Traffic Review of MP 10_0231 - Concept Plan for Australian Catholic University, Strathfield Campus

December 2012

Department of Planning and Infrastructure

PARSONS BRINCKERHOFF

Parsons Brinckerhoff Australia Pty Limited
ABN 80 078 004 798

Level 27, Ernst & Young Centre
680 George Street
Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001
Australia
Telephone +61 2 9272 5100
Facsimile +61 2 9272 5101
Email sydney@pb.com.au

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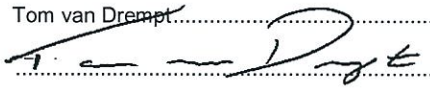
Author: Tom van Drempt

Signed: 

Reviewer: John Webster

Signed: 

Approved by: John Webster

Signed: 

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Executive summary

Parsons Brinckerhoff has undertaken an independent review of traffic assessments made in support of and opposing the proposed expansion of the Australian Catholic University (ACU), Strathfield Campus on behalf of the NSW Department of Planning and Infrastructure (DP&I).

Proposed expansion

The exhibited Concept Plan for the expansion of the University was modified following the submission of the Part 3A application to respond to some of the issues raised in the submissions received following public exhibition. The expansion involves:

- construction of six new buildings within four precincts
- an increase in student number limits to 2,000 on-site at any one time and 2,800 students attending the University across the day, and an increase in staff to 260
- an increase in on-site parking from the current 346 spaces to 717 spaces, located in underground and surface level parking areas
- an additional 30 spaces allocated for St Patricks College in the underground car park to replace current parking
- relocated western access to the University on Barker Road
- an increase to shuttle bus services between the University and Strathfield Station.

Review material

Documents assessed as part of the review include:

- ARUP Transport and Accessibility Study
- McLaren Traffic Engineering (MTE) review
- submissions made on the exhibited Concept Plan from the public, Strathfield Council, Transport for NSW and Roads and Maritime Services
- ARUP Preferred Project Report (PPR)
- MTE review of the PPR from ARUP
- ARUP response to McLaren review of PPR document
- ARUP Green Transport Plan

As part of the review, consultation was undertaken with ACU and their consultants and MTE on behalf of Strathfield Council.

Traffic review

The traffic and transport assessment undertaken by ARUP concluded that the increase in on-site parking would counteract the increase in student numbers, resulting in a net reduction in on-street parking compared to present levels. The shuttle bus was assumed to accommodate the majority of the increase in student travel, with only a minor increase in total parking and therefore traffic generation. Sustainable transport initiatives were proposed.

MTE on behalf of Council and residents raised issues regarding the number of students on-site and across the day, claiming that the previous Land & Environment Court rulings were being exceeded. MTE also raised concerns regarding the method of traffic assessment and the data used in the assessment.

Parsons Brinckerhoff has reviewed the reports written and the results of consultation with ACU and MTE. Observations have been made of parking conditions and shuttle bus operation to assist in our understanding of the issues and of current travel conditions. Based on this review, it appears that neither side has conclusively demonstrated what the impacts of the proposal would be and how they could be mitigated.

Both ARUP and MTE have used methods of calculation which would appear to understate or overstate the impacts of the proposed expansion depending on their position on the proposal. ARUP have based much of their analysis on data which does not give a complete assessment of the current situation. Discrepancies between data sources have not been conclusively answered, leaving uncertainty regarding the conclusions of reduced impact for on-street parking with the proposal. These discrepancies have resulted in a staged increase of students being recommended, to allow time for more conclusive data to be gathered.

Current situation

Our findings on the critical issues surrounding the current operation have been:

- It appears from parking and shuttle bus data that some of the proposed increase in student number limits may have already occurred. However, the impact of this increase has been reduced by the success of the shuttle bus between Strathfield Station and the University. This conclusion is based on the data provided, which only shows the situation at the times surveyed.
- Parking surveys have indicated a gradual increase in on-street parking, which has potentially contributed to opposition to the proposal from surrounding residents.
- The shuttle bus to Strathfield Station has been successful in accommodating a large share of the increase in students.
- There appears to be an inconsistency in the parking and shuttle bus patronage data:
  - Parsons Brinckerhoff parking observations of the number of vehicles parked in surrounding streets correlate well with ARUP's March 2012 surveys.
  - However, shuttle bus patronage numbers indicate that the March 2012 count of 1,650 passengers per day from Strathfield Station to Campus had dropped to 1,100 in May 2012, and 840 in August 2012 (160 students on placement outside the University).
  - The explanation provided for the drop in bus patronage – that student numbers decline across the year is at odds with the parking observations (ARUP parking observations showing a drop in parking in August 2012 are at odds with Parsons Brinckerhoff's observations one week earlier).

- Traffic volumes on Barker Road are within the functional capacity of a collector street, but are in excess of the environmental capacity with or without the influence of University-related traffic.

These findings are limited by the reliability of the data provided in the reviewed reports.

Potential Impact of proposed expansion

Although it has not been reported by ACU or ARUP, if student numbers have already increased beyond the limit of students at any one time (as suggested by the data), the impact of the increase in student population is reduced. That is:

- if the 750 student limit is representative of the current student number, the increase to 2,000 students on-site at any one time is 1,250 additional students – an increase of 167%

- if student numbers are current number of students on-site at any one time is higher, the increase in student numbers is lower and their impact would also be lower.

Based on a range of shuttle bus passenger volumes, the potential impact on on-street parking could vary between an increase of approximately 240 vehicles above 2012 surveyed levels to a decrease of approximately 300 vehicles. The results of repeated shuttle bus surveys included in the recommendations may address this issue.

The proposed construction of additional on-site parking should reduce pressure on on-street parking, which appears to be one of the main grounds for objection from local residents. ACU has submitted a Green Travel Plan with mode share targets that, if achieved, would result in lower impacts on parking than currently exist. However, the ability of the Green Travel Plan targets to be achieved is uncertain due to the uncertainty surrounding the current transport situation.

The increase in total parking is likely to increase traffic volumes on Barker Road. If the reduction in on-street parking can be achieved, this would potentially result in a reduction in traffic in neighbouring local streets. The increases in traffic due to the proposed expansion are considered to be within the functional capacity of Barker Street, although traffic volumes are already in excess of its environmental capacity. The impact on nearby intersections of the proposed expansion will be affected by the magnitude of the increase in the peak number of students on campus at any one time and the success of the Green Travel Plan.

The proposed list of sustainable transport measures are a step in the right direction, but lack detail and solid commitments. Additional work is required to assess pedestrian and cycling routes and evaluate what improvements are required. The quantity and location of bicycle infrastructure within the campus needs to be identified.

Recommendations

Based on the information provided it has not been possible to identify, with reasonable certainty, the transport impact of the proposed increase in student population. To enable the impact of the full student increase to be confirmed, a staged increase in student numbers is recommended.

Staged increase

It is recommended that the expansion of the University could be considered with a limit of 1,600 students at any one time (which is lower than currently proposed limit of 2,000 students at any one time), provided the additional on-site parking is constructed and opened. Further, if it can be demonstrated through independent surveys that the current mode share to car driver for students would not result in an increase of on-street parking (with the construction of the additional on-site parking), the maximum student number limit could be increased to the proposed 2,000 at any one time level. To do this it is recommended that:

1. Independent surveys of shuttle bus patronage be undertaken at the time of peak student attendance at the University campuses (throughout the year – expected to be during March).

2. An on-street parking survey is undertaken outside University sessions and at the same peak student attendance time (as identified for the shuttle bus surveys) within the area identified for ACU parking in Figure 3 of ARUP's PPR report with the addition of streets around Inveresk Park.

3. A travel mode survey of people entering and leaving the ACU Strathfield Campuses (including the Main Campus, Edward Clancy Campus and Sydney Adventist College (if used for ACU Strathfield classes, tutorials, etc.). This survey should be undertaken at the same time as items 1 and 2, and should detail the time of arrival/departure to the nearest minute (to avoid double counting of students moving between campuses. The survey should include a count of bicycles and motorcycles parked within the campuses.

Further recommendations are that:

- The mode share targets proposed in the Green Travel Plan be adopted for the project.
- A minimum requirement of no net increase in student on-street parking levels should be set, with a target reduction in on-street parking to the number proposed in the PPR (230).
- The University should continue to work with Strathfield Council to reduce the incidence of students blocking driveways in nearby streets.
- The proponent should be required to demonstrate progress in implementing the sustainable transport initiatives in the Green Travel Plan.
- The proponent makes a commitment to monitor on-street parking and shuttle bus patronage on an annual basis.

Additional information to be provided with the Project Application includes:

1. Analysis of the capacity of the access intersections onto Barker Road.

2. Swept path analysis of service vehicles moving into and out of the loading dock area.

3. Identification of pedestrian and cycle routes to the University and an evaluation of infrastructure improvements required along these routes, to be included in a Statement of Commitments.

4. The proponent should demonstrate to Transport for NSW and Strathfield Council that future increases in shuttle bus operation will not adversely impact on other transport services at the interchange on the southern side of Strathfield Station.

