valley Road). With completion of the project the total daily population will increase from 3,271 to 4,668 (ie +42.7%), however the increase during the peak times with shift changeover etc

will be some 60%. The proposed parking provision will represent a decrease from 1,308 to 2,058 (ie +57.4%) and this is considered to be a balanced and constrained outcome which reflects the principles of encouraging travel by public transport, walking and cycling whilst providing for the essential needs of the hospital and recognising the future circumstances of residential accommodation in the precinct. The existing circumstances of 'paid parking' for patients and visitors will be retained and consideration will be given to introducing a parking fees for staff and nurses using the multi-level structure.

The RTA Development Guidelines contain criteria for parking at hospitals, however this is based on surveys of small private older style hospitals with an average of some 2,000m^2 and a maximum daytime staff of 100. Council's DCP also contains criteria for parking at hospitals but again this can only be related to small hospitals and not large contemporary hospital providing a wide range of facilities and services.

7. TRANSPORT, PEDESTRIANS AND CYCLISTS

Buses

Passenger use of the existing two bus routes which service SAH is quite modest at the present time. The existing capacity of these services is as follows:

	AM (ph)		PM (ph)	
	To	**From**	**To**	**From**
Route 573	110 seats	110 seats	110 seats	110 seats
Turramurra – SAN	20 stand	20 stand	20 Stand	20 Stand
Route 753	22 seats	55 seats	55 seats	55 seats
Hornsby/Thornleigh – SAN	10 stand	10 stand	10 stand	10 stand

These existing services (Appendix E) provide the ideal circumstances of accessing centres (Hornsby and Thornleigh) and the rail services.

It is apparent that the existing bus services have the available capacity to cater for increases patronage resultant to the proposed development. The current peak frequencies (Route 573 – 2 per hour and Route 589 – 1 per hour) could readily be increased in response to increased demand.

Rail

Patronage of rail services in the Sydney Metropolitan area is increasing as a result of road congestion, travel cost and service upgrades. However, there is capacity on the existing 'main line' services which provide access to the SAN (with bus connection) particularly as this involves significant 'non-peak directional travel' (eg from the City in the morning peak).

Increasing the frequency of the bus routes servicing the SAH would result in direct increase in rail patronage.

Other

Car Pooling – The SAH have fostered car pooling and car sharing. Details of the SAH's CCU Pool and Travel Information Scheme are provided in Appendix G and the hospital administration actively encourages alternative modes of travel (ie to private motor vehicle).

Cycling – Bicycle storage facilities will be provided in 3 areas on the site for use of staff, nurses and doctors and these will be supplemented with lockers and showers. Bike racks will be provided for visitors and volunteers while it is unlikely that patients will choose to travel by bicycle.

Pedestrians

A comprehensive network of 'pedestrian' and 'shared' pathways will be provided throughout the hospital site linking the various internal elements and the existing/ future external networks.

Details of the envisaged pedestrian and cyclists provisions are provided overleaf on the diagram prepared by GTA Consultants.

Site Transport – Due to the large nature of the site and its topography an internal 'bussing' system will be maintained particularly for persons travelling on the external bus services.

The DG's Requirements for a Transport Access Guide and a Work Place Travel Plan are complied with in the Supplementary Papers.

8. ACCESS, INTERNAL CIRCULATION AND SERVICING

Access

The existing vehicle accesses on Fox Valley Road will be retained being:

- the main traffic signal controlled intersection located towards the eastern boundary

- the uncontrolled secondary access located towards the western boundary.

The opportunity will be taken to improve the circumstances/capacity of these accesses as follows:

Main Access – provide a third approach lane in the access as a left-turn 'slip lane' and allow the right-turn egress to be made in two lanes. This work will be undertaken in Stage 2 in conjunction with the upgrading of the internal road system.

Secondary Access – remove the kerbside parking along the Fox Valley Road between the main access and The Comenarra Parkway. This will be undertaken as an early part of the project after Stage 1A.

These vehicle accesses have operated satisfactorily in these locations for many years and will accommodate all vehicles requiring to access the site.

