Australian Catholic University

Australian Catholic University (Strathfield Campus)

Transport & Accessibility Study

221872

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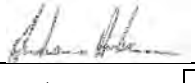
		Signature			
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1 Introduction

Arup has been commissioned by Australian Catholic University (ACU) to undertake a transport and accessibility study for the future extension and development of the Strathfield campus located at 167 – 169 & 179 Albert Road, Strathfield. This report has been prepared as a component of the Concept Plan Application which will be lodged with the Department of Planning under Part 3A Environmental Planning & Assessment Act 1979 ("EP&A Act").

The report has been prepared as per RTA's Guide to Traffic Generating Development, Version 2.2, October 2002. It describes the existing site access, traffic situation, road network performance and transport facilities in the vicinity of the site. The report provides an assessment of the transport requirements for the building occupants including pedestrian, cyclist and public transport facilities and analyses the proposed development's effect on the nearby residential streets and road network. An outline construction traffic management plan is provided.

1.1 Project DGRs

The NSW Government's Department of Planning issued a list of DGRs for the Australian Catholic University Strathfield Campus Concept Plan (Application Number MP 10_0231) dated 17 February 2011. Section 7 of the DGRs has addressed the Transport and Accessibility Impacts (Construction and Operational) as follows:

Provide a Transport & Accessibility Study prepared with reference to the NSW State Plan, Metropolitan Plan for Sydney 2036, Metropolitan Transport Plan, the NSW Planning Guidelines for Walking and Cycling, the Integrated Land Use and Transport policy package, NSW Bike Plan, Premier's Council for Active Living (PCAL) – Development & Active Living, and the RTA's Guide to Traffic Generating Developments (where relevant) and considering the issues as outlined in Table 1.

Table 1: DGR Requirements

Issue	Item Discussed at
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.	Sections 3.5 and 4.9.
Describe the measures to be implemented to promote sustainable means of transport to support and achieve relevant State Plan targets including public transport usage and pedestrian and bicycle linkages in addition to addressing the potential for implementing a location specific sustainable travel plan.	Section 5.6.
Provide an estimate of the total trips generated by the proposed development.	Section 5.1.

Daily and peak traffic movements likely to be generated by the proposed development, including the impact on nearby intersections and the need /associated funding for upgrading or road improvement works (if required). The traffic impact assessment should consider base models with future traffic generated by the proposal.	Section 5.3.
Details of the proposed access, parking provisions, loading facilities and service vehicle movements associated with the proposed development.	Section 4.
Minimal Levels of on-site car parking for the proposed development having regard to the proposed intensification of student/staff levels without further impacting on the surrounding residential precinct, opportunities to encourage pedestrian and cycle usage, public transport accessibility of the site, opportunities for car sharing, local planning controls and RTA guidelines (note: The Department supports reduced parking provisions, if adequate public transport is available to access the site).	Section 5.4.

1.2 History and Background of Strathfield Campus

The Strathfield Campus (Mount Saint Mary) site was formerly part of land belonging to the St James Church of England in 1823. In 1908, the Mount Saint Mary College was inaugurated for the training of teaching monks. In 1975, the Diploma in Primary and Junior Secondary Teaching was approved as a course in Advanced Education. A Postgraduate Diploma in Educational Studies, Pastoral Guidance was introduced in 1980. In the same year, approval was obtained for a joint Bachelor of Education with Polding College to teach years 5-8 program which commenced in 1982.

In 1981, the Federal Government required specified Colleges in each State to amalgamate. Mount Saint Mary College joined in the amalgamation, which was effected in January 1982 as Catholic College of Education Sydney. At the end of 1990, the Catholic College of Education Sydney formally handed responsibility for the College and its operations to ACU.

In 1994 an expansion of the main ACU campus was the subject of the Land and Environment Court approval. As part of the Court approval, conditions were imposed requiring 325 on campus parking and a limit of maximum 510 students on the campus at any one time. As part of the 1994 approval the vehicular access on Albert Road was closed and the main campus access was provided on Barker Road.

In 2002, ACU purchased the Our Lady of Loreto Nursing Home from the St Vincent de Paul Society. The building was extensively developed and re-named after ACU's Foundation Chancellor, His Eminence Cardinal Edward Clancy AC. At the same year Strathfield Council approved the Edward Clancy campus with a requirement of 38 off – street parking spaces and a limit of 240 students on the campus at any one time.

ACU anticipates continued growth of the two Sydney campuses (Strathfield and North Sydney) in the future. Therefore, ACU is seeking approval for a master plan to establish a future development strategy for the Strathfield campus which will permit redevelopment of parts of the site to facilitate future growth of the

campus. As part of the concept plan development this traffic and parking assessment is required.

1.3 Scope of the Report

The scope of this report is primarily to assess the following matters:

- Assessment of the existing traffic and transport arrangements;
- Assessment of the pedestrian routes to and from the site to the key locations (e.g. Strathfield station);
- Assessment of the suitability of the proposal;
- The likely traffic and parking impact of the proposal in the locality;
- The impact on pedestrian movement, safety and amenity; and
- Identify traffic and pedestrian safety issues during the construction stage of the development.

2 NSW Government Strategies and Policies

This report has been prepared in accordance with the following NSW Government Strategies and Policies:

- NSW State Plan 2010;
- Metropolitan Plan for Sydney 2036;
- Metropolitan Transport Plan;
- NSW Planning Guidelines for Walking and Cycling;
- Integrated Land Use and Transport Policy Package 2001;
- NSW Bike Plan;
- Premier's Council for Active Living (PCAL) – Development and Active Living; and
- RTA's Guide to Traffic Generating Development;

The proposed ACU masterplan development will contribute to the achievement of transport objectives contained in the various NSW Government strategies. A summary of these strategies and policies is provided below.

2.1 NSW State Plan 2010

NSW State Plan 2010 outlines the framework for the delivery of service improvements for NSW through strategies, priorities, targets and actions. The following summarises the contents of the *State Plan* which are relevant to the Blacktown and Mt Druitt hospital development proposal.

- **Better Transport and Liveable Cities**

  This chapter recognises the key link between transport links and jobs, facilities and quality of life. It includes priorities to improve the public transport system and the road network. Specific targets are:

  - Increase the proportion of total journeys to work by public transport in the Sydney Metropolitan region to 28% by 2016.
  - Reduce road fatalities to 4.9 per 100,000 population by 2016.
  - Increase the mode share of bicycle trips made in the Greater Sydney Region at a local and district level to 5% by 2016.

- **Healthy Communities**

  The chapter highlights the priority to 'Promote healthy lifestyles' through development and initiatives that can shape our lifestyles, such as influencing transport modes and supporting incidental exercise.

- **Green State**

  This chapter looks toward NSW being a 'green state.' The priority, 'Tackle climate change' seeks to promote initiatives that reduce carbon dioxide emissions, including those from transport.

Commentary

The *State Plan's* priorities align with developing transport strategies that guide sustainable outcomes. Transport infrastructure improvements identified by the *State Plan* support increased transport modal choices to allow for more journeys to be undertaken using more sustainable forms of transport. The *State Plan's* priorities guide the ACU masterplan development proposal towards encouraging active transport choices among students, staff and visitors, to facilitate healthy lifestyles and to reduce carbon dioxide emissions.

2.2 Metropolitan Plan for Sydney 2036

The NSW Government launched the *Metropolitan Plan for Sydney 2036* in 2010 to shape the future growth of Sydney. The publication follows a scheduled five-year review of the *Sydney Metropolitan Strategy* (2005) to ensure that it is responding to the challenges facing Sydney. The *Metropolitan Plan for Sydney 2036* is founded by the following policy settings:

- Establish no new Greenfield fronts to Sydney's existing urban footprint under the Plan.
- Increase the proportion of homes within 30 minutes by public transport of jobs in a Major Centre, ensuring more jobs are located closer to home.
- Build at least 70% of new homes in the existing urban area.
- Enable residential and employment growth in areas where there is available or planned public transport capacity.
- Build at least 80% of all new homes within the walking catchments of existing and planned centres of all sizes with good public transport.
- Plan land use, service provision and infrastructure capacity for 770,000 additional homes by 2036 and 760,000 more jobs by 2036.

The *Metropolitan Plan for Sydney 2036* highlights the importance of integrating transport and land use planning to overcome Sydney's challenges of managing congestion and reducing Sydney's energy-related greenhouse gas emissions. The Plan promotes actions to support sustainable travel, including the implementation of the NSW Bike Plan and Workplace Travel Plans.

Commentary

The *Metropolitan Plan for Sydney 2036* underscores the importance of future growth of Sydney. ACU, located within 25km of the Sydney CBD fringe will indirectly contribute to achieve the objectives contained in the Metropolitan Plan for Sydney 2036.

2.3 Metropolitan Transport Plan

The *Metropolitan Transport Plan* is a complementary strategic document to the *Metropolitan Plan for Sydney 2036*. It outlines the NSW Government's strategy to effectively link Sydney's land use planning with its transport network. The four key vision statements of the *Plan* are:

- Commuting to work easily and quickly.

- Transport and services accessible to all members of our community.
- An efficient, integrated and customer focused public transport system.
- Revitalised neighbourhoods with improved transport hubs.

The *Metropolitan Transport Plan* highlights the role of transport in Sydney as needing to go beyond catering for growth to being able to contribute to shaping a compact and efficient city. The *Metropolitan Transport Plan* is shown in Figure 1.

Figure 1: Metropolitan Transport Plan

Source: NSW Government, 2010

Rail

The *Metropolitan Transport Plan* outlines the following initiatives and improvements to the rail network in 2010 – 2020:

- Constructing the South West Rail Link.
- Constructing the City Relief Line, adding new rolling stock and new platforms to busy CBD stations, leading to more and faster trains from Western Sydney.
- Beginning construction of the North West Rail Link.
- Rolling out new train carriages including Waratah and OSCARs to provide air conditioning to all passenger rail carriages.
- Extending light rail operations to Dulwich Hill and through the CBD.

Buses

The *Metropolitan Transport Plan* outlines the following initiatives to improve bus connections:

- Add 1000 new buses to Sydney's bus network, increasing the size of the bus fleet by approximately 25%.
- 43 strategic bus corridors, all with new bus priority measures, to provide a network of routes connecting the City of Cities.
- Future strategic bus corridors are planned for the areas around the North West and South West Growth Centres, and the Western Sydney Employment Hub.

Bicycle and Pedestrian Infrastructure

A key element of the *Metropolitan Transport Plan* is the NSW Bikeplan 2010, which outlines the delivery of missing cycle links in the Metro Sydney Bike Network and provides funding to assist local councils in improving local cycleway networks. The *Plan* recognises the potential to shift a high number of short trips (under 10 kilometres) from car to active transport alternatives such as cycling and walking.

Commentary

The *Metropolitan Transport Plan* recognises the strong links between land use planning and transport and the need for integration between the two, to enhance the social and economic value of Sydney. It also highlights that the city's economy relies on good transport infrastructure to allow access to jobs, and also highlights that the perception of transport access needs to be regarded high to encourage investment into employment centres.

The ACU masterplan proposal provides significant opportunities to promote active and public transport to its future students and staff. The ACU shuttle bus service is an effective tool to achieve Metropolitan Transport Plan.

2.4 NSW Planning Guidelines for Walking and Cycling

This document was prepared by the NSW Department of Infrastructure, Planning and Natural Resources (DIPNR) in 2004, outlining guidelines to assist land-use planners and related professionals to improve consideration of walking and cycling in strategic planning and development assessment. The guidelines have been designed to provide a walking and cycling focus to the NSW Government's *Integrating Land Use and Transport Planning Policy Package*.

The guidelines encourage the preparation of Transport Management and Accessibility Plans (TMAPs) as part of masterplanning and development approvals process for larger developments. TMAPs promote a mode shift away from motor vehicle use toward walking, cycling and use of public transport.

TMAPs generally comprise a background study, an action plan and an agreement between council, the proponent (developer, building owner/manager or tenant) and other relevant stakeholders, aimed at:

- Managing transport impacts of developments.
- Maximising the use of public transport, walking and cycling.
- Reducing VKT (Vehicle Kilometres Travelled) growth by cars and commercial vehicles generated by the development.

- Reducing car reliance.
- Minimising the impacts of freight, whilst allowing for efficient freight movement.

The guidelines also recommend the preparation of Transport Access Guides as part of a development approval. TAGs are concise presentations of how to reach a site or venue by public transport, walking and cycling. The objective is to make the choice of travel by these modes easier. TAGs are to be prepared in accordance with the RTA/SEDA brochure, *Producing & Using Transport Access Guides*.

The bicycle provision for the proposed masterplan will be in accordance with NSW Government Guidelines for Walking and Cycling (refer to Section 4.9).

2.5 Integrated Land Use and Transport Policy Package 2001

The *Integrated Land Use and Transport Package* (DUAP, 2001) provides guidance to local councils in implementing the objective of 'promoting attractive and convenient places to live and work.' This *Package* emphasises the need for urban structures, building forms, land use location, development designs, subdivisions and street layouts to achieve sustainable transport objectives. The *Package* introduces the following concepts to be considered when planning for transport choice:

Convenience — the transport mode needs to be easy to find and use, and to transfer from one mode to another.

Information — reliable information at accessible locations is essential to encourage use of various travel alternatives.

Proximity — transport facilities and services, such as cycle paths and bus services, need to be in close, convenient and obvious locations to people's trip origins and destinations.

Destination choice — the more destinations that can be linked on a public transport route, the more attractive it will be.

Directness — routes should take the shortest and least deviating course, with priority to achieve fast travel times for walking, cycling and public transport (e.g. pedestrian links, dedicated bus lanes, and bikeways).

Security — the environment for walking and waiting needs to be comfortable and safe from personal attack or conflicts with traffic (e.g. waiting areas sheltered from the elements, natural surveillance, good lighting, bike lanes on major roads).

Commentary

The *Integrated Land use and Transport Package* highlights the key role that planning has in facilitating sustainable transport as well as the risks of inhibiting transport choice. The *Package* recognises that transport planning concepts need to be considered at all stages of land use planning to result in successful urban communities. The ACU masterplan proposal has been designed with consideration to the key concepts outlined in the *Integrated Land Use and Transport Package*.

2.6 NSW Bike Plan

A key element of the Metropolitan Transport Plan is the NSW Bikeplan 2010 that outlines the delivery of the building of missing cycle links in the Metro Sydney Bike Network and provides funding to assist local Councils in improving local cycleway networks. The Plan recognises the potential to shift a high number of short trips (under 10 kilometres) from car to active transport alternatives such as cycling and walking.

The bicycle infrastructure of proposed ACU masterplan is aligned with the key objectives stated in NSW. Further discussion is held in section 4.9.

2.7 Premier's Council for Active Living (PCAL) – Development and Active Living

Development and Active Living: Designing Projects for Active Living document is a resource that helps navigate and advise on urban design factors that will promote active living in development. It is designed to assist timely processing of development applications and includes information, case studies and a quick guide to help planners meet this challenge.

Specifically, the document establishes the following five principles of active living:

- Walkability and Connectivity
- Active Travel Alternatives
- Legibility
- Quality Public Domain
- Social Interaction and Inclusion

The document also establishes matters of consideration to be considered in the development assessment process for each of the active living principles. Table 2 summarises the matters of consideration applicable for institutional development types (including educational facilities such as universities).

Table 2: Active Living Matters for Consideration for Institutional-type development

Active Living Principles	Matters for Consideration
Walkability and Connectivity	• Movement passing and through the site is facilitated • Pathways connect logically to the existing pedestrian and cycle network
Active Travel Alternatives	• Supportive facilities available • Promotion of initiatives which will increase commuting by alternative forms of transport other than the private vehicle • Public transport is available and accessible • Reduce the need to travel, particularly by car
Legibility	• Streetscape and pedestrian environment are recognisable and coherent • Workers, students and visitors are informed about local services and networks

Active Living Principles	Matters for Consideration
	• Welcoming, activated and stimulating places • Access to usable open space, with facilities for all ages, abilities and ethnicities • Promotes a safe community
Social Interaction and Inclusion	• Opportunities to interact • Barrier-free movement and entry • Provision for the human services needs of the workforce, preferably on-site

Commentary

The proposed masterplan development is generally consistent with the matters of consideration outlined in *Development and Active Living: Designing Projects for Active Living*.

2.8 RTA's Guide to Traffic Generating Development

This document was prepared by the NSW Roads and Traffic Authority in 2002 outlining all aspects of traffic generation considerations relating to developments. It provides the basis of which the RTA reviews development applications subject to SEPP 11 (which has been subsequently superseded by SEPP Infrastructure). Specifically, the guide outlines traffic generation rates and parking requirements for specific land uses, as well as cost impacts of traffic generated by developments.

Commentary

The RTA guide does not provide any particular traffic generation and parking provision rate for tertiary educational institution. Therefore, traffic generation for the proposed masterplan is calculated based on existing traffic generation (refer to section 5.1). Parking provision has been estimated based on based on the maximum number of future students and staff at the campus at any one time (refer to section 4.5).