5. Traffic surveys undertaken at peak student times on Barker Road.

6. A program to increase shuttle bus frequencies be provided to match the service capacity to the anticipated increase in demand.

These additional information items for the Project Application should not affect the ability of DP&I to make a determination on the Concept Plan submitted.

1. Introduction

Parsons Brinckerhoff was commissioned by the NSW Department of Planning and Infrastructure (DP&I) to undertake an independent review of traffic assessments associated with the proposed expansion of the Australian Catholic University (ACU), Strathfield Campus (MP 10_0231 – Concept Plan for Australian Catholic University, Strathfield Campus).

This report makes reference to three different measures of student numbers, based on the presentation of this information in the reviewed reports. The measures include:

- The number of students on-site at any one time includes those students physically attending lectures, in tutorial classes, doing research in the library, in student common rooms or otherwise within the premises.
- The number of students attending the site across the day includes all the people listed above plus those who attend lectures or come onto the site at different times of the day but have been and gone or are yet to arrive on-site.
- The equivalent full time student load (EFTSL) provides a measure of the number of enrolments and is a common approach at all tertiary institutions to be able to assess resourcing and funding needs. This number includes undergraduate, postgraduate, online and Away from Base/Residential indigenous program students. Only a portion of these students will be on-site at any one time or across the day.

An increase in one measure may not automatically result in the increase in another.

1.1 Background

ACU is proposing a staged expansion of the student and teaching staff numbers at its Strathfield Campus. The expansion would include an increase in student numbers, including an increase of students scheduled to be on the campus at any one time, an increase in students visiting the campus across a typical teaching day, and an increase in the number of students enrolled at the campus. ACU Strathfield Campus is spread over two sites located close to each other. The main campus is located at 179 Albert Road, Strathfield. A 1994 decision of the Land and Environment Court on a previous expansion approval required 325 on campus parking spaces and a limit of maximum 510 students on the campus at any one time between 8.00 am and 5.00 pm as noted below. The second site is the Edward Clancy Campus at 163–167 Albert Road. This campus has a requirement of 38 off-street parking spaces and a limit of 240 students on the campus at any one time. ACU has recently commenced leasing classroom space in the Sydney Adventist College at 158 Albert Street.

Table 1.1 Limits on students at ACU Strathfield

Time period	Main Campus	Edward Clancy Campus
At any one time - day	510	240
At any one time - night	247	240
Across one day - day	1,100	No limit
Across one day - night	700	No limit

Note: Day time defined as 8.00 am to 5.00 pm and night from 5.00 pm to 9.00 pm, Monday to Friday

1.1.1 The proposal

The University proposes to expand the student numbers by the year 2016 to a figure of 4,800 equivalent full time student load (EFTSL). The number of students on-site at any one time is proposed at a maximum of 2,000 (across both sites) based on two teaching sessions per day (8.00 am–2.00 pm and 2.00 pm–8.00 pm). The maximum number of students across the day would be 2,800.

1.1.2 The proponents' submissions

ARUP has the following documents looking at the impacts and proposed mitigation measures for the expansion:

- A *Transport and Accessibility* study (TAS) was produced in December 2011 for an application under Part 3A of the Environmental Planning & Assessment Act 1979. The report assessed the transport requirements for the building occupants including pedestrian, cyclist and public transport facilities and analysed the proposed development's impact on the nearby residential streets and road network, including the impact on parking.
- Following a list of key issues being issued by the Department of Planning and Infrastructure, a *Preferred Project Report* (PPR) *Transport and Accessibility Report* was issued in July 2012. This report provided:
  - clarification on the issue of the number of students attending the University
  - additional information on traffic, the shuttle bus and parking
  - detailed information on some of the changes to the proposed expansion.
- ARUP responded to questions put to ACU, Hassell and ARUP during consultation for this study with a document containing additional information and explanation on 10 August 2012
- In responding to a request for information from DP&I, a *Green Travel Plan* was produced in October 2012 that outlined the mode share targets for all modes and the strategies designed to achieve them.
- A '*Response to Traffic and Parking Impact Assessment Review undertaken by McLaren Traffic Engineering, August 2012'* was also produced in October 2012 to address issues raised in the second submission by McLaren Traffic Engineering.

1.1.3 Opponents to the proposal

A group of surrounding residents and Strathfield City Council have objected to the expansion on several grounds, including the impact of additional traffic and on-street parking. A core issue to the opposition of the expansion is the belief that ACU Strathfield Campus is currently operating above its student number limit (from Land & Environment Court rulings from 1994 and 2002), and that the current levels of traffic and on-street parking associated with the University are having adverse impacts on residential amenity.

Strathfield Council and the Strathfield Residents Group engaged McLaren Traffic Engineering (MTE) to independently review the proposed expansion of the University and the reports produced by ARUP. Two documents (March 2012 and August 2012) have been produced responding in turn to the ARUP reports. Both discuss the number of students, as well as reviewing and challenging the data and conclusions of ARUP on topics including:

- traffic generation
- parking impact
- access arrangements
- the adequacy of the mitigation measures.

1.1.4 Public exhibition of the Concept Plan

Following exhibition of the Concept Plan, several responses were received from members of the public as well as agencies such as Transport for NSW (TfNSW), Roads and Maritime Services (RMS) and Strathfield Council. These submissions have also been reviewed, as has the '*ACU Strathfield Concept Plan _ Response to Preferred Project Report Submissions MP 10_0231'* (Hassell, October 2012).

Further correspondence was sent in November 2012 by residents of Strathfield, raising objections to the Concept Plan and rebutting information contained in ARUP's PPR and October response to MTE document). Approximately 30 letters with similar content were received by DP&I. This correspondence has also been reviewed.

1.2 Project Objectives

The objectives of this review are to:

- Review the adequacy of the traffic and transport assessments prepared by ARUP for the ACU and prepared by MTE on behalf of Strathfield Council and Residents Action Group.
- Assess whether the impact of the proposed expansion could be reliably determined (based on the material available).
- Make recommendations with regard to potential solutions for any outstanding transport-related issues.
- Consider potential staging requirements for increase to student numbers.

1.3 Approach to the traffic review

The scope of this review includes:

1. Complete a review of the traffic and transport reports prepared by ARUP for the ACU within the submitted PPR and the traffic review prepared by MTE on behalf of Strathfield Council and Residents Action Group.

2. Undertake a site inspection to familiarise ourselves with the local area and location of issues.

3. Consult with ACU and Strathfield Council to discuss the issues and obtain information that may assist the review.

4. Review the submissions from relevant authorities and the community.

5. Assess the traffic and parking impacts based on the information contained in both reports.

6. Draw conclusions on whether the likely impacts of the proposal can be determined and assess the ability of the strategies that have been proposed to manage these impacts.

7. Consider potential staging for increase to student numbers to allow time for monitoring and mitigation measures.

8. Document the review in a report to DP&I containing the recommendations and potential mitigation measures.

A central issue for the community opposition to the project is the number of students currently attending the University in relation to the previous Land and Environment Court decisions. This matter is the subject of pending legal action between Council and ACU.

The purpose of this review is to assess the impact of the proposed development, not to determine whether the University is complying with its student number limits. Reference will be made to student numbers in relation to quantifying the current situation as reported in the submitted traffic assessment reports. Assessment of the impact of the University before 2009 was not possible as traffic and parking information before this time was not made available to Parsons Brinckerhoff.

1.4 Report structure

This report is structured as follows:

- Section 2 contains a description of the proposed expansion of the University

- Section 3 presents reviews the ARUP and MTE traffic reports, the received submissions and the results of further consultation

- Section 4 documents observations of the existing road network, including traffic and parking conditions and correlates this with information from ARUP and MTE

- Section 5 contains an analysis of the traffic, parking and transport impacts of the proposed expansion, based on the understanding of the transport parameters gained from the traffic reports and consultation discussions
- Section 6 presents the findings and recommendations.

2. Description of the proposed concept plan

The information in this section is presented to summarise the most up-to-date information from the ACU application and confirm Parsons Brinckerhoff's understanding of the currently proposed Concept Plan. The Concept Plan was modified following the submission of the Part 3A application to respond to some of the issues raised in the submissions received following public exhibition. These changes include:

- reduced student numbers from 2,400 at any one time to 2,000 at any one time
- increase in proposed on-site parking from the previously proposed 644 to 717 spaces - an increase of 73 spaces above the previous proposal
- removal of the proposal to signalise the intersection of Barker Road and South Street
- removal of proposal to install 2-hour time limit for on-street parking on streets surrounding the campus.