Internal Circulation

A designated regime for internal circulation and access has been designed to comply with the AS 2890.1 design criteria. Cars will be able to ingress and egress the designated carpark areas in an efficient and effective manner with particular regard for the need for patients to be set-down and picked-up at the Concourse access by cars using the visitor carpark. The new carpark areas, including the temporary

carpark, will connect to the existing access road system which will be upgraded in Stage 2 to the final arrangement.

There is a significant provision and designation of disabled driver parking spaces and the design of the carpark areas including bays, ramps, aisles etc will comply with the AS 2890.1 and AS 2890.6 criteria. The concourse porte-cochere (podium) facility will operate with a simple one-way traffic flow and a marked pedestrian crossing along the central pedestrian access corridor.

Servicing

Much of the existing provisions for servicing are located away from the new building areas and will remain unaffected by the new building elements. The three service vehicle elements which are relevant to the proposed development works are:

- the new delivery area (eg linen) in the CSB expansion which will be used by MRV vehicles

- the new oxygen delivery area in Stage 1A

- the kitchen food delivery and refuse removal through the Shannon Stage 3 area.

The provisions for all service vehicles will be suitable and appropriate to accommodate all vehicles requiring to access these areas.

9. CONSTRUCTION TRAFFIC MANAGEMENT

The proposed staged development project will occur over a projected 6½ year timeframe and as such will not have the potential construction vehicle impact of a single consolidated project. There will not be any significant excavation works and materials delivery, concrete pours and worker movements will reflect the peak construction traffic circumstances.

Construction vehicles will only access the site through the 2 existing access points one of which is traffic signal controlled. There will be not works affecting on-street vehicle and pedestrian movements apart from the upgrading of the main access intersection and any accommodating roadworks (eg Comenarra Parkway and Fox Valley Road intersection). These roadworks will be subject to the submission and approval of Traffic Control Plans at the relevant times prior to the commencement of work.

The proposed temporary carpark of 258 spaces will provide for worker parking while the hours of construction specified in the consent will be adhered to. The volume of vehicle movements during the various construction phases will not be any greater than that which will prevail on completion and operation of the hospital.

There will not be any requirement for construction vehicles to stand or wait on Fox Valley Road where NO PARKING/NO STOPPING restrictions will apply after Stage 1A.

The Comenarra Parkway and Fox Valley Road are both subject to LIGHT TRAFFIC restrictions, however construction vehicles for the SAH project will be exempt as the site can only be assessed along those roads. Trucks will be prevented from travelling along Lucinda Avenue and Ada Avenue due to the light traffic restrictions on those routes.

It is envisaged that detailed Construction Traffic Management Plans will be required to be submitted prior to the issue of Construction Certificates for each stage of the project.

10. RESPONSE TO THE DIRECTOR GENERAL'S REQUIREMENTS

This section of the report addresses relevant environmental planning instruments, policies and guidelines and Authority issues in accordance with the DGR's.

We understand that the Minister for Planning is not bound by the provision of an environmental planning instrument, other than a State Environmental Planning Policy in determining an application for a major project (Section 75R(3). In the giving of approval for a Concept Plan the Minister may take into account (but is not required to) the provisions of any environmental planning instrument that would apply but for the application of Section 75R.

The upgrading and expansion of an existing hospital facility presents many circumstances and considerations which are different to the development of other uses and the relevance of strategic planning policies. That is not to say that these policies are not at all relevant, however the SAH has demonstrated into willingness and initiative in regard to contemporary transport and travel policies by:

* funding a public bus service connecting to railway stations and the Metropolitan transport network

* promoting are facilitating for cyclists

* providing end of trip facilities for cyclists

* providing on on-site shuttle bus service

* providing traffic signal controlled pedestrian facilities

* providing a 'How to Find Us' WEB site facility with links to bus timetables etc.