3 Existing Conditions

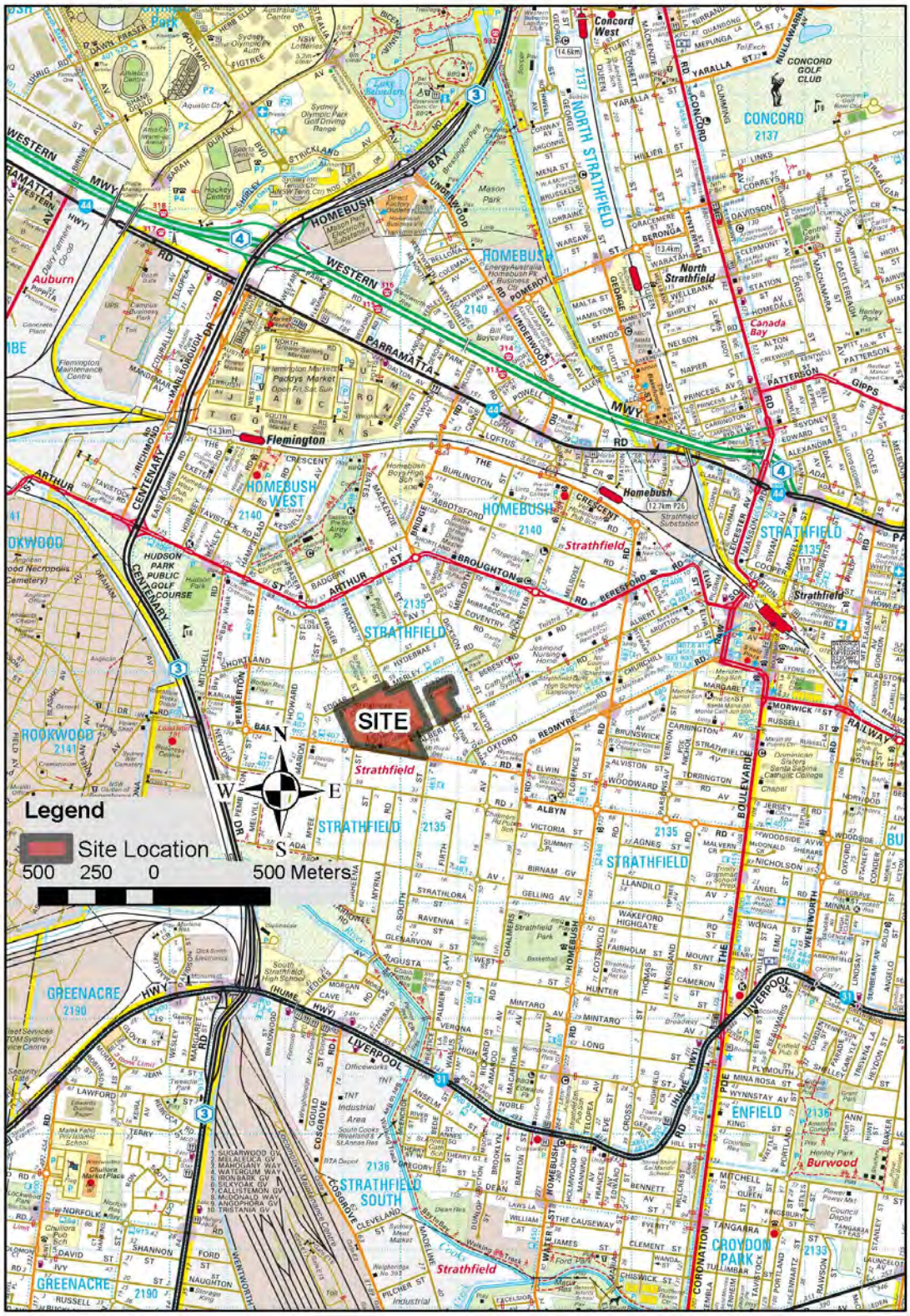
3.1 Site Area and Land Uses

The site (Lot 11 DP869042 – 179 Albert Road & Lot 12 – DP1058289 – 167 – 169 Albert Road) occupies approximately 5 hectares of land across a number of land parcels. The campus is approximately 1.6km south – west from the Strathfield town centre within an established residential area.

The pedestrian and vehicular access is provided via Barker Road. Another pedestrian access to the main campus is provided via Albert Road. Albert Road vehicular access is only available during the emergencies. Both pedestrian and vehicular access to the Edward Clancy campus is provided via Albert Road. Several residential and educational properties separate the two campuses (refer to Figure 2).

The surrounding land uses are predominantly single residential dwellings. A number of residential dwellings near the vicinity of the site are currently under construction. A number of schools and churches are located within close proximity of the university.

Figure 2: Site Area



3.2 Road Network and Traffic Data

Barker Road, a collector road, runs along the southern boundary of the main campus. It provides east – west connection between Redmyre Road (east) and Pemberton Street (west). At west of Pemberton Street, Barker Road only provides access to the residential properties and therefore acts as a local road. On the western end of Barker Road no vehicular connection is provided to Centenary Drive (M3 Motorway).

In front of the site, Barker Road is a two lane two way road with additional parking lanes on each side. Speed limit is restricted to 50 km/h and heavy vehicle restriction (4 ton and over) is in place in Barker Road and the locality.

Photograph 1: Barker Road

East of South St (looking east)

West of Wilson St (looking east)

In front of the site, Barker Road carried approximately 700 – 750 vehicles in the am peak hour which generally represents about 10% of the daily traffic volume (refer to Figure 3 and Figure 4). Therefore, the average daily volume in Barker Road can be estimated as 7,000 – 7,500 vehicles.

Redmyre Road provides connection between Barker Road and Raw Square. This is also a low speed collector road. In some sections of Redmyre Road, relatively large central median strip separates the two way traffic.

Pemberton Street is another collector road (major local road) which provides north – south connection between Arthur Street (north) and Barker Road (south). It is also a two lane two way road with parking lanes on both sides. Speed limit is restricted to 50 km/h and heavy vehicles restriction is in place in this street.

Albert Road provides vehicular access to Edward Clancy campus. It also provides access to the residential prosperities and Catholic Institute of Sydney located at 99 Albert Road. It is a two lane two way lane road with additional parking lane on both sides of the street. On the western end of Albert Road the road terminates as vehicular access is prohibited to the main campus via this road. The vehicular access is only available during emergency situations (refer to Photograph 2).

Photograph 2: Albert Road

	
Looking east	At Main Campus entrance

Arthur Road provides sub – arterial connection between Railway Street/ Church Street (Rockwood) and Broughton Road (Homebush). It is generally a two lane two way 50 km/h road. As per 2005 RTA's traffic count Arthur Street, at east of Pemberton Street, carried 15,860 vehicles per day.

All the above roads carry a significant amount of school traffic due to a number of major schools in the locality.

3.3 Nearby Intersections

The two intersections that are likely to carry the majority of the ACU traffic are Barker Road/ Redmyre Road/ Elwin Street and Arthur Street/ Pemberton Street (refer to Photograph 3).

Photograph 3: Intersections at the vicinity of the site

	
Barker Road/ Redmyre Road/ Elwin Street (looking south - west)	Arthur Street/ Pemberton Street (looking east)

Barker Road/ Redmyre Road/ Elwin Street intersection is located approximately 500m east of the main campus. It is a priority controlled dog legged intersection. Vehicles on Redmyre Road obtain priority over other approaches.

Arthur Street/ Pemberton Street intersection is located about 1.1km north – west of the site. It is also a priority controlled T – intersection.

Both Barker Road/ Redmyre Road/ Elwin Street and Arthur Street/ Pemberton Street intersections have been surveyed by Arup Appointed private contractor R.O.A.R. data on Thursday, 26 May 2011 (during school term and last week of the ACU academic term). The general am and pm peak hour traffic volume in these two intersections is shown in Figure 3 and Figure 4 and detailed survey data is attached in Appendix A.

The traffic volume data in Figure 3 and Figure 4 shows that Barker Road/ Redmyre Road/ Elwin Street carried 1124 vehicles in the am peak and 651 in the pm peak period respectively.

The Arthur Street/ Pemberton Street intersection carried 1424 vehicles in the am peak and 1196 vehicles in the pm peak hour respectively. The traffic volumes in these two intersections are generally low and are acceptable in this residential neighbourhood.

Figure 3: Traffic Volume Data – AM Peak

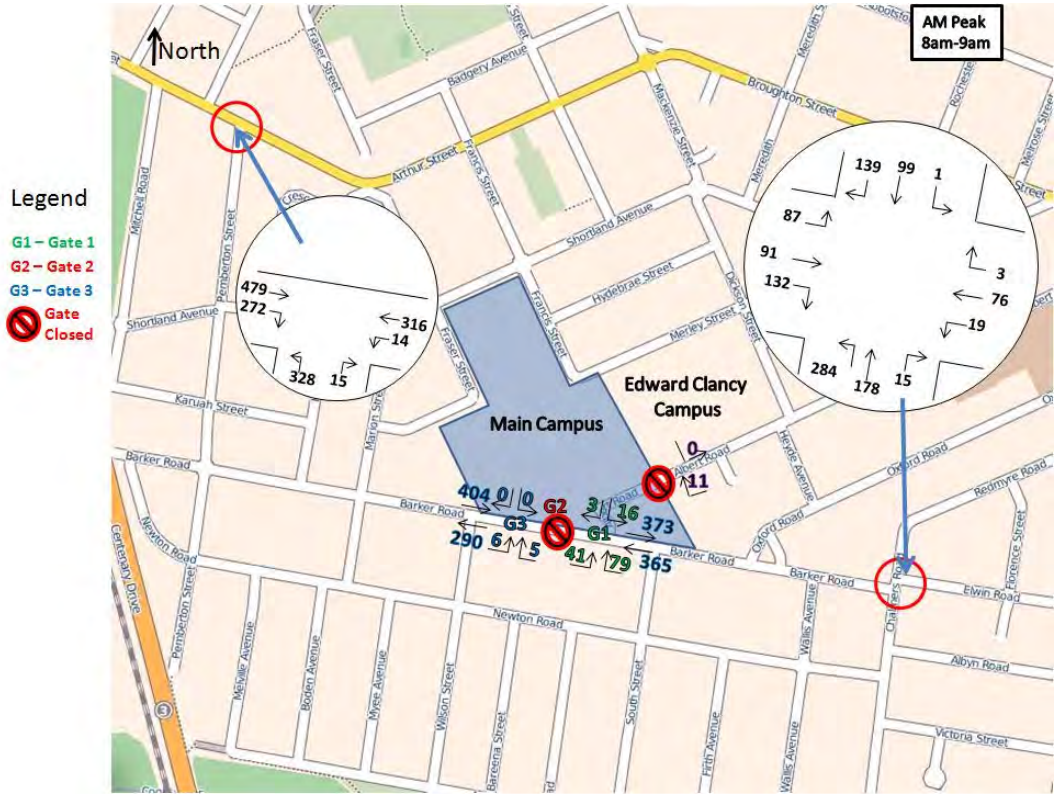
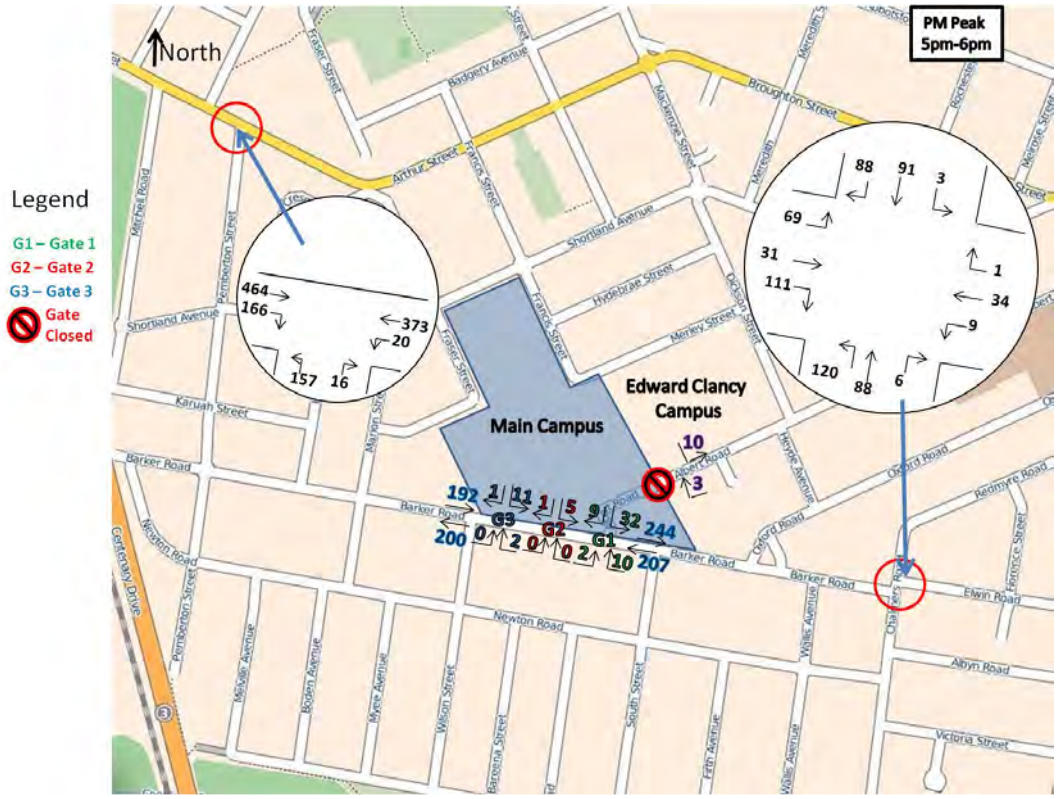


Figure 4: Traffic Volume Data – PM Peak



3.4 Existing Vehicular Access

In total three vehicular accesses are provided on Barker Road. The primary vehicular entrance (Gate 1) to the main campus is located about 70m west of South Street intersection. A short right and left turn bay is provided on Barker Road to this access (refer to Photograph 4).

Gate 2 (mid car park access) is located about 105m west of Gate 1. Gates 1 and 2 are linked internally connecting to a number of car parks. Gate2 was found to be closed in the am peak survey. Around midday this access was opened for a number of delivery vehicles to access the loading area.

Gate 3 (western vehicular access) is located about 20m west of Gate 2. This car park has no internal vehicular link with other car parks.

Photograph 4: Existing Vehicular Access via Barker Road

Gate 1 (main campus access) looking east

Gate 1 (main campus access) looking west

Gate 2 (mid car park access) view from inside

Gate 3 (western car park access)

On Albert Road, two separate vehicle access is provided. The eastern access is an exit driveway but loading vehicles can enter via this access. This access is located about 20m Allenby Crescent intersection. The western access (in) is located about 20m west of the eastern access (refer to Photograph 5).

Photograph 5: Vehicular Access on Albert Road

	
Eastern Access (in and out)	Western Access (out)

3.5 Pedestrian Facilities

Pedestrian access to the campus is separated from the vehicular access. The pedestrian paths are generally well established in the area. Footpaths are generally provided on both sides of the street in the vicinity of the campus (refer to Photograph 6). On both end of the campus pedestrian crossing facilities are provided on Barker Road. Just east of South Street a pedestrian operated traffic signal is provided. Just east of Marion Street a pedestrian refuge island is provided on Barker Road to facilitate the pedestrian to cross the street (refer to Photograph 1).

A pedestrian connection is provided between Barker Road and Albert Road via Mount Royal Reserve. On other local streets, pedestrian facilities are also generally adequate.

Photograph 6: Pedestrian Footpath in the vicinity of the campus

Pedestrian access to the main campus via Barker Road

Pedestrian access to the main campus via Albert Road

Footpath on the northern side of Barker Road (looking west)

Footpath on the southern side of Albert Road (looking west)

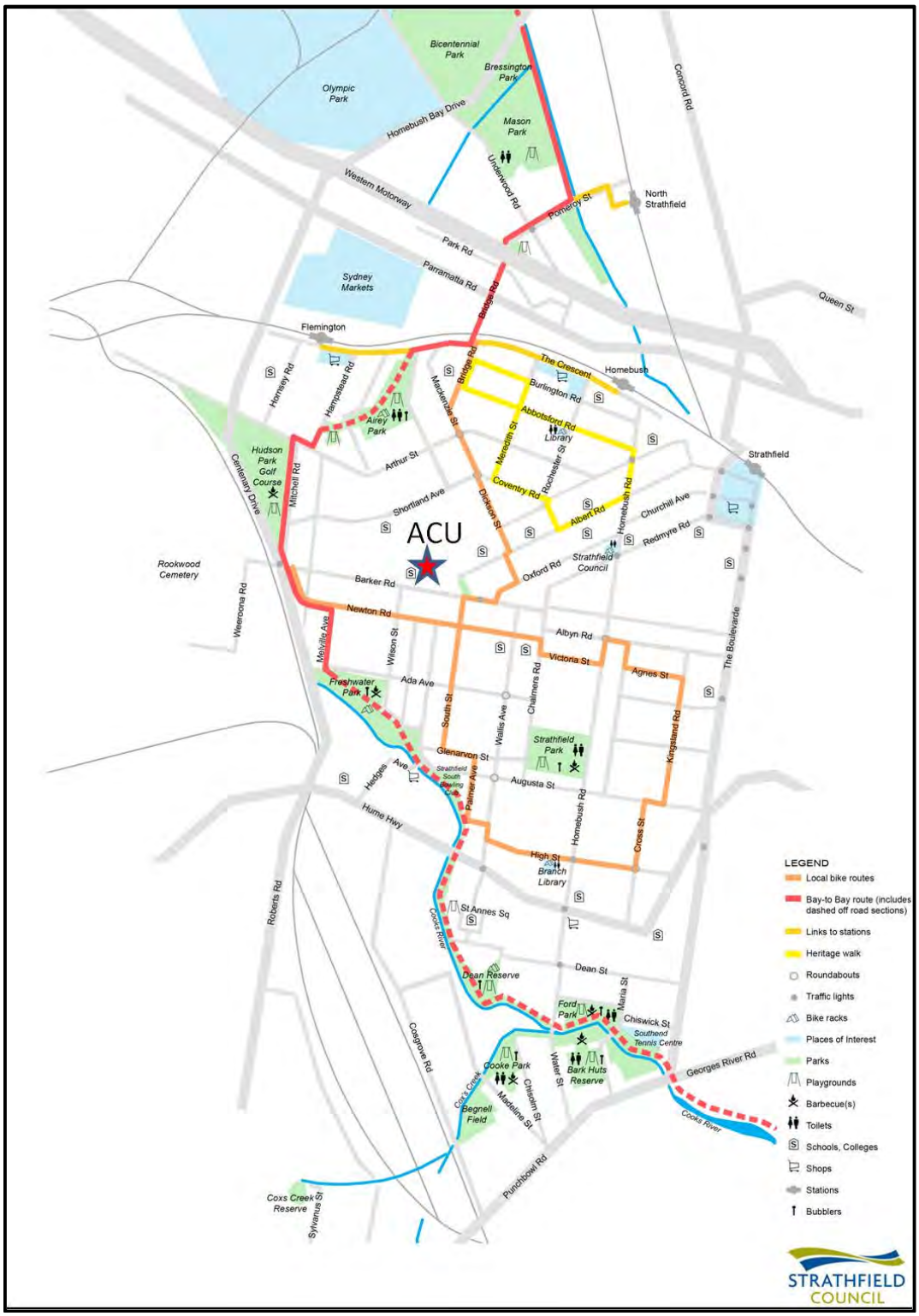
Strathfield station is about 2km from the site. Considering average pedestrian speed of 1.2m per second, the campus is 25 - 30 minute walk from the station. The pedestrian path between Strathfield Station and campus is adequate.

During the site visits very few students were observed to walk to the campus.

3.6 Bicycle Routes and Facilities

There is no shared bicycleway along Barker Road. A local bicycle way runs along South Street – Barker Road – Oxford Road – Heyde Avenue - Dickson Street (refer to Figure 5). However, bicycle signage or pavement markings are not noticeable in this section of the route. During the site visit very few students were observed to ride to the campus by bike.