2.1 The proposed development

The revised Concept Plan submitted for the PPR involves:

- an increase in student numbers by 2016 to:
  - a maximum of 2,000 students on-site at any one time
  - a maximum number of 2,800 students attending classes on any one day (achieved by scheduling students in blocks across the day with some morning only and some afternoon/night-time only blocks)
  - a maximum EFTSL of 4,800 students
- an increase in the number of staff from 190 to 260
- six new building envelopes housing additional classrooms and teacher areas
- an increase in on-site parking from the current 346 spaces to 717 spaces
- an additional 30 spaces provided on the site for parking by staff of the nearby St Patricks College, accessed from Edgar Street
- on-site parking to be accommodated at surface level and in new underground facilities
- a relocation of Gate 3 on Barker Road to near the western extent of the site and a new access from for use by St Patricks College staff only
- a new right-turn bay on Barker Road for movements into the relocated Gate 3 for access to one of the underground car parking areas
- revised pedestrian and vehicular circulation into and within the site

- an expanded shuttle bus service to accommodate the increase in students. The shuttle bus would enter via Gate 1 and leave via Gate 2.

2.2 Mode share target

The Green Travel Plan proposes mode share targets for the future development, to be supported by the sustainable transport initiatives (see section 2.3). The targets are outlined in Table 2.1.

Table 2.1 Mode share targets

Mode	Mode target	Number of students in one hour	Number of students in three hours	Number of students in one day
Public transport	55%	369	1,100	1,540
Private car driver	30%	200	600	840
Private car passenger/drop off	8%	54	160	224
Motor bike/scooter	1%	7	20	28
Bicycle	2%	13	40	56
Walk	4%	27	80	112
Total	**100%**	**670**	**2,000**	**2,800**

Source: Green Travel Plan (ARUP, October 2012)

2.3 Proposed sustainable transport initiatives

The following initiatives were proposed in the ARUP PPR report to promote the use of public transport and active transport to the campus.

Pedestrian facilities

- students living within 2 km of the campus will be targeted to walk to the campus
- working with Strathfield Council to improve pedestrian access between the campus and Strathfield Station as per DDA requirements
- on campus speed limit will be a maximum of 10 km/h.

Bicycle facilities

- bike parking spaces will be visible and signposted. Bicycle lockers and separate male and female shower facilities will be considered
- work with Strathfield Council and the RMS to build the cycling infrastructure after a bicycle network study in the locality. This will include a bike route between the campus and Strathfield railway station
- a fully featured Cycling Map will be published for the University

- a bicycle buddy scheme will be considered to assist new cyclists taking up cycling to and from the university
- a bicycle link will be considered between the campus and Bay to Bay route (west along Barker Road). Bicycle symbols could be inserted in the pavement with some associated signage.

Public transport facilities

- students who live within 1 km of existing train stations will be targeted as potential public transport users
- work with Transport for NSW to improve the bus routes and facilities to and from the campus
- introduction and encouragement of university wide walk/ride/catch public transport to University Day in conjunction with 'National walk to work day, National ride to work day' etc.

Car pooling

- Carpooling system to the university to encourage car sharing amongst the students and staff. Designated carpooling spaces will be provided for these students and staff.

Small car and hybrid/electric car parking

- Parking spaces allocated for small and hybrid cars. Potentially extended to electric car charging points as demand increases.

ACU travel information

- Improvements to the university website emphasising that on – campus parking is extremely limited, alternatives are readily available, along with information about bicycle and motorbike parking inside the campus.

The October 2012 *Green Travel Plan* discusses the use of State Transit Authority (STA) buses (including routes 407 and 483), the continuation/expansion of the shuttle bus between Strathfield Station and the Campus, and the connections to the train network. It also mentions a new smartphone application developed to guide prospective students to the travel choices to get to the Campus, which will be rolled out to new students and staff members for the next orientation week.

In addition to the sustainable transport initiatives listed previously, the *Green Travel Plan* also includes:

- Green travel initiatives including the implementation of:
  - a Green Transport Committee
  - consultation with the Students Association
  - a staff survey to investigate green travel expectations; and
  - dissemination of green travel information in the staff and student newsletters.

- The use of ‘travel blending’ where class timetabling is used to spread the load of student arrivals and departures;
- Travel demand management by scheduling student classes in one block rather than spread throughout the day (which encourages multiple trips to the campus); and
- Participation in healthy lifestyle programs such as the Walk to Work Day.

3. Review of documentation and consultation

This presents our summary and review of the following:

- documents supplied to Parsons Brinckerhoff supporting and opposing the development
- submissions received by DP&I following the public exhibition of the Concept Plan
- consultation with the ACU and Council's traffic representative MTE
- on-site observations.

The review and conclusions of Parsons Brinckerhoff are highlighted in *italicised text with shading*.

3.1 ARUP Transport and Accessibility Study[1]

The Transport and Accessibility Study (TAS) submitted with the Concept Plan application documented ARUP's assessment of the impact of the proposal on traffic volumes and parking in the surrounding streets. An assessment was made on impacts on public transport, pedestrians and cyclists. It proposed transport initiatives designed to promote the use of public transport, walking and cycling and included an assessment of impacts during construction.

3.1.1 Parking

The TAS presented the results of parking surveys undertaken by ARUP and Colston Budd Hunt & Kafes (CBHK).

- ARUP surveys undertaken during the:
  - last week of Semester 1 in May 2011
  - first week of the mid-year exam period in May 2011
  - first week of Semester 2 in 2011
- CBHK surveys undertaken in:
  - July 2009 (during school holidays)
  - July 2009 (during University break)
  - August 2009 during the University and school term.

The response to a question during consultation with the University (see section 3.6.1) indicates that student numbers are at their peak at the beginning of Semester 1 (in March each year). Only one of the parking and traffic surveys undertaken have been completed at this peak time.

1 *'Australian Catholic University (Strathfield Campus) Transport & Accessibility Study' (ARUP, December 2011)*

The CBHK surveys from 2009 indicated that 68 parking spaces were occupied in surrounding streets during University break and that this rose to 329 in the August survey – indicating that 261 spaces were University related. ARUP parking surveys indicate a peak parking number of 407 during the first week of Semester 2 in 2011. There was no comparable survey during the University break.

Therefore it is not possible to isolate what parking is University-related and what parking is resident/other from the ARUP parking surveys. Observations of on-street parking made by Parsons Brinckerhoff in July 2012 (during University orientation week) have been used to separate University-related parking from resident parking and parking from other sources.

Traffic surveys indicated a peak hour volume of approximately 700–750 vehicles per hour (vph). Traffic analysis was completed at the intersections of Arthur Street/Pemberton Street and Barker Road/Redmyre Road/Edwin Street. This was based on traffic surveys undertaken during the last week of the University term when parking surveys indicate that University-related parking were low.

This would result in a potential under-reporting of the impacts of the proposal compared to traffic surveys taken during the beginning of semester. The impact of the proposed expansion on Barker Street and nearby intersections will be affected by the magnitude of the increase in the peak number of students on campus at any one time and the success of the Green Travel Plan.

Of the 644 parking spaces proposed on-site, 130 were allocated to staff, 10 to visitors and 504 to students (total parking has since been increased in the current proposal). A relocated Gate 1 was proposed to connect to the Barker Road intersection with South Street with new traffic signals. Service vehicles would continue to use the existing loading dock area.

The report suggests that a 2-hour parking limit at certain times be introduced on one side of affected streets as a measure to increase parking availability for visitors to residential properties on streets affected by the on-street parking.

This was not supported by residents in submissions made during public consultation as they fear it may displace on-street parking to new areas. This has now been deleted from the proposal following receipt of the PPR.

The Concept Plan identified between 130 and 250 bicycle spaces.

This range is considered to be wide given the stage of planning. This can be further considered during future applications to construct the buildings.

3.1.2 Traffic generation

The report states that, while the on-site parking would be doubled, the traffic volume generated would only increase by approximately 10% (as a conservative assumption) due to the combined total of on-site and on-street parking.

An assumption is made that 40% of students and staff park on-street. The future traffic volumes are estimated as: 250 vph during the AM peak and 130 vph during the PM peak. Adding the number of bus passengers arriving in the peak, this equates to around 16% of students and staff arriving during the peak hour by car and bus.

The assumption about the percentage of students and staff parking on-street depends on the assumption about baseload parking. The analysis also assumes that vehicles parking on-street arrive using the same profile as off-street parking.

The traffic analysis of the impact on the intersections of Arthur Street/Pemberton Street and Barker Road/Redmyre Road/Edwin Street with and without the expansion, was made using

the SIDRA Intersection program. Both intersections are expected to experience only a few seconds increase in average delay. The Barker Road intersections with the new/relocated gates were also analysed in SIDRA and found to operate satisfactorily.
Parsons Brinckerhoff has not reviewed the ARUP traffic models themselves, but has recreated the SIDRA analysis and arrived at similar results. SIDRA is considered to be an appropriate tool for this type of analysis.

The impact on mid-block traffic volumes is assessed for Barker Road (750 vehicle increase per day – around 10% increase). The impact on Albert Street is assumed to be negligible as there is no access to the parking on-site, although this does not consider the impact of changes to on-street parking. The impact on other streets was not analysed.
The method of calculation of the 750 vehicle increase is not clear. If, as claimed, the on-street parking associated with the University reduces due to the proposal, it is likely that other streets would experience a drop in traffic. However, this analysis has not been reported. The impact on traffic volumes was considered further by ARUP in the PPR and is discussed in section 3.4.2.