∗ Metropolitan Transport Plan 2010 (February 2010)

Planning Objectives	Strategies	Compliance
- Effectively link Sydney's landuse planning with its transport network - Create a working, connected sustainable City - Improve quality of life boost the economy and help face future challenges - Integrate with the Metropolitan Strategy providing an effective framework for housing and employment growth and development in Metropolitan Sydney	- Provide 70% of new housing in established areas - Diversity with a variety of renewed neighbourhoods - Ample transport connections - Contain congestion - Concentrate development and supporting transport services in centres - Make better use of existing infrastructure	✓ ✓ ✓ ✓ ✓ ✓

∗ Integrating Landuse and Transport Policy Package (August 2001)

Planning Objectives	Strategies	Compliance
- Reducing the growth of VKT - Improving air quality and reducing green house emissions - Building more compact cities - Promoting economic development and creating jobs - Focus on the movement or people and good rather than vehicles - Focus on maximising accessibility	- Mix uses - Link public transport with landuse - Connect streets - Improve pedestrian access - Improve cycle access - Manage parking supply - Improve road management - Good urban design	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓

∗ NSW State Plan

This plan outlines what the State Government plans to achieve in terms of transport, economy, education, health, energy, community and justice. The proposed development will be compatible with these planning objectives by:

- providing expanded and upgraded health services
- providing housing accommodation integrated with the place or working and learning
- increasing the patronage of the transport service provided (bus)
- increase the number of jobs closer to home.

∗ Nature and Extent of Non-Compliance

Planning Instrument Ku-Ring-Gai DCP № 43 Carparking		Justification
Office Hostel (Group Home) Medical Centre Hospital Child Care Centre Tertiary Education Casual Accommodation	1 space per 33m^2 1 space per staff Assessed on merit 1 space per 25m^2 1 space per 3 beds+ 1 space per 2 day shift staff 1 space per 4 children 1 space per staff + 1 space per 3 students 1 space per unit + 1 space per staff	The proposed development has to some extent all of these elements as well as others (eg volunteers). However, there are numerous interactions as well as complementary and dual use considerations. It is not possible to apply the DCP criteria which are not drawn from data relative the SAH. The most relevant and practical means of assessment is one related to the existing demands factored to the known future circumstances.
Parking area dimensions		The carpark design will comply with the contemporary requirements of AS 2890.2 and AS 2890.6 as being more appropriate.

* Planning Guidelines for Walking and Cycling (December 2004)

Planning Objectives	Strategies	Compliance
- The Walking and Cycling City - Accessible centres	- Improve walkability and cycleability across the City	✓
- Walking and cycling catchments - Regional walking and cycling networks	- Emphasise urban redevelopment and renewal over urban expansion	✓
- Mixed use neighbourhoods - Local walking and cycling networks - Security and safety	- Create accessible centres by increasing density and landuse mix	✓
- Parks and open space - Building and site design	- Ensure walking and cycling and use of public transport is more direct and convenient than use of cars	✓
	- Create quality public spaces	✓
	- Locate centres near passenger transport stops	✓
	- Integrate local walking and cycling networks into neighbourhood scale designs	✓
	- Encourage active uses at street level	✓
	- Minimise the number of driveways crossing footpaths	✓
	- Design intersections to be visibly and physically tight to slow traffic and reduce pedestrian crossing distances	✓

∗ Transport and Accessibility Impacts

- The Assessment of Transport, Traffic and Parking Implications Report has been prepared in accordance with the requirements specified in the RTA Development Guidelines (and SEPP Infrastructure).

- The Supplementary Papers provide a Work Place Travel Plan and a Transport Access Guide. These documents will be upgraded throughout the duration of the project and the development of infrastructure for the precinct.

- The peak traffic movements are identified and the operational performance and needs of the access road system are assessed. The daily traffic movements are not relevant to the assessment.

- The parking criteria for hospital use contained in the RTA Guidelines and Council's DCP are not applicable to this comprehensive and multi-faceted health, teaching and accommodation facility. The nature of the facility is such that there are regular circumstances of peak activity while the significant 'change over time' for staff presents circumstances where parking cannot be constrained. The parking provision only shows a very modest 5% pro-rata addition to the existing circumstance.

- The construction traffic will not have any perceptible impact due to:
    - the 'drawn out' program for staged works
    - the traffic signal controlled access
    - the absence of any direct affectation on the roads (apart from upgrading works)
    - the construction traffic being less than the traffic generated by the completed project.