Figure 5: Bike Routes within Strathfield LGA



3.7 Public Transport Facilities

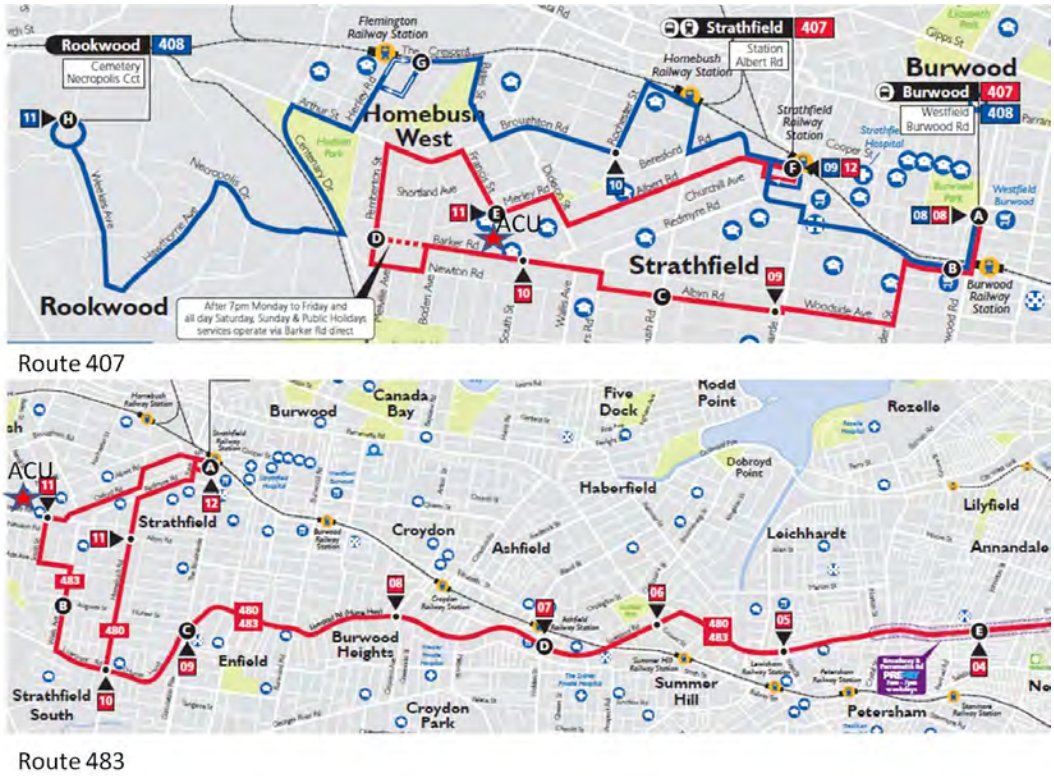
3.7.1 Bus

Bus route 407 between Burwood and Strathfield stations operates along Barker Road (refer to Figure 6). Service frequency is approximately 20 minutes in both directions in the peak hour.

Route 483 operates between Strathfield Station and the city. This route operates along South Street – a small section of Barker Road – Oxford Street. Service frequency is approximately 20 minutes in the peak period.

A number of bus stops are located near the main campus entrance (refer to Photograph 7).

Figure 6: Bus Route along Barker Road



Photograph 7: Bus Stops on the northern side of Barker Road

	
Just west of South Street	Just west of Gate 3 (western vehicular access)

3.7.1.1 Shuttle Bus Services

The university has a free shuttle bus operates between the main campus and Strathfield station (Strathfield Square). According to the university website:

- Bus leaves every 10 minutes from Strathfield Station beginning 7:30am and leaves every 10 minutes from Strathfield Campus beginning 7:40am;
- Bus leaves every 30 minutes from Strathfield Station beginning 10:30am and leaves every 30 minutes from Strathfield campus beginning 10:45am; and
- Last bus leaves Strathfield Station at 8:30pm (5:45pm during exams, study week and out of semester) and last bus leaves Strathfield Campus at 8:45pm (6:00pm during exam week, study week and out of semester).

The shuttle bus service is flexible to meet fluctuations in demand. During school holiday and exam periods, for example, services are adjusted to ensure an efficient transport service is provided.

3.7.2 Train

As stated above, Strathfield station is located about 2km north – east of the campus. As a major transport hub, all train (Northern, Inner West, Western and South railway lines and CountryLink) stop at Strathfield resulting one of the highest frequency station in Sydney. The high frequency trains are connected by bus services in various directions.

3.8 Parking Conditions

3.8.1 On – Street Parking

Parking is generally unrestricted on Barker Road and all other residential streets. Arup has undertaken on – street parking surveys in the nearby residential streets on the following three days:

- Thursday, 26 May 2011 – last week of the university term;
- Monday, 30 May 2011 – first day of the exam period; and
- Tuesday, 26 July 2011 – first week of Term 3

All the above three surveys were undertaken during the school term. The surveyed streets are shown in Figure 7 - Figure 9. The streets are selected based on the similar survey undertaken by Colston Budd Hunt & Kafes Pty Ltd[1] (CBHK) in 2009. The figures show that campus parking was significantly higher compared to overall on- street parking. The total parking occupancy is significantly higher during the university term, especially the campus parking occupancy being slightly over capacity.

The on- street parking occupancy of the three surveys is compared in Figure 10. The graph shows that there was a reasonable amount of vacant spaces in the nearby residential streets in all the surveys. However, during the uni term survey, the parking occupancy has increased to 60 – 65%, presumably students parked in these residential streets.

[1] Review of the Existing Parking and Traffic at the Australian Catholic University, Strathfield Campus, Barker Road, Strathfield – October 2009

Figure 7: Arup Parking Survey Last Week of University Term

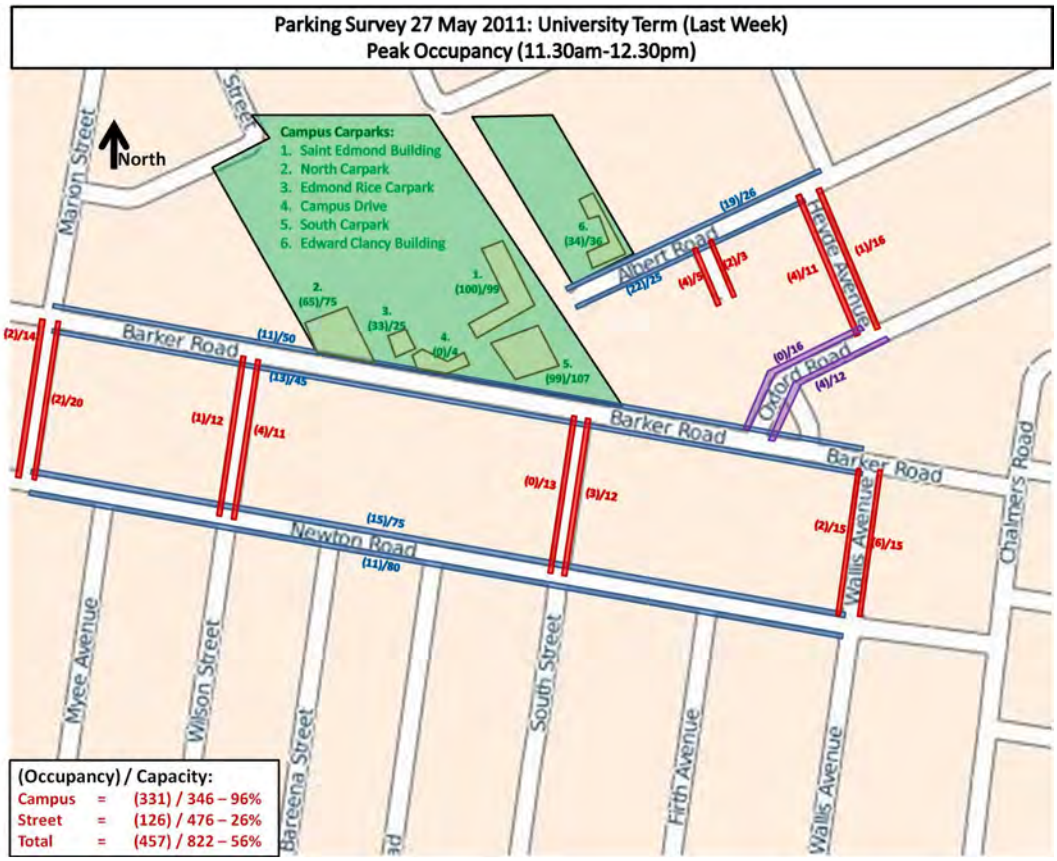


Figure 8: Arup Parking Survey University Exam Period

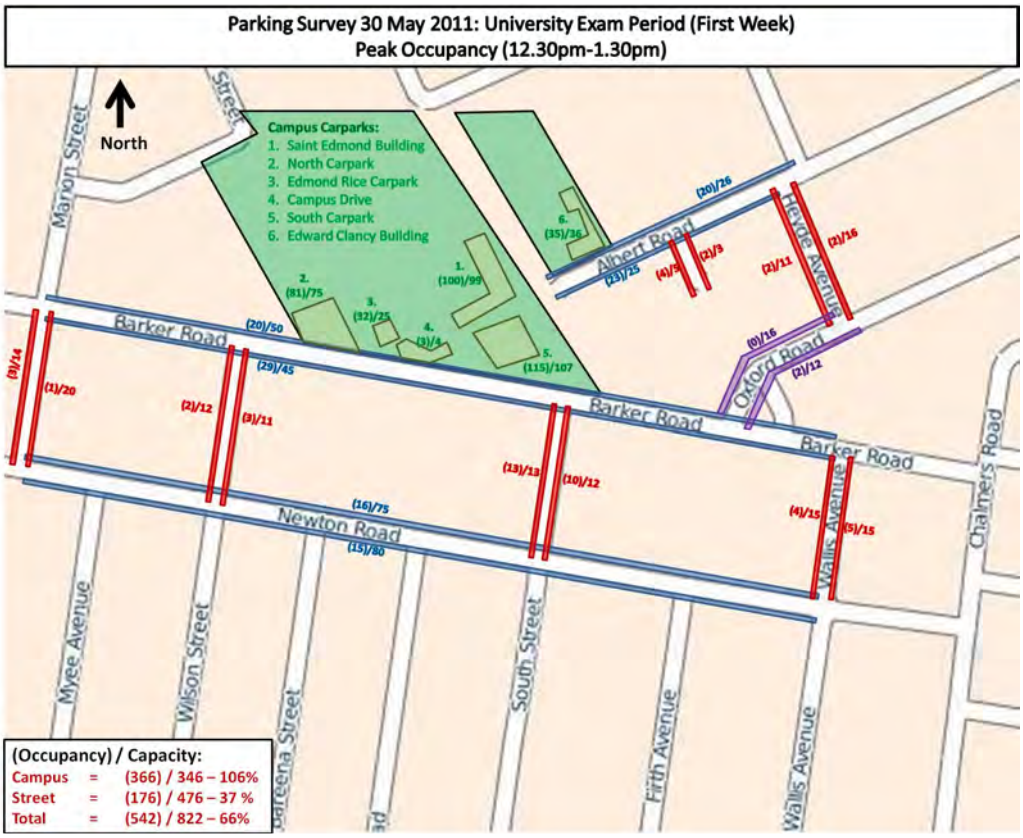


Figure 9: Arup Parking Survey First Week of University Term

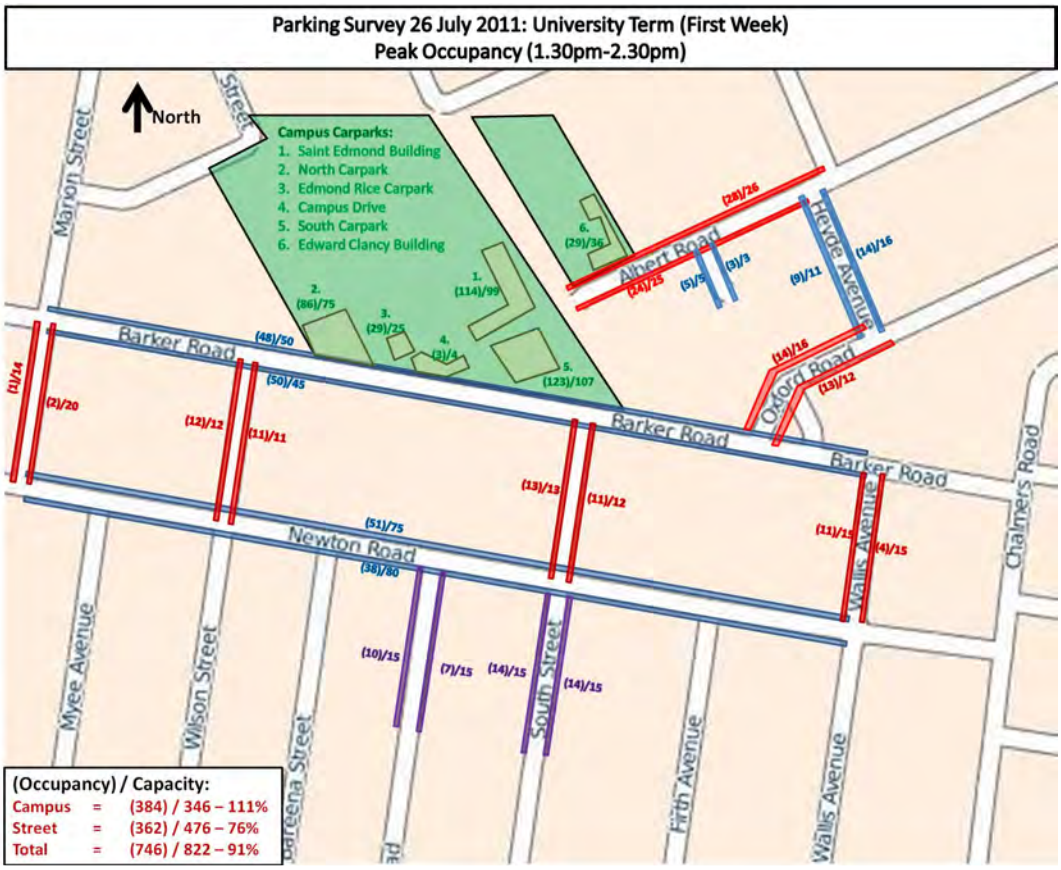
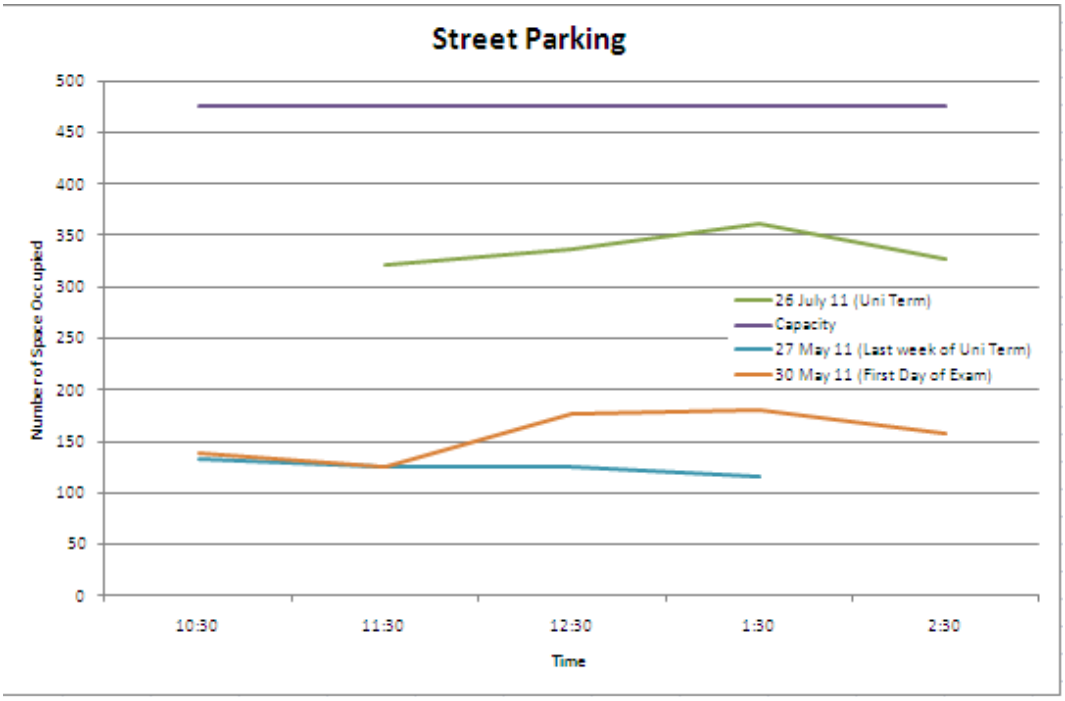


Figure 10: On Street Parking Occupancy (hour beginning)



A comparison of the Arup survey and the CBHK survey are shown in Figure 11 - Figure 13. The parking occupancy in Figure 11 shows that during the last week of the university term on campus parking occupancy was close to capacity in the Arup survey, where as parking occupancy was generally lower in the CBHK survey due to university break.

Arup second survey was undertaken during the exam period where on campus parking was over capacity. However CBHK survey, which was undertaken during the university term but the school holiday, parking occupancy was generally lower (refer to Figure 12).

During the university and school term, parking occupancy is significantly higher in both Arup and CBHK surveys, compared to surveys undertaken at other times (refer to Figure 13).