3.1.3 Public and active transport

The report cites no adverse impacts on pedestrians, cyclists or public transport. However, it notes that some public bus stops would need to be moved and additional traffic in the area would make crossing streets a little more difficult for pedestrians and cyclists.
A more thorough review of routes used pedestrians and cyclists generated by the proposal would have assisted in identifying what improvements to facilities are required to support the development. This can be further considered during the assessment of future applications and following discussion with Council.

The sustainable initiatives proposed are similar to those of the PPR and outlined in section 2.2. The TAS contained a few initiatives that were subsequently omitted, including:

- a proposed taxi rank
- a car share scheme
- interest free loans for public transport annual travel passes and bicycles.

3.1.4 Construction traffic impact

The analysis on impacts during construction listed a number of guiding principles.
Due to the low level of detail available at this stage of planning, this is considered acceptable.

3.2 McLaren Traffic Engineering review[2]

MTE was engaged by Strathfield Council and the residents' action group to review the ARUP TAS. The review was included as part of Council's submission to the exhibition. It raised a number of issues, the main points of which include:

[2] *'Independent Review of Submitted Traffic & Parking Report with due regard to Traffic, Servicing & Parking Effects of the Proposed ACU Strathfield Campus Expansion' (McLaren Traffic Engineering, 12 March 2012)*

- A claim that the University is currently operating in excess of the limits on the number of students from previous Land & Environment Court rulings (currently the subject of legal action between Council and ACU).
- The reliability of the method used to estimate future parking changes, meaning that the level of increase would result in an increase in on-street parking rather than the claimed reduction.
- Perceived gaps in the traffic and transport assessment, including:
  - a baseline survey to identify what is the level of parking and traffic activity when the University is not in session
  - an analysis of future trip numbers and mode share for students and staff
  - a survey of student and staff travel behaviour
  - an analysis of whether the proposed bus service can deliver the required mode shift is required.
  - an assessment of the impact of the traffic volume increases on residential amenity
  - a justification of the number of service vehicle spaces proposed and a swept path analysis of the loading dock area
  - a more rigorous analysis of seasonal changes in parking is required, including an analysis of impacts at night
  - information on the quantity of bicycle, disabled and motorcycle parking.

The review raises objections to the proposed two-hour parking management strategy, as it relies on Council enforcement and may push parking further into residential areas.

It concludes that the proposed sustainable transport initiatives encouraging use of public transport, walking and cycling are not backed up with sufficient detail.

As described in section 3.2 and 3.4, Parsons Brinckerhoff agrees with some of the list of gaps in the ARUP assessment. However, based on our assessment the calculations of parking potentially overstate the impact of the University.

3.3 Submissions

The Concept Plan for the expansion was exhibited by DP&I from 18 January to 29 February 2012, with an extension to 14 March 2012. 627 submissions were made by members of the public and six submissions were made by state and local authorities. The main issues raised relating to traffic, transport, parking and access are summarised in this section.

3.3.1 Strathfield Council

The submission made by HWL Ebsworth Lawyers acting on behalf of Council reiterates the issues raised in the McLaren Traffic Engineering review, namely that:

- the local road network has exceeded capacity
- the proposal would impact on:
  - safety, traffic volumes
  - on-street parking
  - residential amenity
  - fails to discuss staff and student transport modes.

The submission cited traffic-related impacts on residents including traffic noise, pollution and the inability to move in and out of residential housing due to traffic.

3.3.2 Transport for NSW

The submission from TfNSW advised that the Transport and Accessibility Study (December 2011) did not address the Director General's Requirement no. 7 and that information was required on the total number of trips (for all modes) generated by the proposal. This information was required to determine the future requirements of the shuttle bus, demand for car parking and potential improvements to pedestrian and bicycle accessibility.

It also:

- requested that the travel demand management measures and sustainable transport initiatives be developed further
- suggested that a Campus Travel Plan be developed as a Condition of Consent
- requested that State Transit Authority be consulted for any reconfiguration of the Barker Road and South Street intersection
- that the construction traffic management plan discusses impacts on pedestrians, bicycles, bus services and bus stops.

3.3.3 Roads and Maritime Services

The RMS submission echoed the issues raised by TfNSW. It added that the warrants for the signalisation of the intersection of Barker Road and South Street would need to be met, and that the impacts of the removal of parking would need to be addressed.

3.3.4 Public submissions

Traffic, parking and access issues were mentioned in 94% of public submissions, more than any other issue. The biggest areas of concern were the additional traffic resulting from the increase in student numbers and that the additional on-site parking would not cater for the increase in student parking, resulting in an increase in on-street parking. Many members of the public did not support the proposed 2-hour street parking restriction on streets surrounding the campus.

Other issues raised included the impact on pedestrian safety of the additional entry point on Barker Road, and the impact of alterations required to signalise the intersection of Barker Road and South Street. The ability of the shuttle bus to Strathfield Station to encourage sufficient students to use public transport instead of driving was questioned.

3.4 ARUP Preferred Project Report[3]

Following the public exhibition of the Concept Plan, the responses submitted were investigated and a revised proposal was put forward as the 'preferred project'. The details of the revised concept plan were:

- reduced student numbers from 2,400 at any one time to 2,000 at any one time
- increase in on-site parking to be provided from 644 to 717 – an increase of 73 spaces
- removal of the proposal to signalise the intersection of Barker Road and South Street
- removal of proposal to install 2-hour time limit for on-street parking on streets surrounding the campus.

The PPR Transport and Accessibility report discussed the Key Issues identified by DP&I, relevant to traffic, access, parking and sustainable transport.

[3] *'Australian Catholic University (Strathfield Campus) Preferred Project Report Concept Plan Application MP10_0231 - Transport and Accessibility' (ARUP, 9 July 2012)*

3.4.1 Student numbers

The PPR also provided further detail regarding the current and future student attendance numbers. This information identified from an audit of student numbers, that the maximum on-site at any one time was 686, within the limit of 750 (daytime Main Campus and Edward Clancy Campus combined).

The method of survey was not specified and only included students scheduled to be in class. If 750 people are on-site at any one time, and 2,400 students enter the campus across the day, this indicates, in effect, that the entire number of students are replaced more than three times across the day.

If peak student parking is approximately 640 (856 quoted in the PPR adjusted for staff and resident parking numbers), and the shuttle bus passenger number data presented in the same report are correct, it is likely that there would be more than750 students on-campus at any one time. This is discussed further in section 4.

A proposed student timetabling pattern was proposed that indicates that some students were only being scheduled to attend for half the teaching day, with one changeover at around 2.00 pm. The proposed timetable allowed for 2,000 students at any one time and 2,800 across the day.

3.4.2 Traffic surveys

Additional traffic surveys were undertaken on Barker Road, South Street and through Gate 1 (main gate) and Gate 3 (western gate). The surveys were undertaken over 15 days during the last two days of Semester 1 and during exam time.

The days surveyed may be influenced by low student numbers, potentially under-reporting the impact of the University. Information from ACU indicates that University attendance is highest at the start of Semester 1 and decreases throughout the year as some students drop-out. Information on the magnitude of this drop-off was not provided. From the description, it is assumed that the in-session days surveyed were a Thursday and Friday, which the TAS reported had the lower lecture attendance that the rest of the week (69% on Thursday and 41% on Friday). Bus patronage data presented in the PPR shows Thursday at 89% and Friday at 52% of peak daily numbers. As reported below, if University traffic represents 20% of the traffic on Barker Street on the day surveyed, even if University traffic were 50% higher, the traffic volume on Barker Street would still be within its functional capacity.

The report concluded that the current University traffic generation was 2,438 vehicles per day (vpd). With 65% of traffic travelling to/from the east and 35% travelling to/from the west as they leave the University gates, it estimated that University traffic represented 20% of the traffic volume on Barker Road, east of Oxford Street and 15% of the traffic volume on Barker Road, west of Wilson Street.

No estimate of University traffic was provided for South Street, although the difference between the volume during the last days of semester and the study break was 272 vehicles. The MTE comment regarding the need to assess the impact of the proposal on streets other than Barker Road was not addressed in the PPR. If the claimed reduction in on-street parking can be achieved, a reduction in traffic volumes on South Street should be possible.

3.4.3 Shuttle bus information

Bus frequency information was provided based on the University website. The PPR presented information on bus patronage collected by bus drivers during the first week of Semester 1 (the peak time of student attendance across the year. Peak patronage of 1,655 people were carried from the Station to Campus, with slightly fewer (1,328) using the shuttle bus to return.

Analysis of the reported service frequency and patronage indicated high average bus loads throughout the day. Subsequent information (see section 3.6.1) has shown that actual frequencies are much higher, reducing the average loads to more realistic levels.

3.4.4 Parking

On-street parking of 506 vehicles was reported based on previous surveys and more recent observation in March 2012. It is reported that five parking spaces on the northern side of Barker Road and eight on the southern side will need to be removed to enable the creation of the right-turn bay into the new western access. Two bus stops for State Transit route 407 will also need to be relocated.

Details of the 2012 observed number of 506 parked vehicles on-street were not provided to the same level of detail as the parking surveys presented in the TAS. The surveys were undertaken during March 2012 when student numbers are reportedly at their peak.

3.4.5 Car driver and public transport trips

The PPR provides graphs charting the increase in students against the change in daily trip numbers by shuttle bus and peak parking. It shows that the number of vehicles parking on – site and in the surrounding streets has increased marginally. It indicates that the majority of the recent large increase in daily trips has been accommodated by a sharp rise in bus patronage.

It is uncertain from the information provided whether the bus passengers were using another mode before the introduction of the shuttle bus (e.g. walk) or whether the increasing use of the shuttle bus has matched the increase in students attending across the day.
The rapid rise in student numbers is not explained, as the classroom audit numbers presented in Table 2 indicate that numbers were lower in 2011 compared to 2010 and 2009. Information from ACU (see section 3.6.1) indicates that scheduling allows students to attend classes in two 'shifts'. Bus patronage and daily traffic surveys show a large arrival during the morning peak and a gradual turn-over through the rest of the day and afternoon. ACU advise that some students attend classes during the morning, then leave campus and return in the afternoon to attend more classes due to timetabling.

Future projections of student numbers and trips indicate a slower growth in student numbers between 2012 and 2016 than has occurred from 2009 to 2012. Most of the increase is forecast to be accommodated on the shuttle bus, which is forecast to achieve a mode share of around 70% by 2016. Total parking is expected to increase slightly by 100–150 vehicles at any one time. ARUP conclude that the increase in on-site parking would accommodate some of the current on-street number, reducing on-street parking.

It is noted that Figures 10 and 11 of the PPR mix daily bus numbers with spot parking surveys. Information presented elsewhere in the ARUP reports indicates a 1.5 turnover factor for parking. If this factor is applied to the parking to get a daily parking number (adjusted to not include resident on-street parking), and added to the projected daily bus patronage, the number (not including walk, cycle or car passenger trips) is higher than the 2,800 daily students proposed. Student numbers are discussed further in section 4 of this report.

Traffic impacts are based on the increase in parking from 2012, applying the 1.5 turnover factor. The traffic growth represents an increase of 3% on top of the traffic volume on Barker Road, east of Oxford Street and 2% on top of the traffic volume on Barker Road, west of Wilson Street.

No information is presented on other streets, although if the proposed reduction of on-street parking is realised, these streets would potentially experience a drop in University-related traffic.

3.4.6 Initiatives

The sustainable transport initiatives proposed are listed in section 2.2.

In discussions with ACU, Hassell and ARUP, it was stated that shuttle bus services would have increased frequency to meet demand.

3.5 McLaren Traffic Engineering review of PPR[4]

MTE reviewed the information contained in the PPR and provided their own report highlighting additional issues. It presented survey information that MTE reports as evidence that there are more students on campus at any one time than allowed by the current Land & Environment Court rulings. The MTE report compares the reported peak student number (668) to the proposed number per day (2,000). It reports independent pedestrian surveys that indicate a peak number of people on-site of 1,467 across the Main Campus, Edward Clancy Campus and Sydney Adventist College. The MTE report questions the number of staff and staff parking spaces, which are not discussed in detail in the PPR.

The MTE response lists a Car Parking Report dated 4 April 2012. Within the report, MTE raise concerns about the parking numbers, which it claims show that student numbers are higher than the 668 reported by ARUP. The report notes that the on-street parking numbers quoted by ARUP include resident and other parking. Projected parking numbers illustrate an issue of the magnitude of the student increase proposed not addressed by ARUP.

The Car Parking Report has not been provided to Parsons Brinckerhoff.

After providing evidence that MTE claim demonstrates a number of students and staff on-site at any one time of approximately 1,450 students, MTE base their parking projections on the 658 students (from ACU audits) and 190 staff. If the former number is accurate, the impact is reduced by a higher base. The MTE calculations do not take into account the potential for increased public transport use or the impact of the higher turnover of students across the day, as indicated by ACU.

The report states that insufficient information has been provided on shuttle bus capacity, frequency and kerbside impact at Strathfield Station. It reports independent bus patronage surveys during May 2012 that indicate approximately 1,100 passengers across the day on the shuttle bus from Strathfield Station to the University and approximately 1,000 on the return journey.

Parsons Brinckerhoff has reviewed this information subsequently by ARUP on 10 August 2012 which demonstrates that there is sufficient capacity to move the number of shuttle bus passengers claimed, and also indicating lower shuttle bus passengers in August 2012.

[4] *Traffic And Parking Impact Assessment Review Part 3A Application Australian Catholic University, Strathfield (McLaren Traffic Engineering, August 2012)*

The MTE report also raises concerns about the:

- traffic analysis method with surveys undertaken during the end of term and during the exam time
- lack of intersection analysis in the PPR
- focus on daily traffic generation to forecast future traffic and parking numbers
- parking turnover factor of 1.5.

MTE believe that the impact on the amenity of surrounding streets has not been addressed.

Parsons Brinckerhoff notes that intersection analysis was included in the TAS and reportedly in the Car Park Report. As discussed in section 3.4, the change of access proposed at the main gate should have been analysed in the PPR. The analysis undertaken for the TAS indicated low levels of average delay and sufficient spare capacity for the site accesses, which is unlikely to be affected by the increase in on-site parking proposed in the PPR. This analysis should be confirmed by the proponent as part of their Project Application.

3.6 Consultation

As part of this study, Parsons Brinckerhoff met with ACU and its representatives (Hassell and ARUP). Strathfield Council was contacted and advised that it was happy for MTE to act on its behalf on the matter. MTE were contacted by telephone to discuss their review of the traffic reports and assessment of traffic and transport-related impacts.

3.6.1 ACU consultation

A meeting was held with ACU, the project planning consultant (Hassell) and the project traffic consultant (ARUP) at ACU offices on 27 July 2012. At the meeting, Parsons Brinckerhoff asked several questions to assist in our understanding of the Concept Plan, the traffic and transport assessment of its impacts and the data used to make this assessment.

Issues discussed at the meeting included:

- Student numbers during Parsons Brinckerhoff's site visits – first visit made during orientation week when student numbers are down and parking is typically contained within on-site parking.
- The ability of timetables to avoid a changeover between morning and afternoon/evening students – ACU indicated that a 30 minute gap was possible to spread arrivals and departures.
- Shuttle bus capacity, frequency and operation – ACU confirmed that shuttle buses now operate on a continuous loop, with more trips than indicated in the PPR.
- Gaps in their lecture timetables can lead to students visiting the campus multiple times per day.
- Teaching methods are changing with reduced face-to-face lectures, reducing the proportion of students on campus.

- The bicycle strategy may include hire bikes provided on-site. The amount of bicycle parking/number of lockers has not been quantified yet as the development is only at Concept Plan stage.
- Increased on-site parking would absorb more of the on-street parking at non-peak times reducing parking impacts in the evening.
- Pedestrian improvements could include additional street lighting.
- Car passenger numbers are observed to be low, but the difference in bus numbers between the trip from the Station to the Campus and the return journey indicates that some students share a car when they leave the campus.
- The proposed entry of shuttle buses through Gate 1 and exit via Gate 2 requires passengers to cross the internal road. Could this be reversed to drop and pick up passengers with one less road crossing? Hassell and ARUP indicated that the proposed arrangement utilises the existing right-turn bay, sand that the internal road would be used by few vehicles other than the shuttle buses.
- Have any discussions been held with Transport for NSW regarding the increased use of the Strathfield bus interchange? ACU indicated that they had not yet had discussions, but discussions have been held with Strathfield Council.

Following the meeting, a number of questions from Parsons Brinckerhoff were put to Hassell as the project coordinator. The response was received from ARUP on 10 August 2012.

Questions and responses

1. Have any surveys been done of student and staff travel?

Response: An on-line survey has been completed by new students in their first semester. The surveys indicate:

- increasing use of public transport – 49% in 2011 and 54% in 2012
- decreasing use of own car – 47% in 2011 and 41% in 2012
- increasing opinion of ease of access to public transport – 81% rate this fair, good or excellent in 2011, increasing to 92% in 2012.

2011 surveys total 96% and 2012 surveys total 95%. No explanation was offered for the remaining 4% and 5% of students in the mode survey. It is anticipated that these students could have travelled as pedestrians, cyclists or car passengers. The number of students who responded was not specified. The responses to the survey question regarding the ease of use do not necessarily mean that these students will use the shuttle bus. No information has been provided on the travel patterns of staff.

2. Does the University have a transport plan for the campus?

Response: The University does not have a transport plan but promotes the shuttle bus as the primary mode of access. The website provides travel information and first year students are provided with information about the shuttle bus during orientation week.

3. Can more detail be provided on the bus patronage reported in the PPR?

Response: The information on bus frequency in the ARUP reports was taken from the ACU website, but does not reflect the actual operation. Currently, buses operate in continual rotation during peak times at a greater frequency than indicated in the report.