Figure 11: Comparison of Arup and CBHK Surveys

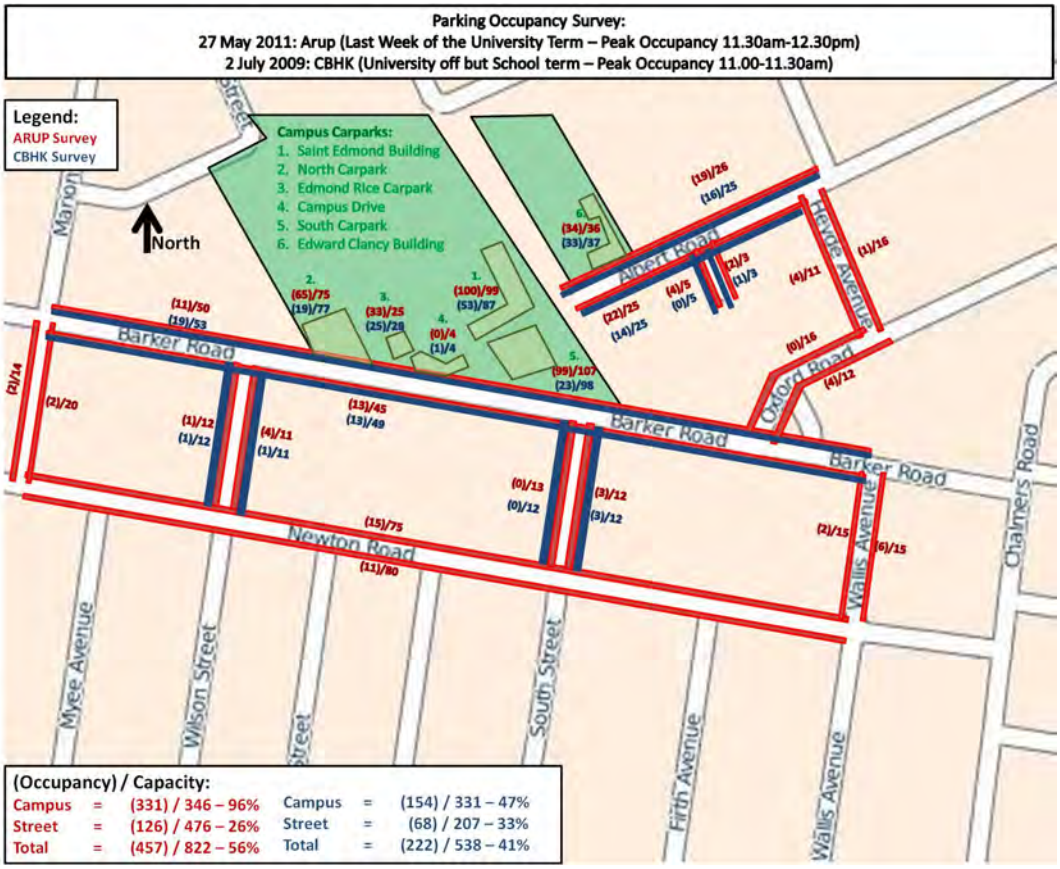


Figure 12: Comparison of Arup and CBHK Surveys

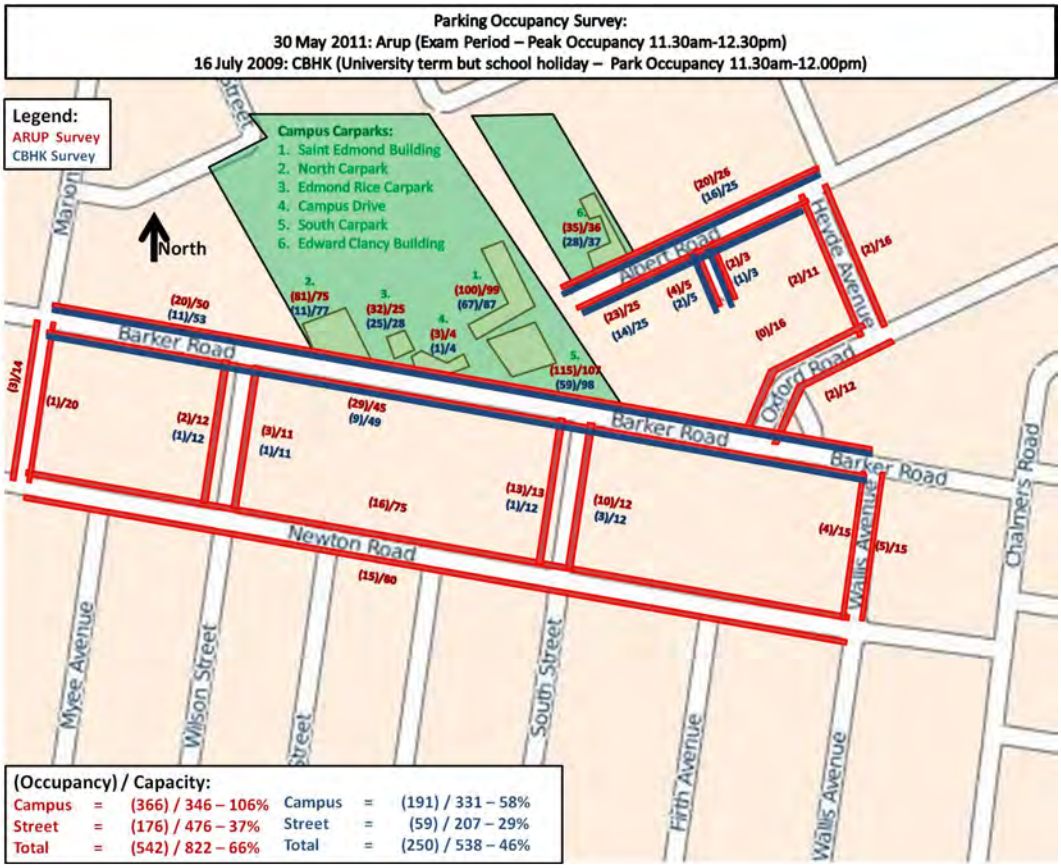
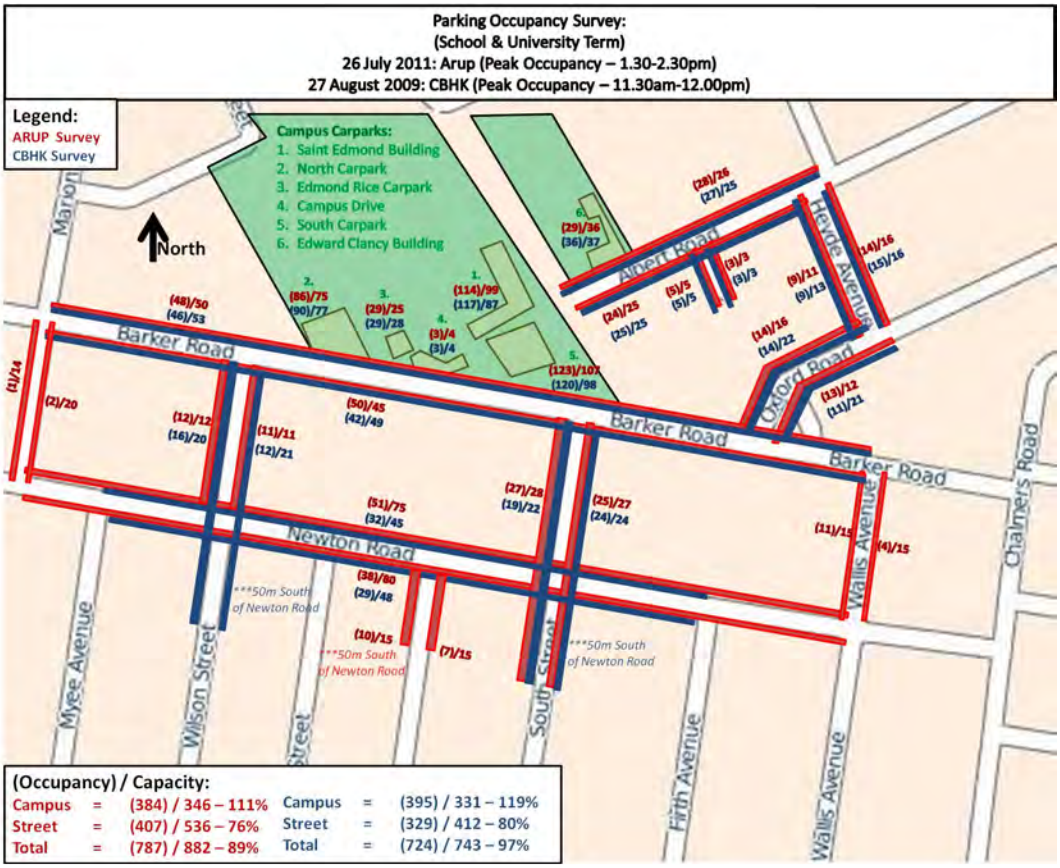


Figure 13: Comparison of Arup and CBHK Surveys

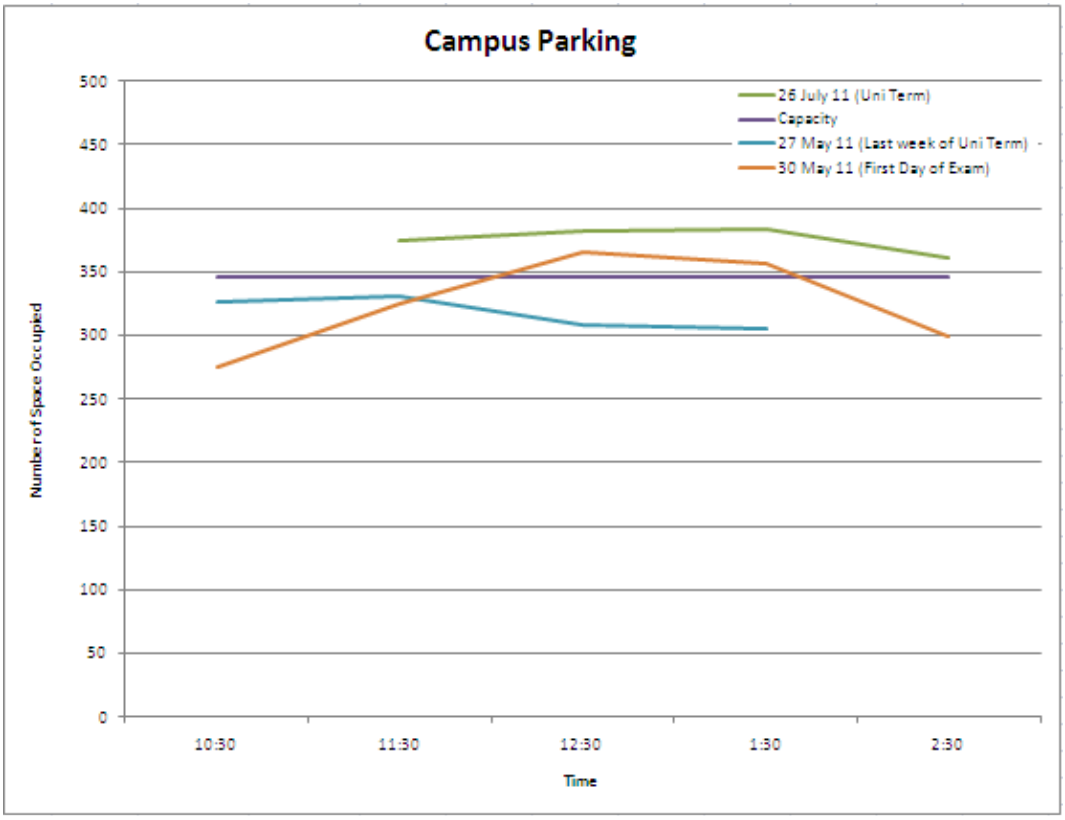


3.8.2 Off – Street Parking

The university has currently 346 parking spaces (main campus 310 spaces and Edward Clancy campus 36 spaces). Out of 346 spaces, 251 parking spaces are allocated for the students and remaining 90 spaces are for the staff. Currently Strathfield campus is allowed to hold a maximum 2200 students at any one time. Therefore, the current on campus parking provision is 1 space per every 9 students.

The on-campus car parks have been surveyed concurrently with the on-street survey (refer to Figure 7 - Figure 9). The off-street car park occupancy is compared in Figure 14. The graph in Figure 14 shows that the campus parking was over capacity during the university term and some periods of the exam periods indicating high utilisation of campus car parking which offers unrestricted use. However, the last week of the university terms, the parking occupancy was under capacity.

Figure 14: On Campus Parking Occupancy (hour beginning)



3.9 Current Student Peak Period

The student classroom attendance for ACU Strathfield campus was collected during 2008 and 2009 for semesters 1 and 2. The graph in Figure 15 shows that in all the three analysed semesters, the maximum number of attendance occurred on Monday and Tuesday. Friday has a lower attendance than other days of the week with fewer lectures scheduled. An analysis of the hourly attendance on Monday reveals that the maximum student attendance occurs between 10am – 12pm (refer to Figure 16).

In 2008 Semester 1, the peak student capacity reached 884 students attending lectures and tutorials where room capacity being 1585 at that time. This equates to room utilisation ratio of 56%. Similarly, the survey carried out in August 2008 found 611 students but with an increased room capacity of 1775 which is 35% utilisation rate. Therefore in Strathfield campus the maximum utilisation of students is only 55 – 60% of its permissible capacity.

Figure 15: Weekday Student Attendance Profile

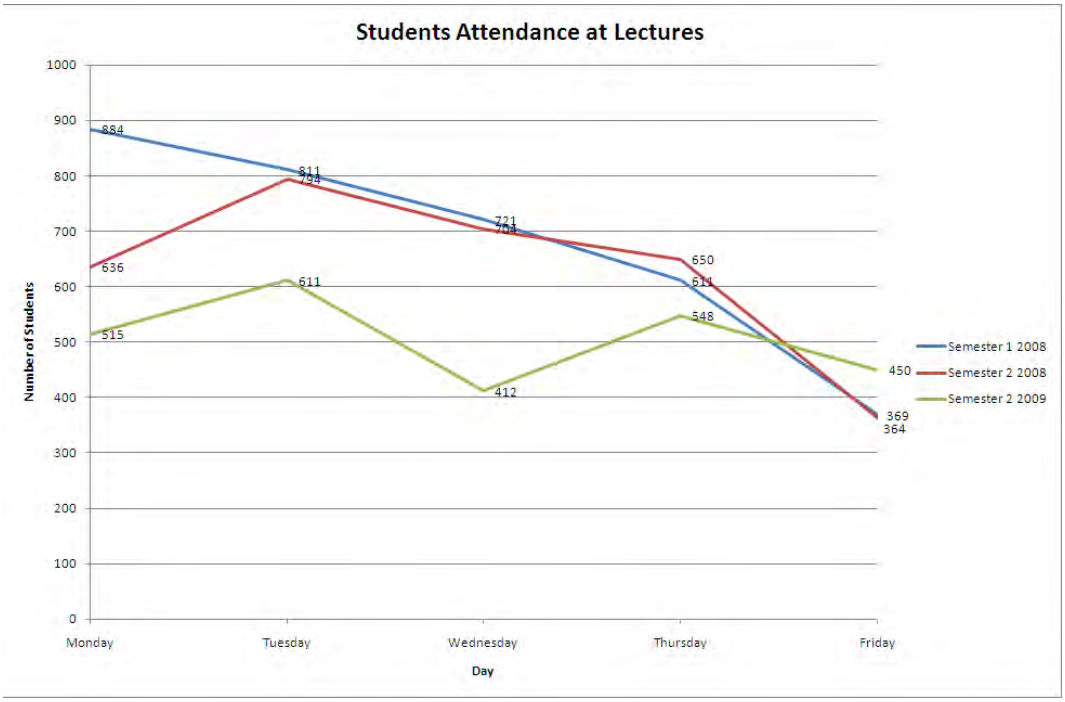
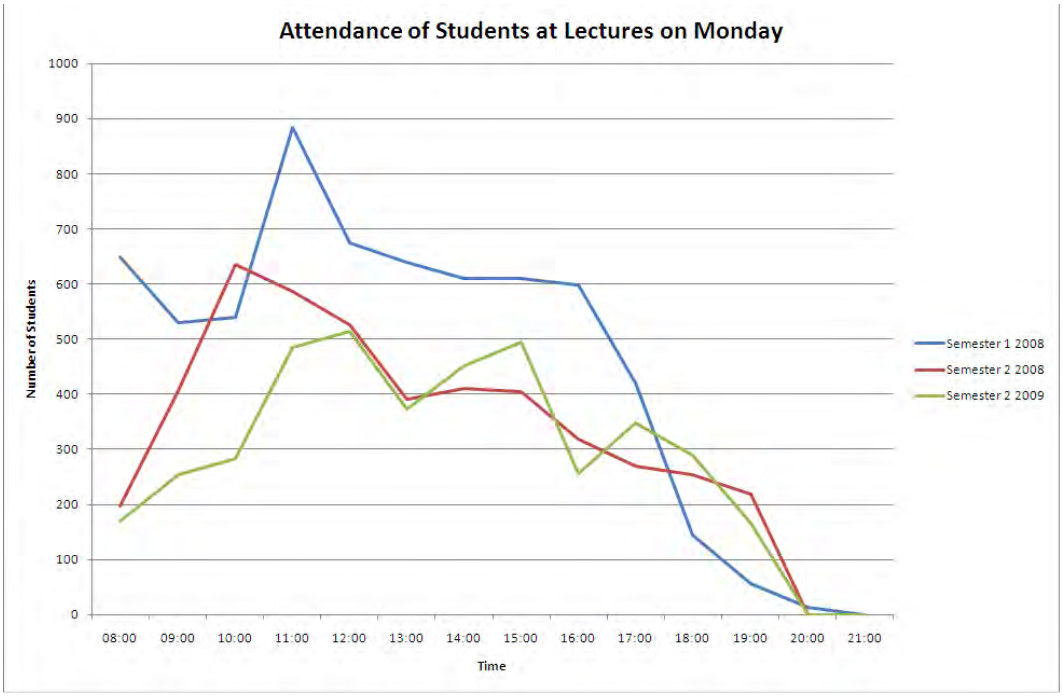


Figure 16: Monday Hourly Profile



3.10 ACU Travel Information

Detailed travel information is provided on the university website (http://www.acu.edu.au/acu_national/our_campuses/strathfield_campus/get_to_know_your_campus/travel_to_the_strathfield_campus/). The campus travel information provides university shuttle bus timetable, STA bus and train services to the Strathfield station.

Information about travelling to the campus by car is also provided. However, there is no information about discouraging the car driving and encouraging the walking and cycling to the campus. There is also no information about the bike and motorbike parking within the campus.