Additional bus surveys were undertaken on 7 August 2012. They indicate up to 12 trips per hour (one bus every 5 minutes), higher than the reported frequency of one bus every 10 minutes. Patronage across the day (840 passengers from Station to Campus, and 757 passengers from Campus to Station) was lower than claimed in Table 7 of the PPR (1,620 and 1,297 respectively). However, this was due to a natural decline in student numbers across the year and approximately 160 students undertaking off-campus teaching placements when the surveys were taken.

Bus patronage matching the PPR numbers were estimated and related to bus frequency to demonstrate that the reported number of passengers (during the peak time at the start of Semester 1 in March) could be carried across the day.

The response that bus passengers are down because student numbers are down is at odds with parking observations made by Parsons Brinckerhoff that indicate parking at similar levels to March 2012 surveys reported by ARUP. ARUP surveys from August 2012 indicate a drop in parking, but the numbers are substantially different from those observed by Parsons Brinckerhoff one week earlier. It was expected that if bus patronage is down, then on-street parking would be down by a similar percentage. In a subsequent phone call, ARUP suggested that some bus passengers may change mode to car driver throughout the year as parking becomes easier. While this statement is based on speculation, if true it may have implications for the use of the shuttle bus once additional on-site parking is provided.

4. Do University students park on streets to the north of the Campus and walk across the playing fields to get to University?

Response: ACU indicated that students do not park in this area.

This response is collaborated by Parsons Brinckerhoff's parking observations that showed lower parking numbers in streets to the north of the Campus during the first week of Semester 2.

5. What is procedure if one of the shuttle buses breaks down or is undergoing scheduled maintenance?

Response: ACU operate four of their five buses at any one time, with one in reserve.

- Would the student numbers on 31 July 2012 be close to the current maximum number of students across the day of 2,400?

Response: This day is within the first week of second semester for students. This is usually the busiest time of the semester, with student numbers remaining the same as first semester.

This response contradicts the response given for Question 3, which justifies the reduced shuttle bus patronage in a survey taken one week later on the basis of reduced student attendance across the year. The uncertainty in the shuttle bus patronage numbers has been addressed by the recommendation of a staged increase in student numbers, to allow time for additional data to be gathered to confirm the impact of the full student increase.

3.6.2 Phone conversation with MTE

A phone conversation was held with Mr Craig McLaren of MTE on 9 August 2012. Issues discussed include:

- Reiteration of the Council/MTE conclusion that current ACU student number limits are being exceeded.
- The current on-street parking situation is not considered acceptable by residents. The parking situation for 750 students at any one time is considered to be the acceptable limit.
- Travel requirements of staff are not adequately assessed in either of ARUP's reports.
- Increase in on-site parking does not cater for increased student numbers. MTE expects a doubling of parking overspill.
- No assessment has been made on the impact of additional shuttle buses on the operation of the bus interchange on the southern side of Strathfield Station.
- The sustainable transport initiatives do not contain any concrete improvements.
- The traffic assessment does not analyse the environmental capacity of the affected local streets and that the additional traffic from vehicles finding a parking spot will exceed their environmental capacity.
- Concerns regarding the proximity of the relocated Gate 3 to the intersection of Barker Road and Wilson Street.

The environmental capacity of a road is defined in the Australian Model Code for Residential Development (AMCORD) Urban guideline (1992) as 'the maximum number of vehicles that should be permitted to pass through a given environmental situation over time under prevailing environmental conditions. The desire to limit traffic volumes in new residential subdivisions is generated by a wish to preserve the amenity of residents by designing street connections to keep traffic volumes on all residential streets within their environmental traffic capacity.'

The functional capacity used by ARUP relates to the typically traffic volume range for a collector street of between 2,000 and 10,000 vehicles per day. The RMS guideline indicates that at volumes greater than 5,000 vehicles per day, residential amenity begins to decline noticeably.

MTE's conclusions regarding the gaps in the PPR analysis are generally supported by Parsons Brinckerhoff. The assessment of the acceptability or otherwise of the current parking situation is subjective, as it is noted that the majority of residents have off-street parking.

3.7 ARUP response to McLaren review of PPR document

The *Response to Traffic and Parking Impact Assessment Review undertaken by McLaren Traffic Engineering, August 2012* (ARUP, 17 October 2012)challenges the validity of the method used to count people entering and leaving the Main Campus, Edward Clancy Campus and hired rooms in the Sydney Adventist College. It is argued that the surveys over counts the total numbers by counting students walking between the Campuses as well as when they first arrive and leave at the end of the day. It responds to the criticism of the independence of the ACU classroom audits stating that they are the most up-to-date and accurate description of student levels.

Despite the criticism of the MTE pedestrian surveys, the ACU surveys do not provide a complete picture of on-site numbers. Correlation with ARUP surveys of shuttle bus passenger numbers and estimates of University-related cars parked on-campus and on-street indicate that the number on-site at any one time may already exceed the stated limits for 'in attendance' students. ACU maintain that they are complying with the relevant restrictions of student numbers.

The response states that the shuttle bus driver counts of bus passenger numbers were taken at the busiest time of the year, and that declines in student numbers on-site due a combination of on-line lectures, smaller tutorial classes and teaching student placements (160 students for a 10 week block at the start of Semester 2).

The difference in the bus passenger surveys between March 2012 and August 2012 are significant (1,650 per day from Strathfield Station to the University versus 840). No classroom attendance figures have been provided to verify the suggested drop in student numbers. The explanations above do not explain why there is not a similar drop in car parking (when comparing the March 2012 parking surveys to Parsons Brinckerhoff observations). Parsons Brinckerhoff has discussed this matter further in section 5.

The response also indicates that, despite the MTE concerns regarding the timing of the traffic counts undertaken for the PPR, they still involve the filling of the available spaces, with the surplus parking accommodated on-street. The number of gate entries and exits will be higher than the actual number parking as drivers search for a parking space.

The response provides calculations of future travel characteristics based on the same mode share target as the *Green Travel Plan* (shown in Table 2.1). It estimates the total number of staff driving per day as 156 out of 260. It estimates that the peak number of students driving to the Campus will be 680, and therefore estimates that the peak parking impact will be 836 vehicles – a surplus of 119 over the proposed 717 on-site parking spaces. Making allowance for resident and other parking, this figure, if achieved, represents a drop of approximately 300 vehicles compared to the March 2012 parking surveys.

The proposed number of student bus passengers across the day is 1,540, with a peak of 369 in one hour. An increase in shuttle bus numbers from four to six buses operating at the peak is proposed.

The car driver numbers, if achieved, would reduce the impact on on-street parking to lower than 2009 figures (from the TAS). The number of daily bus passengers is slightly lower than the 2,000 proposed in the TAS, with the shortfall taken up by car passenger, walking and cycling modes. The proposed increase to six buses operating in the peak is sufficient to carry the proposed maximum number of bus passengers per hour, but will increase the number of trips into Strathfield Interchange to 18 per hour – a bus every 3 minutes 20 seconds.

3.8 ARUP Green Travel Plan

The *Green Travel Plan* outlines a target mode share for all modes including public transport, car driver, car passenger, motor bike, scooter and pedestrian. The proposed mode share and number of trips by each mode are outlined in Table 2.1.

The proposed mode share for public transport (55%) is lower than the 70% originally proposed in the TAS, but does roughly match the results of the on-line survey of first year students (49% in 2011 and 54% in 2012) reported in the response to questions provided during the consultation for this study. The mode shares for walking, cycling, car passenger and motor bike cannot be confirmed as no data has been provided on current usage of these modes. This mode share target raises the following questions:

- *What is the current mode share? and*
- *Are the proposed transport initiatives sufficient to achieve the required change?*

These questions are discussed further in section 5.

The *Green Travel Plan* presents the strategies identified to achieve the mode share target. These include the strategic transport initiatives previously proposed in the PPR document, as well as:

- Green travel initiatives including the implementation of:
  - a Green Transport Committee
  - consultation with the Students Association
  - a staff survey to investigate green travel expectations; and
  - dissemination of green travel information in the staff and student newsletters
- the use of 'travel blending' where class timetabling is used to spread the load of student arrivals and departures;
- travel demand management by scheduling student classes in one block rather than spread throughout the day (which encourages multiple trips to the campus); and
- participation in healthy lifestyle programs such as the Walk to Work Day.

The proposed initiatives are all considered to be steps in the right direction. The ability to achieve the mode share targets appears to largely rest on the ability of the public transport service to attract more students out of their cars. Achieving this is proposed from a combination of an increase shuttle bus frequency, working with Transport for NSW to improve access to the public bus network and better information to students and staff.

3.9 Correspondence from resident

Approximately 30 letters with similar content were sent in November 2012 by residents of Strathfield outlining their objections to the Concept Plan and requesting that DP&I recommend against the proposed development. They question the accuracy of material provided in the ARUP PPR and *Response to Traffic and Parking Impact Assessment Review undertaken by McLaren Traffic Engineering, August 2012* (ARUP, 17 October 2012). The main issues raised are considered below.

3.9.1 Student numbers

The letters claim that ACU has exceeded its student limits. The letters provide estimates of students on-site at any one time based on information provided for each mode, as outlined in Table 3.1.

Table 3.1 Resident estimate of 2012 number of students on-site at any one time

	Number
Peak net arrivals AAOT by shuttle bus (per Arup report 17/10/12, page 4)	418
Total parking AAOT by students & staff (per Arup report 9/7/12, page 20)	856
Arrivals AAOT via walking, bicycle, drop-off & carpooling (Arup report 17/10/12, page B1 has mode share target of 14% by 2016; we assume 7% for 2012)	100
Estimate of students arriving by Government buses (ACU provides no numbers; we assume 5%)	71
Less teachers AAOT (75% of 190 as per Arup report 17/10/12, page B1)	(140)
Total students present on-campus AAOT	**1,305**

Source: Resident letters sent to DP&I in November 2012.

The letters state that this number could be higher if the shuttle bus numbers at the peak student time is used. They also dispute ARUP's claim that the MTE pedestrian surveys are double or triple counting student numbers.

As stated previously, the issue of whether ACU has exceeded its student numbers is not a matter for the traffic and transport review to comment on, per se. However, it is relevant to understanding the current transport situation and how that relates to the potential future situation for traffic and transport. The residents' concerns about student numbers on-site at any one time are considered to be valid as they address the issue of the number of student vehicles parked on surrounding roads and the shuttle bus patronage. This issue is discussed further in section 5.1. The following observations are made regarding the numbers presented in the letters:

- *Adjusting the shuttle bus numbers for students using other modes to get home, Parsons Brinkerhoff's estimate of the peak number of students on-site who arrived by shuttle bus is 405.*
- *Using ARUP's assumption that only 80% of staff attend on any one day, the adjustment for staff calculated by Parsons Brinckerhoff is 114.*

- *Despite the description in Table 9 of ARUP's PPR document, Parsons Brinckerhoff understands that the 856 number includes resident and other non-ACU related parking. Observations made by Parsons Brinckerhoff during O-week in July 2012 estimate that approximately 90 vehicles parked on-street were not related to ACU. Allowing for this, the number of staff and students parking is estimated as 766 (i.e. 652 students parking).*

- *Estimates of students arriving by STA bus, walking, bicycle, drop-off & carpooling appear to be within a reasonable range, but there is insufficient data to say if the numbers are correct with certainty.*

- *Making these adjustments, the estimate of total students on-site at any one time reduces to 1,228.*

These adjustments change the mode share estimate slightly to: 53% car driver, 39% public transport, 8% walking, cycling, car passenger and drop-off.

The letters claim that information from ACU indicates that the proposed 2,000 students at any one time relates to students in-class, excluding students on-campus but not in classes – e.g. in the library, in group study, etc. If the results of the classroom audits are compared to the estimate of total people on-campus, there are approximately double the number of students in class who are on-site at any one time. Therefore the number of students travelling to the Campus could be 4,000.

Assuming the 668 maximum student number from 2010 applies to the 2012 surveys, and the 1,228 maximum number of students on-site at any one time estimated earlier, the ratio of students in class to students on-site is approximately 1 to 1.8, i.e. still substantially higher.

Information presented in Table 3 of the PPR indicates five groups of 400 students 'on-site at any one time'. The last paragraph in Section 2.2.2 in the same report states that 'the term 'at any one time' varies day to day and includes students that may never attend campus or attend campus for short defined periods within the year.' Parsons Brinckerhoff does not consider that a student could be considered to be on-site at any one time if they do not physically attend the Campus. Information provided to DP&I by Hassell on behalf of ACU indicates that the proposed numbers are based on a 'headcount', i.e. the 'actual number of students on-site'.

The assessment in this review is based on the definition of on-site at any one time provided in section 1, i.e. the assumption that the maximum proposed number of students on-site at any one time includes all students who have physically entered the Campus, regardless of whether they are included in the classroom audits or not. If the definition of on-site at any one time only relates to students in class, the resident's concerns about impacts larger that claimed are reasonable and the impacts are likely to be substantially higher.

3.9.2 Other issues

The letters claim inconsistent information from ARUP:

- 2,000 students per day carried by the shuttle bus in the PPR (a 68% mode share of 2,800 students) versus the assumption of 55% in ARUP's October Response to MTE.
- Calculations based on the gate entry numbers in the PPR and on-street parking estimates indicate 1,406 car drivers out of 2,590 daily trips to the University – a mode share of 59%.

They claim that this lower mode share for public transport indicates that the shuttle bus currently has 'significant surplus unused capacity'.

The number of students arriving by shuttle bus has changed in the most recent material from ARUP – see section 3.8 for more details. However, it is noted that if the mode share proposed by ARUP in the Green Travel Plan can be achieved, the net result should be a reduction in on –street parking. The resident's concerns about the current mode share are considered valid, although some of the details in the calculation method are questioned.

As discussed in section 5.2, the above calculations change if the higher March 2012 shuttle bus numbers are used. However, the large discrepancy between the March and August bus numbers creates uncertainty about which is the more representative number, and therefore mode share, should be assumed for the current situation.

The ARUP numbers estimate that during the March peak student numbers, the shuttle bus with a 1,600 daily passenger load is operating at around 90% capacity. Observations made by Parsons Brinckerhoff in July indicate that even during the middle of the day, selected trips prior to the start of afternoon lectures can be almost full when leaving Strathfield.

The letters identify concerns that the student timetable rubric proposed will result in higher impacts due to student turnover

The proposed student timetable rubric implies a change-over of students, where students for the next class arrive before the students from the previous class have left the Campus. ACU have indicated that a gap between classes could be scheduled to reduce the cross-over of students. However, there is currently no proposal compelling them to implement this gap.

The letters claim that there are noise and amenity issues from the shuttle bus, and that if this services increases, the impact will also increase.

Compared to the number of car trips, the shuttle bus trip numbers are considered to be small. The impact of the shuttle bus is considered to be substantially smaller than the impact if all of the students that use it drove to the Campus.

The letters outline concerns that impacts of increased opening hours at night and on weekends have not been adequately addressed.

The impact assessment undertaken by ARUP has not included the impact during weekends. This assessment is based on the understanding that student numbers would be in line with current approvals, and that therefore all parking during weekends would be contained within the increased number of on-site parking spaces.

4. Existing transport network

The ability to forecast travel behaviour in the future with a reasonable level of confidence requires a good understanding of what is happening for the current situation. A number of traffic, parking bus and student surveys have been presented by ARUP and MTE, with some inconsistency between the results. These surveys have been undertaken during different times of the year. Some of the inconsistency between the surveys may be explained by the changing number of students attending the University across the year, although these details have not been quantified.

The data used by ARUP in their assessment was collected at different times, which makes a complete picture of the existing situation difficult to achieve. This section assesses the different data sources and attempts to understand their relative accuracy. This is used to assess the reliability of the future forecasts made by ARUP and MTE.

4.1 Parking

Parking data is presented from CBHK surveys in July and August 2009, ARUP in May and July 2011, ARUP in March 2012 and MTE in May 2012. The surveys indicate a gradual increase in the number of vehicles parking in the surrounding streets from 329 in 2009 to 506/597 in May 2012 (we are unsure of the exact boundaries of the MTE parking counts for comparison purposes). The reason for the increase is inferred to be the increase in students at the University.

During site visits, Parsons Brinckerhoff made observations of on-street parking on two occasions. The first on between 1.00 pm and 2.00 pm on Thursday 26 July 2012 was taken during orientation week at the start of Semester 2. On-street parking associated with the University was minimal, with most accommodated on campus. The second was undertaken parking survey undertaken between 2.20 pm and 3.20 pm on Tuesday 31 July 2012 during the first week of Semester 2.

The surveys confirmed the on-street parking area diagram shown in Figure 3 of ARUP's PPR and reproduced in Figure 4.1. Parking to the north, on streets such as Merley Street, Francis Street, Fraser Street, Edgar Street and Marion Street north of Edgar Street was actually lower when University was in session. On-street parking in this area may be attributable to St Patricks College.