4 Proposed Development

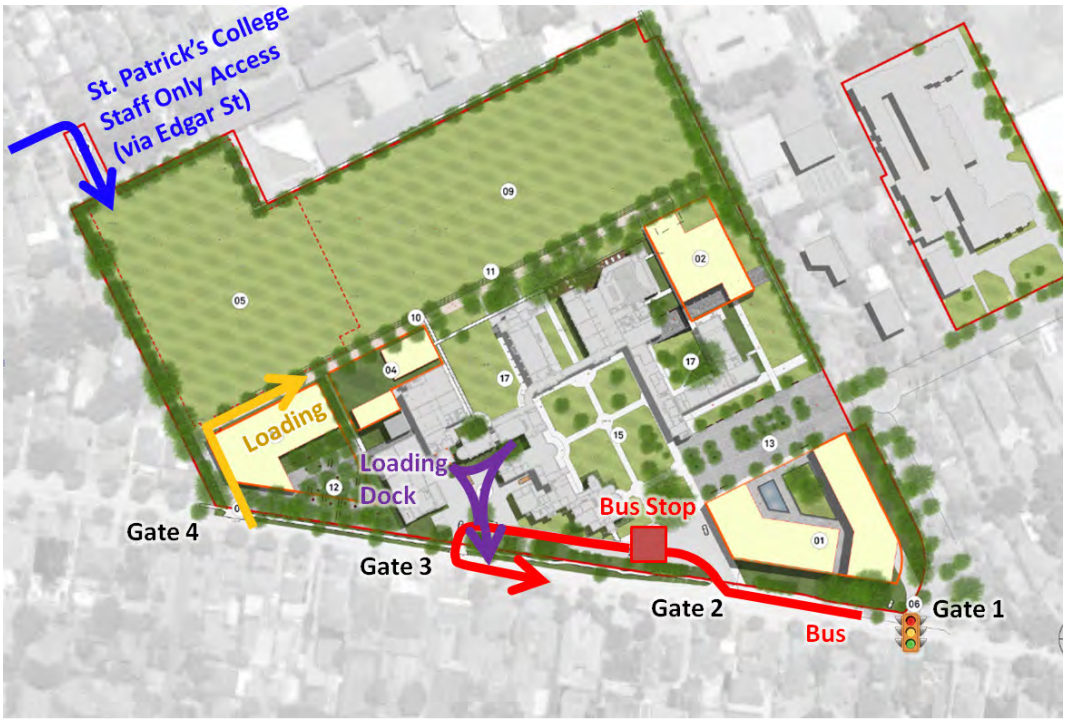
4.1 Description of the Extension of the Campuses

The proposed masterplan seeks to establish a future development strategy for the Strathfield campus which incorporates growth opportunities for the campus while improving parking and traffic functions and promoting the heritage significance of the existing buildings. The overall aims of the masterplan are to:

- Create a world class university precinct including modern teaching and learning facilities;
- Rationalise existing teaching functions across the two Sydney campuses focusing specialised activities with each campus;
- Establish additional floor space to increase availability and efficiency of teaching functions for the Strathfield campus;
- Improve site access, car parking and surrounding traffic functions in the project;
- Upgrade the public domain to create visually interesting transitions through the campus and promote heritage elements of the campus; and
- Strengthen pedestrian linkages through the campus.

The proposed masterplan is shown in Figure 17. The figure shows that four new buildings are proposed (marked yellow). The parking and loading facilities are generally proposed on the southern and western boundary of the main campus. Extensive landscape works are also proposed. However, this proposal may require slight modification in the detailed design stage. Four vehicle entry points are proposed along Barker Road. A new vehicular access is proposed via the eastern boundary of the main campus opposite South Street, and the western driveway will be moved towards the western boundary of the site opposite Wilson Street. A dedicated vehicle entry and exit is to be provided for staff of St. Patrick's College via Edgar Street to an underground parking area, on the north western boundary of the site. This is illustrated in Figure 17.

Figure 17: Illustrative Masterplan



4.2 Car Park Circulation

The proposed car park circulation for the main campus is shown in Figure 17. The figure shows that the shuttle bus will continue to access the campus via Gate 2 and will exit the site via Gate 3.

The loading vehicles will continue to access the site via Gate 2.

Staff and students will use Gate 1 opposite South Street and the relocated Gate 4 to access the new basement car parking areas. St. Patrick's College staff will access the north-western underground car park via Edgar Street.

4.3 Planning Controls

The following planning instruments are applicable to the subject site:

- Stage Environment Planning Policy (Major Development) 2005;
- Stage Environment Planning Policy (Infrastructure) 2007;
- Strathfield Planning Scheme Ordinance 1969;
- Strathfield Development Control Plan 2005; and
- Strathfield Council Stormwater Management Code.

The proposal is classified as traffic generating development pursuant to Schedule 1 of the Infrastructure Stage Environment Planning Policy (SEPP 2007). Therefore, the proposal must be referred to the RTA.

Strathfield DCP 2005 does not provide any specific standards for a 'university' and it requires a merit based assessment of parking provisions.

4.4 Vehicular Access

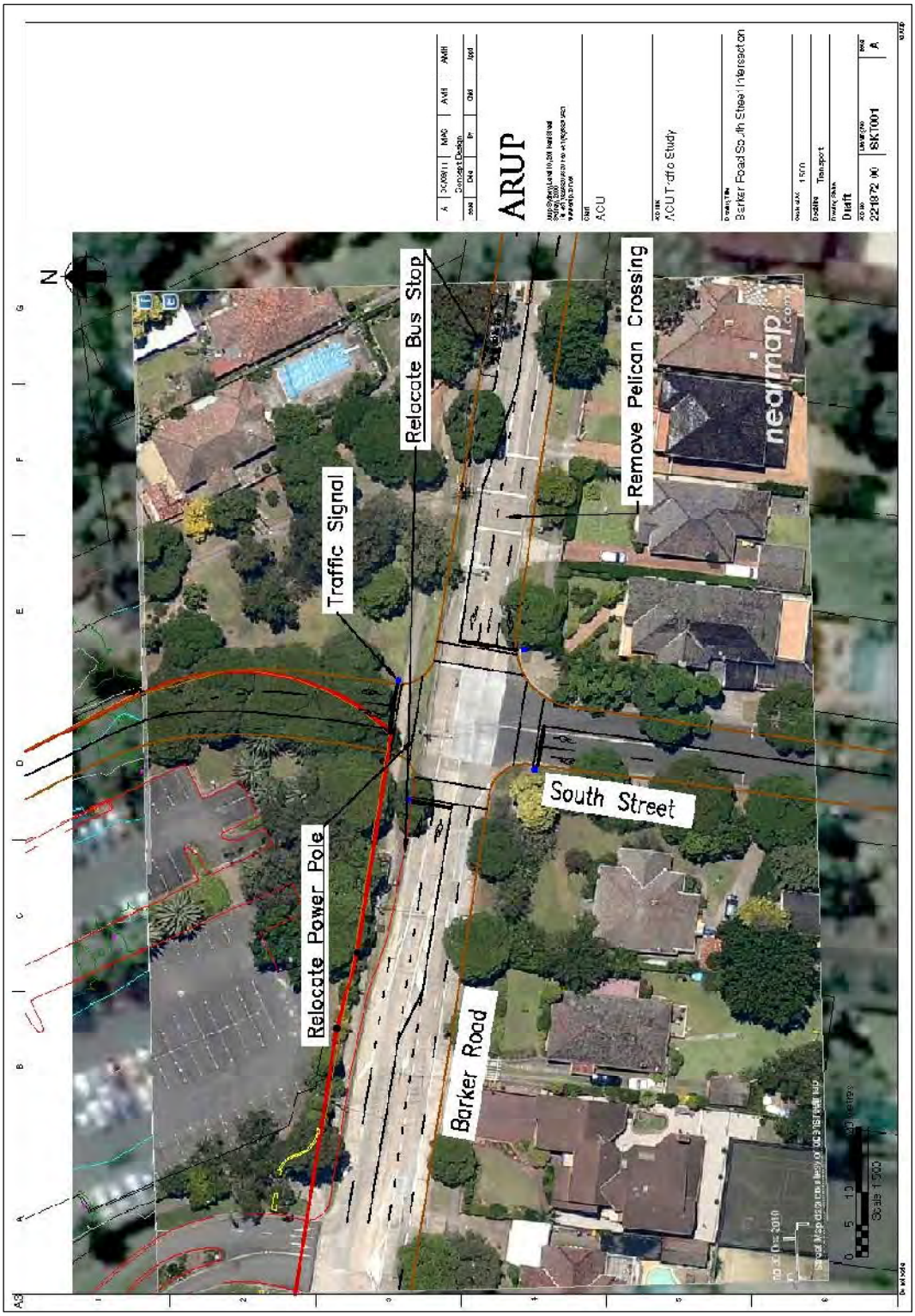
The eastern and mid vehicular access on Barker Road (Gate 2 and 3) will be retained. The western vehicular access on Barker Road (Gate 4) is proposed to be relocated approximately 50m west, along the western boundary of the site. Due to an increased number of vehicles via this access, a detailed traffic assessment has been undertaken to determine the appropriate configuration for the driveway.

The new underground car park in the north western corner of the campus will have a major access driveway from Barker Road to provide access for ACU staff and students. A secondary access driveway is proposed from Edgar Street to provide access to 30 car spaces to be used by St Patrick's College staff members. Access to these spaces will be controlled by a boom gate control system. Whilst St Patricks College is not increasing staff numbers, it currently has an undersupply of staff parking spaces on their site leading to double parking on-site and overflow parking on-street. The 30 staff spaces will improve parking conditions for St Patricks but will generate no new vehicle trips on the local street system.

A new access driveway is proposed on the eastern boundary of the site (Gate 1), aligned opposite South Street and is proposed to be controlled by traffic signals (refer to Figure 18). The proposed traffic signals will have pedestrian crossing facilities on all the four approaches. These traffic signals would be installed prior to the completion of the ACU redevelopment.

Due to the proposed traffic signals, the existing pedestrian operated traffic signal on Barker Road which is located about 25m east of South Street is proposed to be removed. The new intersection location will require an existing power pole and bus stop on Barker Road to be relocated. There will be no change in the number of on-street car parking spaces after installation of the traffic signals and compliance with mandatory no stopping distances.

Figure 18: Proposed Traffic Signals at Barker Road/ South Street/ New Campus Access Intersection



4.5 Parking Provision

Strathfield Council's DCP 2005 (Part I) does not provide any parking rates for a tertiary institution. The RTA Guide to Traffic Generating Developments, October, 2002 also does not provide any specific parking code for the tertiary institutions. Therefore, the future on campus parking provision will need to be considered based on the maximum number of future students and staff at the campus at any one time.

The future campus parking should be carefully considered. Excessive amount of on-site parking should be avoided as it will encourage future students and staff driving to the campus. It will hinder promoting active and public transport to the campus. On the other hand, parking provision should not be so low that nearby residential streets are adversely affected by the overflow of student parking.

Due to the above consideration, a balanced parking provision should be considered. A comparison of the existing and proposed number of students at any one time, and the overall parking provision, is shown in Table 3.

Table 3: Existing and Proposed Parking Provision

Element	Existing	Proposed	Increase
Students (at any one time)	2,200	2,400	200 (9%)
Student Parking	251	504	253 (101%)
ACU Staff Parking	90	130	40 (44%)
Visitor/Clinical Parking	5	10	5 (100%)
Total On-Site Parking	**346**	**644***	**298 (86%)**

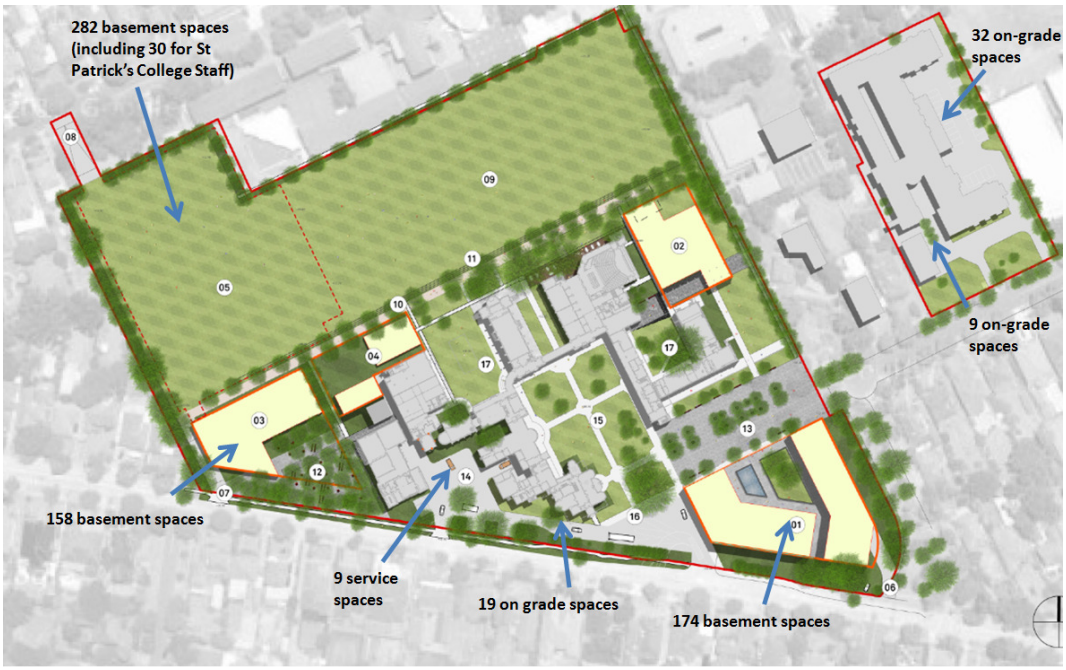
* Excludes 30 parking spaces to be allocated to staff of St. Patrick's College in the north-western underground car park (access via Edgar Street)

The data in Table 3 shows that currently 1 parking space is allocated for every 9 students. It is proposed to increase the parking ratio to 1 space for every 5 students. The net increase of the student parking provision will be approximately 100%. Although the increase in parking appears to be significant, the parking ratio is still reasonably low as per Department of Planning and State Government Target for sustainable transport initiatives.

4.6 Location of the Proposed Parking Spaces

The proposed location of the campus parking is shown in Figure 19. The figure shows that 603 spaces are proposed in the main campus and remaining 41 spaces to the Edward Clancy campus. Out of 603 parking spaces, 584 spaces are proposed to be at the basement level. In addition to 644 spaces, an additional 9 service vehicle spares are also proposed.

Figure 19: Proposed campus parking provision



4.7 Service Vehicle Provision

The existing loading area located adjacent to Gate 3 will be retained. Parking for 8.8m Medium Rigid Truck, 6.5m Small Rigid Truck and courier vans will be available. Additional service access is available via the relocated Gate 4 to an area at the rear of the proposed Arts Precinct Building.

The loading docks will be designed to accommodate a MRV with swept paths in accordance with AS 2890.2 – 2002 – Part 2: Off-street commercial vehicle facilities. The delivery vehicles will be able to enter and exit the site in a forward direction. A swept path will be undertaken by Auto Track program in due course to ensure the adequate manoeuvre by the delivery vehicles.

4.8 Disabled Parking Provision

In total 1-2% of total parking spaces must be designed for people with disabilities and will be located adjacent to the disabled ramps and lifts.

4.9 Bicycle Provision

Bike parking should be provided based on the NSW Government Guidelines for Walking and Cycling, December 2004. The recommended bike parking rate for tertiary education facilities are in the range of 3 – 5% for the staff and 5 – 10% for the students. Based on the maximum number of 2400 students and 260 staff in the campus at any one time, the masterplan will provide in the range of 130 – 250 bike parking spaces.

Bike spaces should be visible or properly signposted. Bicycle lockers and separate male and female shower facilities will be provided. In addition, to encourage the cycling in the campus, the following initiatives should be undertaken:

- Establish a working in partnership with the Strathfield Council and the RTA to build the cycling infrastructure after a comprehensive bike study in the locality. This should include bike route between the campus and the nearby railway stations;
- Publish a fully featured Cycling Map for the university; and
- Introduce a bicycle buddy scheme to assist new cyclists taking up cycling to and from the university.

4.10 Motor Bike Parking

Approximately 30 – 40 motor bike parking spaces should be considered on the campus.

5 Transport Impact Assessment

5.1 Traffic Generation

5.1.1 Existing

The existing traffic generation to the campus is estimated based on the traffic surveys undertaken in the various campus driveways (refer to Figure 3 and Figure 4). Based on the survey, the four existing campus driveways are currently generating the following traffic (both in and out):

- AM peak – 161 vehicles; and
- PM peak – 86 vehicles.

In addition to above, assuming an additional 40% of students and staff park on street during the university term, the total existing traffic is estimated to be:

- AM peak – 225 vehicles; and
- PM peak – 120 vehicles.

5.1.2 Forecast

Although parking provision for the proposed masterplan will be doubled, there will not be the same level of increase in traffic generation. The additional campus parking provision will result less parking pressure on the residential streets.

The forecast traffic generation is calculated based on the maximum number of students at any one time in the campus. In the masterplan proposal, the maximum number of students at any one time in the campus will increase by 9%. Due to sustainable transport initiatives by the ACU for its future students, it is likely that the future traffic generation to the campus will increase by no more than 5%. However as a conservative approach, additional 10% traffic to the campus is forecasted after the full development of the masterplan. Based on this consideration, the estimated future traffic generation will be approximately:

- AM peak – 250 vehicles; and
- PM peak – 130 vehicles.

This additional traffic is used in the Sidra modelling, discussed in the following sections of this report.

5.2 Traffic Distribution

Based on the Arup traffic survey undertaken at the main campus driveway, the traffic distribution on Barker Road has been estimated as follows:

- 65% to and from the east; and
- 35% to and from the west.

5.3 Traffic Impact

5.3.1 Intersections

In urban areas, the traffic capacity of the major road network is generally a function of the performance of traffic intersections. This performance is quantified in terms of the Level of Service (LOS), which is an index of the operational performance of traffic at an intersection and is based on the average delay per vehicle. LOS ranges from A = very good to F = highly congested travel conditions, as shown in Table 4.

Table 4: Level of Service Definitions

Description	Level of Service (RTA Definition)	Average Delay per Vehicle (s)
Very Good	A	< 14.5
Good	B	14.5 ≤ 28.5
Satisfactory	C	28.5 ≤ 42.5
Near Capacity	D	42.5 ≤ 56.5
At Capacity	E	56.5 ≤ 70.5
Over Capacity	F	≥ 70.5

Generally it is desirable to aim at achieving a Level of Service of C or better at all major road intersections. However, in practice, it is reasonable for some intersections to operate at Level of Service D at peak times.

Another common measure of intersection performance is the degree of saturation (DOS), which provides an overall measure of the capability of the intersection to accommodate additional traffic. A DOS of 1.0 indicates that an intersection is operating at capacity. The desirable maximum degree of saturation for an intersection with traffic signals is 0.9.

The existing intersection performance is assessed in this report in terms of the following four factors for each intersection:

- Degree of Saturation
- Average Vehicle Delay (AVD) in seconds per vehicle
- Level of Service
- Length and direction of peak traffic queue (95th percentile traffic queue)

Barker Road/ Redmyre Road/ Elwin Street and Arthur Road/ Pemberton Street intersections have by analysed by the SIDRA intersection modelling program (version 5). The intersections have been analysed in the worst case scenario, while there were maximum traffic during the surveyed two hour periods. The results of the intersection analysis are presented in Table 5 and Appendix B.

Table 5: Existing and Future Intersection Performance

Intersection	Scenario	AM Peak				PM Peak			
		LOS*	DOS	AVD (sec)	Max Queue (m)	LOS	DOS	AVD (sec)	Max Queue (m)
Barker Rd/ Redmyre Rd/ Elwin St	Existing	n/a	0.50	7	23	n/a	0.30	6	11
	Future	n/a	0.60	8	31	n/a	0.34	6	14
Arthur Rd/ Pemberton St	Existing	n/a	0.41	5	26	n/a	0.32	4	20
	Future	n/a	0.47	5	33	n/a	0.33	4	22

* For priority controlled intersections LOS is considered for each individual approach, not for the overall intersection

5.3.1.1 Barker Road/ Redmyre Road/ Elwin Street Intersection

In the AM peak hour, the intersection is currently operating at LOS A & B on all approaches with spare capacity. The right turning movement experiences the highest delay (15 seconds). The maximum queue occurs on Barker Road (23m).

With the addition of the future site traffic, the intersection will continue to operate at LOS A & B on all approaches with slightly increased capacity. The AVD will increase by only 0.7 second. The vehicular queue on Barker road will increase by about 8m.

In the PM peak period, the intersection is currently operating in LOS A on all approaches. The AVD is currently about 6 seconds.

With the addition of the future site traffic, the intersection will continue to operate at LOS A on all approaches with slightly increased capacity. There will be no noticeable increase to the AVD.

5.3.1.2 Arthur Street/ Pemberton Street Intersection

In the AM peak hour, this intersection is currently operating at LOS A & B with about 40% capacity. The AVD is less than 5 seconds. The maximum delay occurs for the right turning vehicles from Pemberton Street (20 seconds). The maximum queue occurs for the right turning vehicles from Arthur Street.

With the addition of the future site traffic, the intersection will continue to operate at the same LOS with marginal increase in capacity and vehicular delay. The maximum queue will increase about 8m.

In the PM peak hour, currently the intersection is also operating at LOS A & B just over 30% capacity. The AVD is less than 4 seconds. The maximum delay occurs for the right turning vehicles from Pemberton Street.

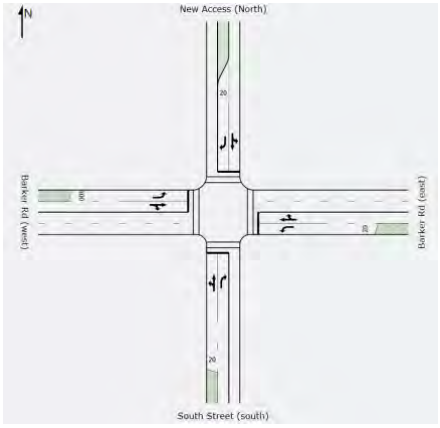
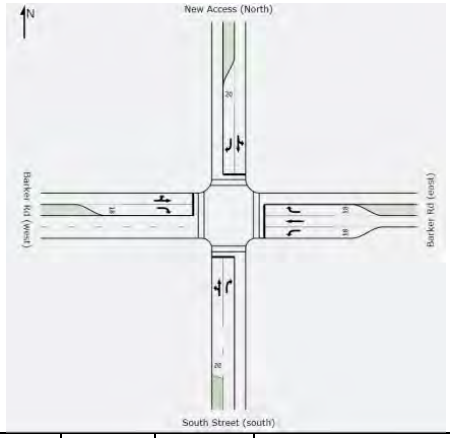
With the addition of the future site traffic, the intersection will continue to operate at LOS A & B with slightly increased DOS and AVD. The maximum delay for the right turning vehicles from Pemberton Street will increase by 3 seconds only.

5.3.1.3 Barker Road/ South Street Proposed Gate 1 Intersection

This proposed signalised intersection has been analysed in the critical AM peak period when most of the vehicles will arrive to the campus. Based on the existing vehicular survey at the main campus driveway, it is assumed that 50% of the vehicles will arrive in the AM peak period.

The results of the intersection analysis for the AM peak hour are presented in Table 6.

Table 6: Barker Road / South Street (Proposed Gate 1) Intersection Results

Scenario (AM Peak Hour)	Without Right Turn Bay				With a 18m long Right Turn Bay on East Approach			
								
	LOS	DOS	AVD (sec)	Max Queue (m)	LOS	DOS	AVD (sec)	Max Queue (m)
Overall intersection	A	0.51	12	74	A	0.46	11	70
Westbound Through Movement	A	0.51	12	74	A	0.37	9	58

There results in Table 6 shows that the intersection will operate at LOS A with or without the right turn lane in the east approach. Without the right turn lane, the AVD for the westbound through movement will be 11 seconds with maximum queue length of approximately 11 vehicles. With an 18m long right turn bay on the east approach, the delay and queuing will be reduced to 9 seconds and 8 vehicles respectively.

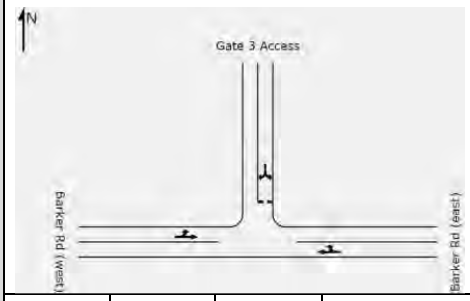
To facilitate safe and efficient vehicle movement into the new underground parking area, a short right turn bay is recommended at this intersection.

5.3.1.4 Barker Road/ Proposed Gate 4 Intersection

This intersection has been analysed in the critical AM peak period when most of the vehicles will arrive to the campus. Based on the existing vehicular survey at the main campus driveway, it is assumed that about 50% of the vehicles will arrive in the AM peak hour.

The results of the intersection analysis are presented in Table 7.

Table 7: Proposed Gate 4 and Barker Road Intersection Analysis (Future Traffic)

Scenario	Without Right Turn Bay				With a 18m long Right Turn Bay on East Approach			
								
	LOS*	DOS	AVD (sec)	Max Queue (m)	LOS*	DOS	AVD (sec)	Max Queue (m)
Overall intersection	n/a	0.37	3	29	n/a	0.26	2	5
Westbound Through Movement	A	0.37	4	29	A	0.20	0	0

* For priority controlled intersections LOS is considered for each individual approach, not for the overall intersection

Results in Table 7 indicate that the intersection will operate well both with and without the right turn lane on the east approach. Without the right turn lane, the AVD for the westbound through movement will be 3 seconds with maximum queue of about 5 vehicles. With an 18m long right turn bay on the east approach, the there will be no delay and queuing for the westbound through vehicles on Barker Road.

To accommodate the existing raised median opposite Wilson Street, and facilitate safe vehicle movement into the site, a short right turn bay (as indicated in Figure 20) is proposed. There is no loss of parking with the introduction of this facility.

Figure 20: Proposed Right Turn Bay on Barker Road at Gate 4

5.3.2 Mid Block

5.3.2.1 Barker Road

The daily traffic volume on Barker Road is estimated at about 7,500 vehicles (refer to section 3.2). Due to the full development of the masterplan, Barker Road will carry approximately additional 750 vehicles (10% increase), increasing the daily traffic volume to 8,250 vehicles.

According to the RTA's functional classification of the road, a collector road should carry between 2,000 – 10,000 vehicles per day. Therefore, with the proposed masterplan development, the traffic volume on Barker Road will remain within RTA's recommended traffic volume range.

5.3.2.2 Albert Road

There will be no change in the car parking provision of Edward Clancy Campus. Therefore, there will be no increase of traffic on Albert Road.

5.4 Parking Impact

The masterplan proposes 644 off-street car parking spaces (1 space/ 5 students) dedicated for ACU staff and students, plus an additional 30 spaces for St Patrick's College staff members. The ACU promotes the use of active and public transport for the students and staff coming to campus, however there will still be some students and staff who will need to drive (e.g. there are no public transport facilities nearby to their residence). When the car park is full, these students are likely to park in the nearby residential streets.

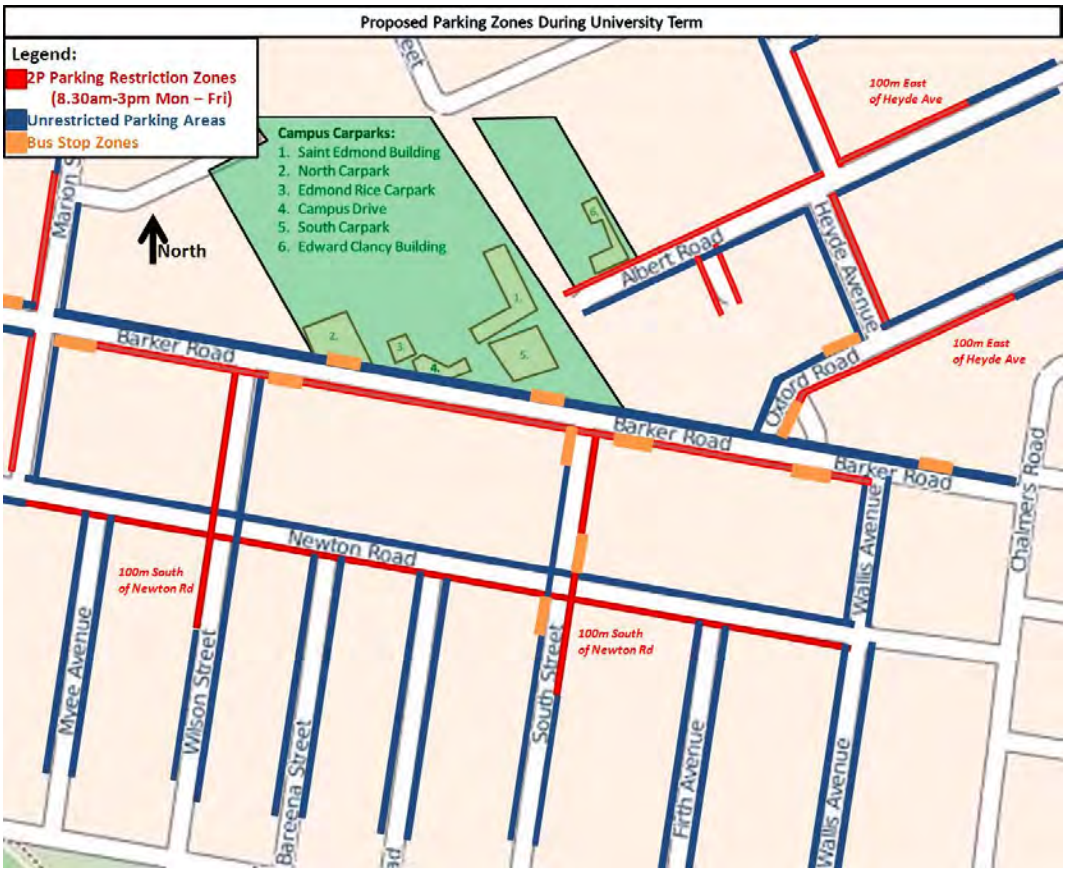
The Arup on-street parking survey during the university term shows that the parking occupancy in the nearby residential streets is 76% (refer to Figure 9). This occupancy rate is acceptable considering the majority of the residential properties have more than one off-street parking space. Residents can still obtain a parking space within reasonable walking distance if they wish to park on-street for a short period of time. It is therefore recommended that these on-street parking spaces should be well utilized while still retaining some free spaces e.g. achieving peak occupancy rates about 80 – 90% in streets close to ACU. It is acknowledged that the residents should be favoured first but there should still be a reasonably equitable distribution of all the parking spaces between the residents, visitors and employees in the area.

Therefore, the overall philosophy of the parking management must maintain an appropriate balance between the car parking needs of the residents and the visitors in the area. As most of the surveyed streets have off-street parking provision, any introduction of a resident parking scheme is not supported as the residents will not qualify for a parking permit. The only equitable way to distribute the available parking spaces between the residents and visitors is to place parking time restrictions to help manage the available parking balance in the area.

Despite the significant increase in campus car parking supply, demand is forecast to exceed supply and hence overflow parking will continue to occur in the surrounding streets. Therefore, parking restriction in the residential street will be required. The recommended parking restriction is shown in Figure 21. Two hour parking restrictions are proposed for only one side of the street between 8.30am – 3pm, Monday – Friday, during the university terms. The proposed parking restriction will ensure there will be some level of vacant parking spaces for the residents who need to park on-street for a maximum two hour period during the peak university period.

The effectiveness of the proposed parking restriction could be monitored for a period of between 3 and 5 years and if warranted another parking occupancy survey could be undertaken at that time. However, it is imperative that the recommended modifications to the current parking restrictions in the area must be accompanied by regular parking enforcement by the Strathfield Council parking officers and rangers. Motorists must have the perception that they are likely to be fined if they overstay parking time restrictions.

Figure 21: Proposed Parking Restrictions on Nearby Residential Streets



5.5 Public Transport, Pedestrian and Cyclist Impacts

The proposed development will have no adverse impact to the existing public transport facilities, pedestrians and cyclists. ACU will establish a working partnership with the Strathfield Council and the RTA to investigate improvements to the bicycle route markings and facilities to ensure good connectivity.

The current shuttle bus frequency is 10 minutes in the peak campus hours. The proposed maximum number of students at any one time is 2400, an increase of 200 students (9%). In the future proposal, the students will be encouraged to choose active travel options such as bicycle or walking to the campus. Shuttle services are able to respond to increases in demand as student numbers grow.

5.6 Sustainable Transport Initiatives

To promote the use of public and active transport to the campus, the following sustainable transport measures should be undertaken:

5.6.1 Pedestrian Facilities

- Students living within 2km of the campus should be targeted to walk to the campus;

- Establish working partnerships with Strathfield Council to provide a direct, comfortable and safe pedestrian access between the campus and Strathfield station as per DDA requirements. Encourage the "10,000 steps a day to improve health initiative" for all students and staff of the university;
- On campus speed limit should be maximum 10 km/h and pedestrian should always obtain the right of way.

5.6.2 Bicycle Facilities

- A connected bicycle link should be established between the campus and Bay – to Bay route (west along Barker Road). A bicycle link should also be investigated between the campus and Strathfield railway station. Bicycle symbol could be inserted in the pavement with some associated signage. An undesignated bicycle way will be suitable on Barker Road and other adjoining streets due to its low speed environments.

5.6.3 Public Transport Facilities

- Students who live within 1km of existing train stations should be targeted for potential public transport users;
- Establish a working partnership with the STA and Transport NSW to improve the bus routes and facilities to and from the campus;
- Introduce and encourage university wide walk/ride/catch public transport to Uni Day in conjunction with "National walk to work day, National ride to work day" etc; and
- Provide interest free loans for annual staff/employee travel passes and to purchase bicycles, possibly subsidised.

5.6.4 Car Pooling

Introduce a car pooling system to the university to encourage car sharing amongst the students and staff, especially those who located outside the 10km radius but within close geographic location to each other. Designated car pooling spaces should be provided for these students and staff.

The University of NSW has a comprehensive Car Pooling system (http://myunswcarpools.unsw.edu.au/). Similar effective car pooling system should be considered.

5.6.5 Car Share Scheme

Introduce a car share scheme by allowing convenient and dedicated car share parking spaces within the campus i.e. Go Get, Flexicar & Charter Drive. Car share schemes work best where a variety of users can gain access to the vehicle allowing business use during the day and resident use in the evening and at weekends. An appropriate level of demand would need to be established.

5.6.6 Small Car and Hybrid/Electric Car Parking

Some parking spaces should be allocated for small and hybrid cars to encourage low carbon emission vehicles into the campus. This could be extended to electric car charging points as demand increases.

5.6.7 Taxi Rank

A taxi rank could be considered within the university, possibly utilising a call up system to a local taxi company. Discussion could be held with the NSW Taxi Council.

5.6.8 ACU Travel Information

The university website should provide comprehensive travel information for its future students, staff, and the visitors. It should be emphasized that the on – campus parking is extremely limited and alternatives to driving, including the frequent shuttle service between the campus and Strathfield Station are readily available. Information about the bicycle and motorbike parking inside the campus should be highlighted. In the ACU website motivational factor should be included to promote walking, cycling and public transport use to the campus, rather than driving.

5.6.9 Other Sustainable Transport Initiatives

The university should consider other sustainable initiatives. The key principles of the sustainable transport initiatives should be:

- Establish a support group/s and network/s to provide motivation, drive and support for implementation of the plan;
- Change current travel patterns towards more sustainable modes using two approaches. The first using initiatives which encourage and make it easier to change and the second using discouragement initiatives which make car driving less attractive;
- Limit the environmental impact as much as possible for those who continue to drive; and
- Remove the need to travel at all.

To achieve the above objectives, a comprehensive transport access guide needs to be prepared by the university. The university should have a current travel data statistics for all current students and staff and set a sustainable mode share target for the mid and long time future.

When required, the university should purchase hybrid and electric vehicles. A Uni Green House Gas Emissions Travel Indicator/Index should be developed for the students and staff to quantify their individual $C0_2$ travel impacts on the environment.

The university should also promote flexible working practices e.g. one day/week working from home. More distance learning/education should also be promoted. New technology communication facilities should be introduced for the staff to limit car business travel.

6 Traffic and Pedestrian Management during Construction Period

A construction traffic management plan/ traffic control plan will need to be prepared by the construction contractor prior to obtaining the Construction Certificate for the development. This section outlines the preliminary indicative construction traffic management guidelines. The following issues need to be considered:

6.1 Traffic Impact

The construction traffic should generally be restricted outside the peak traffic hours to minimize the traffic impact in the locality. Limited on-site car parking should be provided for the construction workers and it's use managed to minimize the traffic impact. The majority of the workforce should be encouraged to travel by train and bus outside the morning and afternoon commuter peak periods.

6.2 Parking Impact

Construction workers should be encouraged not to park in the residential streets. All construction related light and heavy vehicles should be accommodated on site.

6.3 Pedestrian Activity at/ near the Site

There should not be any pedestrian impact during the construction period in and at the vicinity of the campus. Inside the site boundary, pedestrian access should be limited via fencing/ safety hoardings.

The pedestrian activity adjacent to main campus driveway on Barker Road should be managed and controlled by site personnel. Pedestrian affects on Albert Road should be minimised and a safe and convenient pedestrian environment should be maintained at all times.

6.4 Cycling Impact

Cyclist volumes on Barker Road are currently low and the proposed development will not result in any adverse impact to the cyclists on Barker Road.

6.5 Impact to Adjacent Residential Properties

The properties located to the opposite side of Barker Road should not be affected due to the construction activity.

6.6 Truck Movements

All construction trucks should be able to enter and exit the worksite areas in a forward direction. All queuing and storage of trucks should be accommodated on-site, within the designated construction zones or in designated marshalling areas. Trucks should not be permitted to park on-street in Barker Road, Albert Road or any other surrounding residential streets. Truck drivers will be advised of the

presence of the traffic controllers/ spotters and they must observe directions provided.

6.7 Construction Traffic Management

The movement of construction vehicles to/ from the site and in particular trucks associated with the removal of spoil/ other construction debris should be managed by qualified site personnel. All trucks removing spoil from the site should be loaded to prescribed limits and loose materials should be covered during the transport from the site. Vehicles leaving the site should be cleaned in an appropriate manner as required to prevent the tracking of dirt/ other construction debris onto public roads.

6.8 Hours of Construction

Work associated with the construction of the development must be carried out in accordance with the Strathfield Council and / or Department of Planning Requirements.

The construction contractor should consult with Strathfield Council officers about the appropriate construction hours for the development.

6.9 Stakeholder Consultation

Stakeholders need to be consulted and all necessary approvals must be obtained from the relevant government authorities. The main stakeholders, such as Strathfield Council and RTA, must be consulted should any modifications to the operational and/ or infrastructure traffic management arrangements occurs during the construction stage.

7 Conclusions and Recommendations

This report describes the existing situation, development proposal, forecast traffic generation, transport impact assessment and parking impact for the proposed masterplan for the ACU Strathfield Campus.

The report considers and discusses all the traffic and transport related issues stated in the Department of Planning Director – General's requirements. The proposed masterplan development is consistent with the objectives of the NSW State Plan, Metropolitan Plan for Sydney 2036, Metropolitan Transport Plan, the NSW Planning Guidelines for Walking and Cycling, the Integrated Land Use and Transport policy package, the NSW Bike Plan and Premier's Council for Active Living (PCAL) – Development & Active Living.

The future transport strategy for ACU should recognize the importance of sustainable modes of transport. Although the motor vehicle is currently the primary travel mode to the Strathfield campus, the design of all future development within the campus should not inhibit the longer term potential for incorporating alternatives to car travel e.g. walking, cycling and public transport modes.

In the proposed masterplan, the mode share to the campus by the students and staff should shift towards sustainable mode of transport from car dependency. To achieve the desired longer term future transport sustainability objectives, the proposed masterplan should consider the following types of measures:

- Provide stronger multi modal travel links between the campus and Strathfield station;
- Provide the alternative travel mode links as early as possible in the masterplan to influence travel mode choice prior to car dependant travel patterns/ habits being established to the new students and staff; and
- Provide good quality safe pedestrian and cycling links within the vicinity of the site. Effective discussion and negotiation should be held with the different government authorities in this regard.

The above measures would all encourage the future use of non – car based means of travel while still providing suitable parking accessibility for those who have not alternative but to drive.

The other conclusions of this study are summarised in the following bullet points:

- Traffic generated by the proposed development can be accommodated on the existing road network with minimal/ negligible impact;
- In accordance with State government sustainability policies, the masterplan proposes a relatively low provision of car parking spaces (1 space/ 5 students). The increase in the on-site parking provision for ACU students should reduce the parking pressure on the nearby residential streets ;
- Gate 4 on Barker Road is proposed to be relocated approximately 50m to the west, near Wilson Street. To provide safe and efficient vehicle entries into the new underground car park at this location, a right turn bay on Barker Road is proposed;

- A new signalised intersection is proposed at the Barker Road/ South Street intersection. Pedestrian crossing facilities are proposed on all four approaches of this intersection;
- The masterplan will provide adequate secure bike parking, shower facilities and locker facilities for the students and staff;
- ACU already provides free shuttle services between the campus and Strathfield station. The service frequency will increase with the future growth of the students;
- ACU Strathfield campus will prepare a comprehensive travel plan for the students and staff encouraging active and public transport. A location specific Travel Access Guide (TAG)/ Green Travel Plan could be produced in due course;
- A connected bicycle link should be established between the campus and Bay – to Bay route (west along Barker Road). A bicycle link should also be investigated between the campus and Strathfield station. Subject to consultation with RTA and Strathfield council, bicycle symbols could be inserted in the pavement with some associated signage;
- Parking Restrictions (8.30am – 3pm, Monday – Friday, During the University Terms) are proposed in some of the nearby residential streets (on side of the street only). The proposed parking restriction will ensure there will be some level of vacant sparking spaces for the residents who need to park on – street for a maximum two hour period during the university term; and
- The effectiveness of the proposed parking restriction could be monitored for 3 – 5 years by undertaking anther parking occupancy survey and based on the outcome, future measures could be considered;

Appendix A

Traffic Survey Data

R.O.A.R. DATA

Reliable, Original & Authentic Results

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

Client : ARUP

Job No/Name : 3611 Strathfield Intersection Counts

Day/Date : Thursday 26th May 2011

All Vehicles	NORTH Redmyre St			WEST Barker Rd			SOUTH Redmyre St			EAST Elwin St			
Time Per	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0700 - 0715	0	9	5	7	5	18	19	25	1	2	3	0	**94**
0715 - 0730	0	10	7	8	5	21	24	21	2	3	4	0	**105**
0730 - 0745	0	10	9	17	7	23	27	46	4	2	7	0	**152**
0745 - 0800	0	20	18	19	8	30	35	69	6	2	6	0	**213**
0800 - 0815	0	29	27	27	22	36	58	57	5	3	10	0	**274**
0815 - 0830	0	29	37	27	40	34	84	53	6	3	26	0	**339**
0830 - 0845	0	26	48	22	24	35	87	36	3	6	25	2	**314**
0845 - 0900	1	15	27	11	5	27	55	32	1	7	15	1	**197**
Period End	**1**	**148**	**178**	**138**	**116**	**224**	**389**	**339**	**28**	**28**	**96**	**3**	**1688**

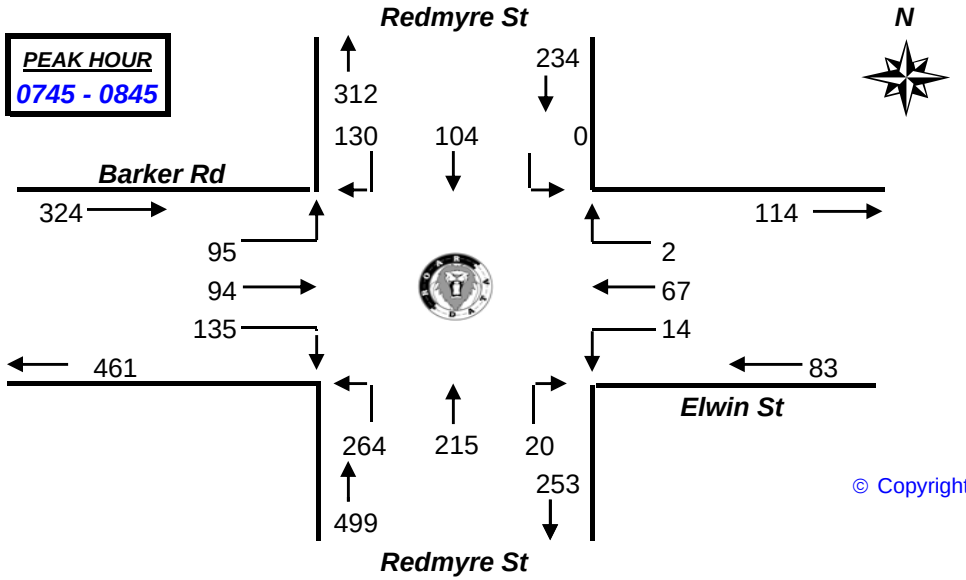
All Vehicles	NORTH Redmyre St			WEST Barker Rd			SOUTH Redmyre St			EAST Elwin St			
Time Per	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1600 - 1615	0	13	15	16	8	33	26	13	4	2	10	0	**140**
1615 - 1630	1	20	17	25	9	39	29	19	1	1	11	0	**172**
1630 - 1645	0	11	17	14	4	36	25	14	2	4	6	0	**133**
1645 - 1700	0	22	28	14	8	39	39	21	1	3	7	1	**183**
1700 - 1715	1	19	23	28	14	49	40	19	4	3	14	0	**214**
1715 - 1730	2	27	19	14	8	7	31	24	0	2	4	1	**139**
1730 - 1745	0	17	17	16	4	25	24	26	1	1	4	0	**135**
1745 - 1800	0	28	29	11	5	30	25	19	1	3	12	0	**163**
Period End	**4**	**157**	**165**	**138**	**60**	**258**	**239**	**155**	**14**	**19**	**68**	**2**	**1279**

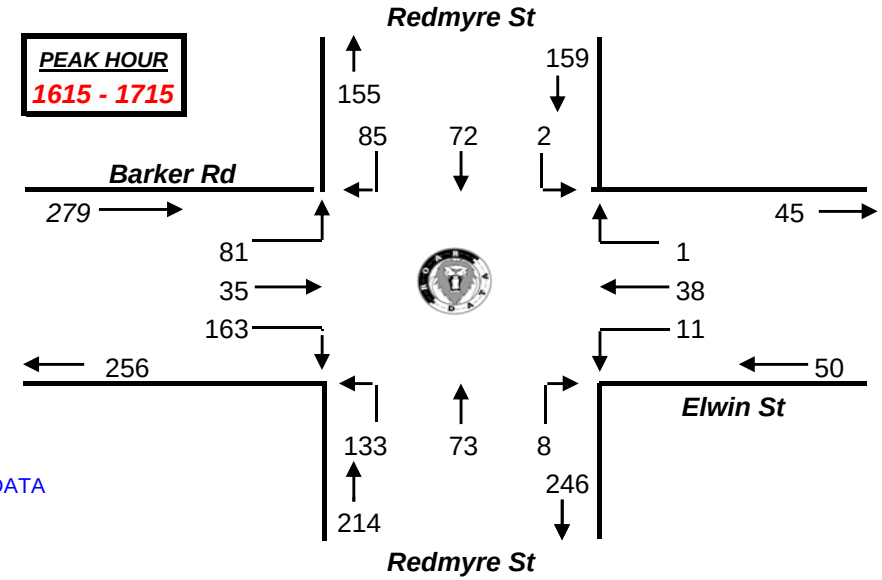
	NORTH Redmyre St			WEST Barker Rd			SOUTH Redmyre St			EAST Elwin St			
Peak Time	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0700 - 0800	0	49	39	51	25	92	105	161	13	9	20	0	**564**
0715 - 0815	0	69	61	71	42	110	144	193	17	10	27	0	**744**
0730 - 0830	0	88	91	90	77	123	204	225	21	10	49	0	**978**
0745 - 0845	0	104	130	95	94	135	264	215	20	14	67	2	**1140**
0800 - 0900	1	99	139	87	91	132	284	178	15	19	76	3	**1124**

	NORTH Redmyre St			WEST Barker Rd			SOUTH Redmyre St			EAST Elwin St			
Peak Time	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1600 - 1700	1	66	77	69	29	147	119	67	8	10	34	1	**628**
1615 - 1715	2	72	85	81	35	163	133	73	8	11	38	1	**702**
1630 - 1730	3	79	87	70	34	131	135	78	7	12	31	2	**669**
1645 - 1745	3	85	87	72	34	120	134	90	6	9	29	2	**671**
1700 - 1800	3	91	88	69	31	111	120	88	6	9	34	1	**651**

PEAK HOUR	**0**	**104**	**130**	**95**	**94**	**135**	**264**	**215**	**20**	**14**	**67**	**2**	**1140**

PEAK HOUR	**2**	**72**	**85**	**81**	**35**	**163**	**133**	**73**	**8**	**11**	**38**	**1**	**702**





R.O.A.R. DATA

Reliable, Original & Authentic Results

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

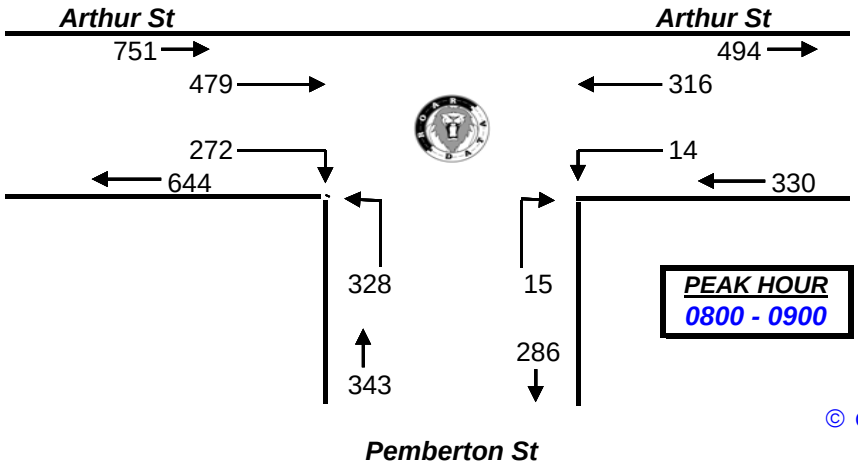
Client : ARUP
Job No/Name : 3611 Strathfield Intersection Counts
Day/Date : Thursday 26th May 2011

All Vehicles

	WEST		SOUTH		EAST		
	Arthur St		*Pemberton*		*Arthur St*		
Time Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOTAL**
0700 - 0715	55	53	35	3	7	41	**194**
0715 - 0730	74	39	44	2	2	48	**209**
0730 - 0745	86	43	55	1	3	77	**265**
0745 - 0800	91	49	65	3	4	74	**286**
0800 - 0815	100	61	70	5	3	57	**296**
0815 - 0830	128	75	81	3	2	74	**363**
0830 - 0845	137	65	101	5	4	98	**410**
0845 - 0900	114	71	76	2	5	87	**355**
Period End	**785**	**456**	**527**	**24**	**30**	**556**	**2378**

	WEST		SOUTH		EAST		
	Arthur St		*Pemberton*		*Arthur St*		
Peak Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOTAL**
0700 - 0800	306	184	199	9	16	240	**954**
0715 - 0815	351	192	234	11	12	256	**1056**
0730 - 0830	405	228	271	12	12	282	**1210**
0745 - 0845	456	250	317	16	13	303	**1355**
0800 - 0900	479	272	328	15	14	316	**1424**

PEAK HR	**479**	**272**	**328**	**15**	**14**	**316**	**1424**

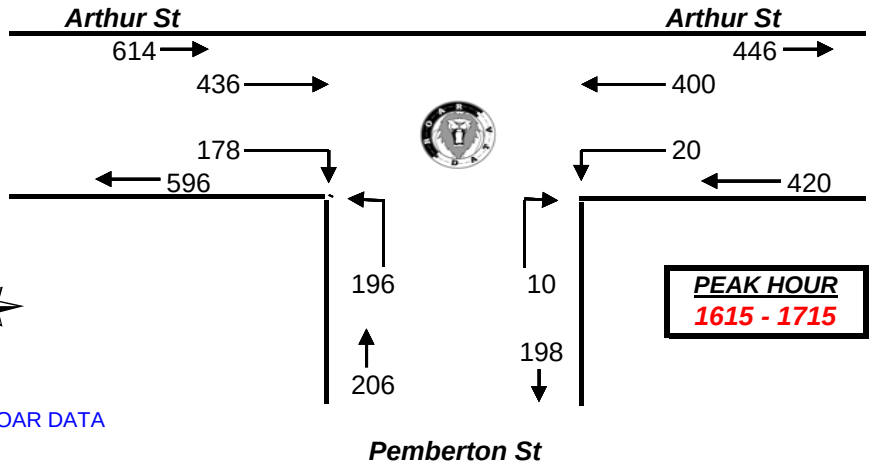


All Vehicles

	WEST		SOUTH		EAST		
	Arthur St		*Pemberton*		*Arthur St*		
Time Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOTAL**
1600 - 1615	68	30	46	4	4	84	**236**
1615 - 1630	106	46	49	2	4	83	**290**
1630 - 1645	104	43	60	2	5	124	**338**
1645 - 1700	112	45	42	3	7	90	**299**
1700 - 1715	114	44	45	3	4	103	**313**
1715 - 1730	100	45	35	6	4	98	**288**
1730 - 1745	139	37	34	2	7	87	**306**
1745 - 1800	111	40	43	5	5	85	**289**
Period End	**854**	**330**	**354**	**27**	**40**	**754**	**2359**

	WEST		SOUTH		EAST		
	Arthur St		*Pemberton*		*Arthur St*		
Peak Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOTAL**
1600 - 1700	390	164	197	11	20	381	**1163**
1615 - 1715	436	178	196	10	20	400	**1240**
1630 - 1730	430	177	182	14	20	415	**1238**
1645 - 1745	465	171	156	14	22	378	**1206**
1700 - 1800	464	166	157	16	20	373	**1196**

PEAK HR	**436**	**178**	**196**	**10**	**20**	**400**	**1196**



Appendix B

SIDRA Intersection Analysis

MOVEMENT SUMMARY

Site: Existing AM Peak

Redmyre Rd & Barker Rd & Elwin Rd Intersection
Existing AM Peak (7.45am - 8.45am)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Redmyre Rd (sout)											
1	L	278	1.0	0.151	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
2	T	226	1.0	0.133	0.4	LOS A	0.9	6.2	0.22	0.00	47.3
3	R	21	1.0	0.132	6.8	LOS A	0.9	6.2	0.22	0.80	43.1
Approach		525	1.0	0.151	3.8	LOS A	0.9	6.2	0.10	0.36	44.9
East: Elwin St (east)											
4	L	15	1.0	0.019	6.9	LOS A	0.1	0.4	0.21	0.57	42.6
5	T	71	1.0	0.145	10.8	LOS A	0.6	4.5	0.62	0.81	39.7
6	R	2	1.0	0.150	12.1	LOS A	0.6	4.5	0.62	0.88	39.1
Approach		87	1.0	0.145	10.2	LOS A	0.6	4.5	0.55	0.77	40.1
North: Redmyre Rd (north)											
7	L	1	1.0	0.001	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
8	T	109	1.0	0.204	2.3	LOS A	1.3	9.2	0.48	0.00	43.6
9	R	137	1.0	0.204	8.6	LOS A	1.3	9.2	0.48	0.80	42.0
Approach		247	1.0	0.204	5.8	LOS A	1.3	9.2	0.48	0.44	42.7
West: Barker Rd (west)											
10	L	100	1.0	0.143	8.5	LOS A	0.6	4.1	0.44	0.70	41.5
11	T	99	1.0	0.495	13.9	LOS A	3.3	23.0	0.71	0.99	37.2
12	R	142	1.0	0.495	15.2	LOS B	3.3	23.0	0.71	1.02	36.8
Approach		341	1.0	0.496	12.9	LOS B	3.3	23.0	0.63	0.92	38.2
All Vehicles		1201	1.0	0.496	7.3	NA	3.3	23.0	0.36	0.56	42.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Future AM Peak

Redmyre Rd & Barker Rd & Elwin Rd Intersection
Future AM Peak (10% increase of volume in all approaches)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Redmyre Rd (sout)											
1	L	305	1.0	0.166	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
2	T	248	1.0	0.146	0.4	LOS A	1.0	6.9	0.23	0.00	47.1
3	R	23	1.0	0.146	6.9	LOS A	1.0	6.9	0.23	0.80	43.1
Approach		577	1.0	0.166	3.9	LOS A	1.0	6.9	0.11	0.36	44.8
East: Elwin St (east)											
4	L	17	1.0	0.022	7.0	LOS A	0.1	0.5	0.22	0.57	42.5
5	T	78	1.0	0.180	11.8	LOS A	0.8	5.6	0.67	0.84	38.9
6	R	3	1.0	0.175	13.1	LOS A	0.8	5.6	0.67	0.89	38.4
Approach		98	1.0	0.180	11.0	LOS A	0.8	5.6	0.59	0.79	39.4
North: Redmyre Rd (north)											
7	L	2	1.0	0.001	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
8	T	121	1.0	0.233	2.7	LOS A	1.5	10.8	0.52	0.00	43.2
9	R	151	1.0	0.233	9.0	LOS A	1.5	10.8	0.52	0.83	41.7
Approach		274	1.0	0.233	6.2	LOS A	1.5	10.8	0.51	0.46	42.4
West: Barker Rd (west)											
10	L	111	1.0	0.161	8.8	LOS A	0.7	4.7	0.46	0.72	41.2
11	T	109	1.0	0.598	16.8	LOS B	4.3	30.6	0.78	1.10	35.4
12	R	156	1.0	0.599	18.0	LOS B	4.3	30.6	0.78	1.11	35.0
Approach		376	1.0	0.600	15.0	LOS B	4.3	30.6	0.69	0.99	36.7
All Vehicles		1324	1.0	0.600	8.0	NA	4.3	30.6	0.39	0.59	41.3

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Existing PM Peak

Redmyre Rd & Barker Rd & Elwin Rd Intersection
Existing PM Peak (4.15pm - 5.15pm)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Redmyre Rd (sout)											
1	L	140	1.0	0.076	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
2	T	77	1.0	0.046	0.2	LOS A	0.3	1.9	0.16	0.00	47.9
3	R	8	1.0	0.046	6.6	LOS A	0.3	1.9	0.16	0.80	43.2
Approach		225	1.0	0.076	4.3	LOS A	0.3	1.9	0.06	0.41	44.8
East: Elwin St (east)											
4	L	12	1.0	0.015	6.8	LOS A	0.0	0.3	0.17	0.57	42.7
5	T	40	1.0	0.052	7.2	LOS A	0.2	1.6	0.43	0.61	42.6
6	R	1	1.0	0.053	8.5	LOS A	0.2	1.6	0.43	0.72	41.8
Approach		53	1.0	0.052	7.1	LOS A	0.2	1.6	0.37	0.61	42.6
North: Redmyre Rd (north)											
7	L	2	1.0	0.001	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
8	T	76	1.0	0.113	0.7	LOS A	0.6	4.4	0.29	0.00	46.0
9	R	89	1.0	0.113	7.1	LOS A	0.6	4.4	0.29	0.68	42.7
Approach		167	1.0	0.113	4.2	LOS A	0.6	4.4	0.29	0.37	44.1
West: Barker Rd (west)											
10	L	85	1.0	0.111	7.1	LOS A	0.4	2.7	0.26	0.59	42.4
11	T	37	1.0	0.297	8.1	LOS A	1.6	10.9	0.49	0.67	41.6
12	R	172	1.0	0.297	9.3	LOS A	1.6	10.9	0.49	0.77	40.9
Approach		294	1.0	0.297	8.6	LOS A	1.6	10.9	0.42	0.71	41.4
All Vehicles		739	1.0	0.297	6.2	NA	1.6	10.9	0.28	0.53	43.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Future PM Peak

Redmyre Rd & Barker Rd & Elwin Rd Intersection
Future PM Peak (10% increase of traffic in all the approaches)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Redmyre Rd (sout)											
1	L	154	1.0	0.083	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
2	T	85	1.0	0.051	0.3	LOS A	0.3	2.2	0.17	0.00	47.8
3	R	9	1.0	0.051	6.7	LOS A	0.3	2.2	0.17	0.79	43.2
Approach		248	1.0	0.083	4.3	LOS A	0.3	2.2	0.07	0.41	44.7
East: Elwin St (east)											
4	L	13	1.0	0.016	6.8	LOS A	0.1	0.4	0.18	0.57	42.7
5	T	44	1.0	0.062	7.5	LOS A	0.3	1.9	0.45	0.64	42.3
6	R	2	1.0	0.062	8.8	LOS A	0.3	1.9	0.45	0.74	41.5
Approach		59	1.0	0.062	7.4	LOS A	0.3	1.9	0.39	0.63	42.3
North: Redmyre Rd (north)											
7	L	3	1.0	0.002	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
8	T	84	1.0	0.127	0.8	LOS A	0.7	5.1	0.31	0.00	45.7
9	R	99	1.0	0.127	7.2	LOS A	0.7	5.1	0.31	0.69	42.7
Approach		186	1.0	0.127	4.3	LOS A	0.7	5.1	0.30	0.38	44.0
West: Barker Rd (west)											
10	L	94	1.0	0.123	7.2	LOS A	0.4	3.0	0.28	0.60	42.3
11	T	41	1.0	0.345	8.9	LOS A	2.0	14.1	0.53	0.73	40.9
12	R	189	1.0	0.344	10.1	LOS A	2.0	14.1	0.53	0.84	40.3
Approach		324	1.0	0.344	9.1	LOS A	2.0	14.1	0.45	0.76	40.9
All Vehicles		818	1.0	0.344	6.4	NA	2.0	14.1	0.30	0.55	42.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: Existing AM Peak

Arthour St & Pemberton St
Existing AM (8am - 9am)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pemberton St S											
1	L	345	1.0	0.413	9.6	LOS A	2.9	20.8	0.52	0.81	40.6
3	R	16	1.0	0.068	20.0	LOS B	0.3	1.8	0.79	0.92	33.7
Approach		361	1.0	0.414	10.0	LOS B	2.9	20.8	0.54	0.81	40.3
East: Arther St E											
4	L	15	1.0	0.090	6.4	LOS A	0.0	0.0	0.00	0.88	43.3
5	T	333	1.0	0.090	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		347	1.0	0.090	0.3	LOS A	0.0	0.0	0.00	0.04	49.7
West: Arther St W											
11	T	504	1.0	0.397	1.1	LOS A	3.6	25.5	0.26	0.00	46.4
12	R	286	1.0	0.397	8.6	LOS A	3.6	25.5	0.51	0.82	42.1
Approach		791	1.0	0.397	3.8	LOS A	3.6	25.5	0.35	0.30	44.7
All Vehicles		1499	1.0	0.414	4.5	NA	3.6	25.5	0.31	0.36	44.6

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Future AM Peak

Arthour St & Pemberton St
Future AM (10% addtional traffic in all approaches)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pemberton St S											
1	L	380	1.0	0.474	10.4	LOS A	3.8	26.7	0.57	0.88	40.0
3	R	18	1.0	0.093	23.4	LOS B	0.3	2.5	0.83	0.93	32.0
Approach		398	1.0	0.474	11.0	LOS B	3.8	26.7	0.58	0.89	39.5
East: Arther St E											
4	L	17	1.0	0.099	6.4	LOS A	0.0	0.0	0.00	0.88	43.3
5	T	366	1.0	0.099	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		383	1.0	0.099	0.3	LOS A	0.0	0.0	0.00	0.04	49.7
West: Arther St W											
11	T	555	1.0	0.445	1.4	LOS A	4.6	32.6	0.28	0.00	46.1
12	R	316	1.0	0.444	9.2	LOS A	4.6	32.6	0.57	0.88	41.6
Approach		871	1.0	0.444	4.2	LOS A	4.6	32.6	0.39	0.32	44.3
All Vehicles		1652	1.0	0.474	4.9	NA	4.6	32.6	0.34	0.39	44.1

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Existing PM Peak

Arthour St & Pemberton St
Existing PM (4.15pm - 5.15pm)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pemberton St S											
1	L	206	1.0	0.276	9.5	LOS A	1.4	10.2	0.52	0.78	40.7
3	R	11	1.0	0.042	18.5	LOS B	0.2	1.1	0.76	0.91	34.6
Approach		217	1.0	0.276	9.9	LOS B	1.4	10.2	0.53	0.79	40.4
East: Arther St E											
4	L	21	1.0	0.114	6.4	LOS A	0.0	0.0	0.00	0.88	43.3
5	T	421	1.0	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		442	1.0	0.114	0.3	LOS A	0.0	0.0	0.00	0.04	49.6
West: Arther St W											
11	T	459	1.0	0.322	1.4	LOS A	2.8	19.5	0.30	0.00	46.0
12	R	187	1.0	0.322	8.9	LOS A	2.8	19.5	0.53	0.85	42.0
Approach		646	1.0	0.322	3.5	LOS A	2.8	19.5	0.36	0.25	44.8
All Vehicles		1305	1.0	0.322	3.5	NA	2.8	19.5	0.27	0.27	45.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Future PM Peak

Arthour St & Pemberton St
Future PM (additional 10% vehicles in all approaches)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pemberton St S											
1	L	227	1.0	0.321	10.3	LOS A	1.8	13.0	0.56	0.85	40.1
3	R	12	1.0	0.051	20.3	LOS B	0.2	1.4	0.79	0.92	33.6
Approach		239	1.0	0.321	10.7	LOS B	1.8	13.0	0.57	0.85	39.7
East: Arther St E											
4	L	23	1.0	0.126	6.4	LOS A	0.0	0.0	0.00	0.88	43.3
5	T	463	1.0	0.126	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		486	1.0	0.126	0.3	LOS A	0.0	0.0	0.00	0.04	49.6
West: Arther St W											
11	T	505	1.0	0.331	1.7	LOS A	3.1	22.2	0.33	0.00	45.6
12	R	168	1.0	0.331	9.3	LOS A	3.1	22.2	0.57	0.90	41.8
Approach		674	1.0	0.331	3.6	LOS A	3.1	22.2	0.39	0.22	44.6
All Vehicles		1399	1.0	0.331	3.7	NA	3.1	22.2	0.29	0.27	45.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: AM (no right turn lane)

Proposed Barker Rd & South St & New Access Traffic Signal
Critical AM Peak
Scenario - no right turn lane
Signals - Fixed Time Cycle Time = 60 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Street (south)											
1	L	16	0.0	0.109	24.2	LOS B	0.7	5.1	0.77	0.69	31.9
2	T	5	0.0	0.109	17.8	LOS B	0.7	5.1	0.77	0.54	32.6
3	R	32	0.0	0.074	24.7	LOS B	1.1	7.7	0.78	0.71	31.3
Approach		53	0.0	0.109	23.8	LOS B	1.1	7.7	0.77	0.69	31.6
East: Barker Rd (east)											
4	L	32	0.0	0.109	13.5	LOS A	0.7	4.8	0.49	0.67	37.7
5	T	384	1.0	0.511	11.0	LOS A	10.5	74.1	0.72	0.63	37.7
6	R	57	1.0	0.511	17.4	LOS B	10.5	74.1	0.72	0.87	36.4
Approach		473	0.9	0.511	11.9	LOS A	10.5	74.1	0.70	0.66	37.6
North: New Access (North)											
7	L	6	1.0	0.015	23.9	LOS B	0.3	1.8	0.76	0.67	31.9
8	T	1	0.0	0.015	17.5	LOS B	0.3	1.8	0.76	0.51	32.7
9	R	3	1.0	0.017	24.1	LOS B	0.1	0.8	0.75	0.63	31.6
Approach		11	0.9	0.017	23.3	LOS B	0.3	1.8	0.76	0.64	31.9
West: Barker Rd (west)											
10	L	33	1.0	0.033	13.5	LOS A	0.7	5.0	0.49	0.68	37.7
11	T	425	1.0	0.448	9.3	LOS A	9.7	68.4	0.66	0.57	39.2
12	R	16	0.0	0.446	15.7	LOS B	9.7	68.4	0.66	0.89	37.6
Approach		474	1.0	0.448	9.8	LOS A	9.7	68.4	0.64	0.59	39.1
All Vehicles		1009	0.9	0.511	11.7	LOS A	10.5	74.1	0.68	0.63	37.8

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	26	10.2	LOS B	0.0	0.0	0.58	0.58
P3	Across E approach	26	24.3	LOS C	0.0	0.0	0.90	0.90
P5	Across N approach	26	10.2	LOS B	0.0	0.0	0.58	0.58
P7	Across W approach	26	24.3	LOS C	0.0	0.0	0.90	0.90
All Pedestrians		104	17.3				0.74	0.74

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual pedestrian movements: Delay (HCM).

MOVEMENT SUMMARY

Site: AM (with right turn lane)

Proposed Barker Rd & South St & New Access Traffic Signal
Critical AM Peak
Scenario - no right turn lane
Signals - Fixed Time Cycle Time = 60 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Street (south)											
1	L	16	0.0	0.109	24.2	LOS B	0.7	5.1	0.77	0.69	31.9
2	T	5	0.0	0.109	17.8	LOS B	0.7	5.1	0.77	0.54	32.6
3	R	32	0.0	0.074	24.5	LOS B	1.1	7.7	0.78	0.71	31.4
Approach		53	0.0	0.109	23.7	LOS B	1.1	7.7	0.77	0.69	31.7
East: Barker Rd (east)											
4	L	32	0.0	0.119	13.5	LOS A	0.7	4.8	0.49	0.67	37.7
5	T	384	1.0	0.372	8.8	LOS A	8.3	58.4	0.62	0.54	39.7
6	R	57	1.0	0.303	19.3	LOS B	1.7	11.8	0.66	0.72	34.1
Approach		473	0.9	0.372	10.4	LOS A	8.3	58.4	0.62	0.57	38.8
North: New Access (North)											
7	L	6	1.0	0.015	23.9	LOS B	0.3	1.8	0.76	0.67	31.9
8	T	1	0.0	0.015	17.5	LOS B	0.3	1.8	0.76	0.51	32.7
9	R	3	1.0	0.017	24.1	LOS B	0.1	0.8	0.75	0.63	31.6
Approach		11	0.9	0.017	23.3	LOS B	0.3	1.8	0.76	0.64	31.9
West: Barker Rd (west)											
10	L	33	1.0	0.443	15.7	LOS B	10.0	70.3	0.65	0.88	37.6
11	T	425	1.0	0.445	9.3	LOS A	10.0	70.3	0.65	0.57	39.2
12	R	16	0.0	0.078	17.1	LOS B	0.4	3.0	0.60	0.67	35.4
Approach		474	1.0	0.445	10.0	LOS A	10.0	70.3	0.65	0.60	38.9
All Vehicles		1009	0.9	0.445	11.0	LOS A	10.0	70.3	0.64	0.59	38.3

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	26	10.2	LOS B	0.0	0.0	0.58	0.58
P3	Across E approach	26	24.3	LOS C	0.0	0.0	0.90	0.90
P5	Across N approach	26	10.2	LOS B	0.0	0.0	0.58	0.58
P7	Across W approach	26	24.3	LOS C	0.0	0.0	0.90	0.90
All Pedestrians		104	17.3				0.74	0.74

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual pedestrian movements: Delay (HCM).

MOVEMENT SUMMARY

Site: AM (no right turn lane)

Proposed New Gate 3 & Barker Rd Intersection
Critical AM Peak
Scenario - no right turn lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Barker Rd (east)											
5	T	384	1.0	0.368	3.6	LOS A	4.1	29.0	0.64	0.00	42.3
6	R	152	1.0	0.368	7.5	LOS A	4.1	29.0	0.64	1.01	28.6
Approach		536	1.0	0.368	4.7	LOS A	4.1	29.0	0.64	0.29	37.3
North: Gate 3 Access											
7	L	17	1.0	0.068	11.0	LOS A	0.3	1.9	0.60	0.70	26.8
9	R	8	1.0	0.068	11.4	LOS A	0.3	1.9	0.60	0.82	26.7
Approach		25	1.0	0.068	11.1	LOS A	0.3	1.9	0.60	0.74	26.7
West: Barker Rd (west)											
10	L	80	1.0	0.263	5.6	LOS A	0.0	0.0	0.00	0.79	43.5
11	T	425	1.0	0.263	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		505	1.0	0.263	0.9	LOS A	0.0	0.0	0.00	0.12	48.9
All Vehicles		1066	1.0	0.368	3.0	NA	4.1	29.0	0.33	0.22	41.5

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: AM (with right turn lane)

Proposed New Gate 3 & Barker Rd Intersection
Critical AM Peak
Scenario - with right turn lane
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Barker Rd (east)											
5	T	384	1.0	0.198	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R	152	1.0	0.189	6.3	LOS A	0.7	5.2	0.47	0.71	28.5
Approach		536	1.0	0.198	1.8	LOS A	0.7	5.2	0.13	0.20	41.2
North: Gate 3 Access											
7	L	17	1.0	0.062	10.2	LOS A	0.2	1.7	0.58	0.69	27.1
9	R	8	1.0	0.062	10.6	LOS A	0.2	1.7	0.58	0.82	27.0
Approach		25	1.0	0.062	10.3	LOS A	0.2	1.7	0.58	0.73	27.0
West: Barker Rd (west)											
10	L	80	1.0	0.263	5.6	LOS A	0.0	0.0	0.00	0.79	43.5
11	T	425	1.0	0.263	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		505	1.0	0.263	0.9	LOS A	0.0	0.0	0.00	0.12	48.9
All Vehicles		1066	1.0	0.263	1.6	NA	0.7	5.2	0.08	0.18	43.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.