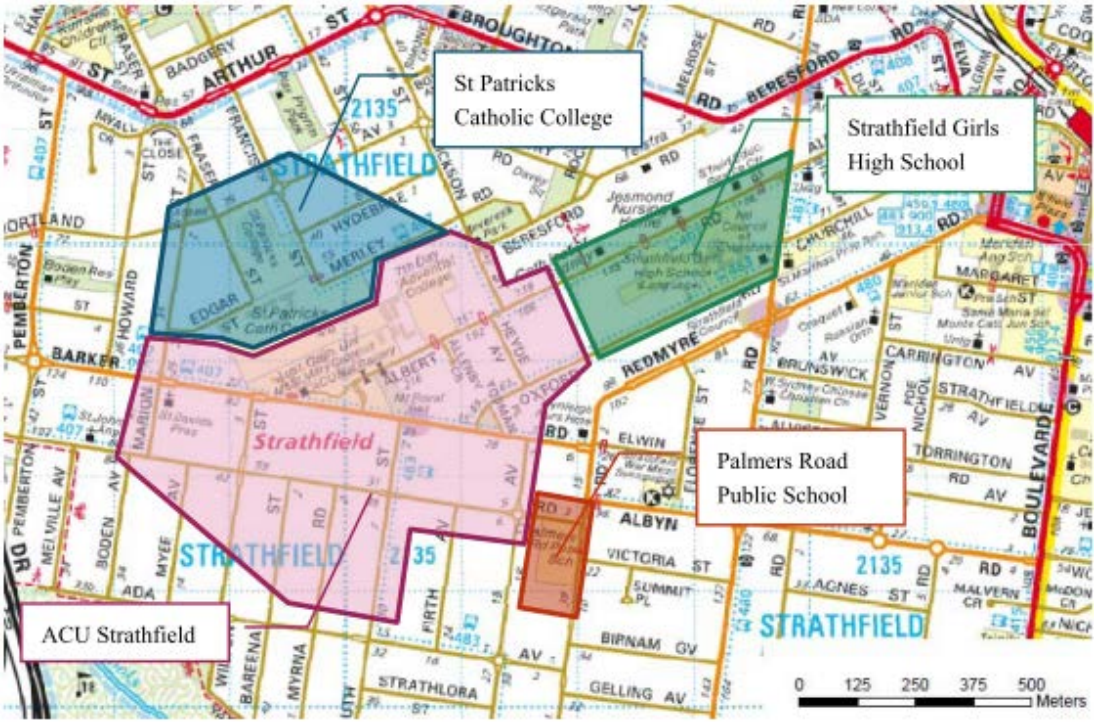

Figure 4.1 Approximate boundary of University-related parking

The number of vehicles surveyed, roughly in the pink shaded area of Figure 4.1, was:

- Thursday 26 July 2012 118 parked vehicles
- Tuesday 31 July 2012 478 parked vehicles.

30 vehicles were observed on Albert Street near the Edward Clancy Campus which appeared to be University-related. Adjusting the 26 July 2012 surveys to remove these 30 spaces, the baseload of resident and non-University related parking is estimated to be 88 vehicles. The difference between the baseload and the 31 July 2012 survey is 390 vehicles, which is presumed to be representative of the University related parking at that time.

During the Tuesday 31 July 2012 survey, it was noted that some vehicles were already leaving, and that the peak parking on the day had occurred earlier in the day. Using factors developed from Figure 10 of the TAS, it is estimated that University-related on-street parking is approximately 430 vehicles, and that total on-street parking within the surveyed area would be 516 vehicles. This compares well with the reported number of 506 vehicles reported in the PPR for March 2012, but is less than the figure of 597 reported by MTE.

The ARUP March 2012 parking surveys and Parsons Brinckerhoff observations indicate a relatively consistent parking impact between the start of the first and second semesters. This is contradictory to the explanation given for the decline in bus patronage (see section 3.6.1) which indicates lower student numbers in Semester 2. ARUP parking observations on Tuesday 7 August 2012 indicate a 30% reduction from the March 2012 levels. However, these observations are at odds with Parsons Brinckerhoff's observations one week earlier.

4.2 Shuttle bus patronage

There have been a number of surveys reported for the patronage of the shuttle bus. The PPR claims that patronage has increased since the introduction of the service in 2010 to approximately 1,650 from the Station to the University in March 2012. It is noted that this survey is taken at the time when student numbers are reportedly at their peak.

This level of bus patronage has not been replicated in subsequent surveys by ARUP (840 passengers in August 2012), MTE (1,100 passengers in May 2012) and limited observations by Parsons Brinckerhoff (consistent with the August 2012 ARUP counts). The stated reason from ACU for the drop in patronage is the decline in students across the year, although the same drop has not been observed for on-street parking (using the data available), and this statement is contradicted by another statement in the same advice that numbers of students are relatively consistent between the first week of both semesters. This indicates that:

- the March 2012 bus patronage surveys were unusually high
- the March 2012 surveyed parking was low
- as speculated by ARUP, that students using the bus gradually drift towards car use as overall student numbers decline and on-street parking becomes easier to find.

This inconsistency reduces the reliability of the future forecasts which are based on the shuttle bus patronage assessed at its 1,650 maximum, and has implications as to whether the proposed development would result in a net increase or decrease in on-street parking. This is an issue for the approval of the full student increase as proposed by ACU. The uncertainty in the shuttle bus patronage numbers has been addressed by the recommendation of a staged increase in student numbers, to allow time for additional data to be gathered to confirm the impact of the full student increase.

The ARUP shuttle bus patronage surveys on 7 August 2012 indicate that up to four buses were used and that each bus usually made three round-trips per hour, i.e. the service had a peak frequency of 12 services per hour. The average load to seated capacity ratio across the day was 36%, with a peak ratio of 63%. The number of passengers carried in each direction per hour, and the cumulative total of students assumed to be on-site is shown in Table 4.1. This data indicates a peak accumulation of students at the University end of the loop of 405 students.

ARUP provided advice that the reduced number of shuttle bus patrons was due to the variation of student attendance across the year. To illustrate the possible patronage at peak student time (in March) they factored up bus passenger numbers to approximately 1,600 and slightly adjusted bus frequency to demonstrate that the shuttle bus service had sufficient capacity to carry the peak student load. This analysis indicated a peak bus occupancy of 90% of the seated capacity. The peak accumulation of students using the factored bus patronage was 739 students at the University end of the loop.

Table 4.1 Shuttle bus passengers per hour and student accumulation

Hour beginning	Station to University	University to Station	Cumulative number of students on-site*
7:00	119	0	119
8:00	103	5	216
9:00	134	11	338
10:00	94	31	398
11:00	91	76	405
12:00	54	69	382
13:00	92	93	371
14:00	68	65	367
15:00	47	111	290
16:00	19	105	193
17:00	16	127	68
18:00	1	41	24
19:00	1	17	6
20:00	1	6	0
Total	**840**	**757**	

Note: Due to the total passengers numbers from the Station to the University being higher than the.

4.3 Traffic volumes

Traffic surveys have been reported for the period at the end of Semester 1 in both 2011 and 2012 by ARUP. The 2012 surveys appear to have been taken during days at the end of term which are likely to have lower than normal student attendance, potentially affecting the number of vehicles counted. Traffic surveys at the peak student time (or on peak student days such as Monday or Tuesday) would have been useful for comparison purposes.

It is likely that traffic volumes at peak times would be higher, although the peak number is difficult to estimate. If the reported number in the PPR is for a Thursday, it could be between 70% and 90% of the typical Monday volume.

4.3.1 Mid-block road capacity

The ARUP report assessed the functional capacity of Barker Road, but does not discuss the environmental capacity of the surrounding residential streets. This could be due to the proposed drop in on-street parking. The RMS Guide to Traffic Generating Developments provides recommended speeds and traffic volume levels. These are shown in Table 4.1.

Table 4.2 Environmental capacity performance standards on residential streets

Road type	Maximum speed	Maximum peak hour volume (vph)
Local street (e.g. South Street, Wilson Street, Newton Road)	40 km/h	200 environmental goal
		300 maximum
Collector street (e.g. Barker Road)	50 km/h	300 environmental goal
		500 maximum

Source: RMS Guide to Traffic Generating Developments Version 2.2 (2002).
Note: Maximum speed relates to the appropriate design maximum speeds in new residential developments. In existing areas maximum speed relates to 85th percentile speed.

There is insufficient traffic volume data to assess what the current levels of traffic are on many of the local streets, other than South Street, with a peak hour volume of 210 vph which is higher than its environmental goal, but lower than the maximum for a local street. There is insufficient data to indicate what component of traffic on these local streets is attributable to the University during the peak hour.

Based on traffic count data from the TAS and PPR, it is estimated that traffic volumes on Barker Street already exceed the collector street maximum of 500 vph identified in Table 4.1, even when University is not in session. An alternative guideline - the RMS Functional Classification for Roads indicates a functional capacity for a collector street of 10,000 vpd. Assuming that the peak hour is 10% of the daily volume, the flows surveyed are within the functional capacity of a collector street.

4.4 Trip numbers

A consolidated complete understanding of transport to/from the University for the current situation has not been provided in the TAS or PPR. This type of analysis has been requested by TfNSW. Peak parking numbers and detailed shuttle bus patronage information has been provided, along with statements that the numbers of students walking, cycling and travelling as car passenger are low. There are reliability questions surrounding the data that has been provided. Total parking numbers need to be separated into staff, students and residents numbers before being factored up to daily numbers and combined with estimates of other modes.

For the purposes of understanding the reliability of the forecast parking impacts made by ARUP and MTE, Parsons Brinckerhoff have estimate the parking and trip numbers using survey data drawn together from various sources and assumptions on staff mode share, parking turnover, average car occupancy and use of other modes. Due to the number of assumptions made and the reliability of the data used, these can only be considered as estimates. They indicate:

- a current peak number of students parking on-street of 420
- a current mode share for students across the day of:
  - car driver 35%
  - car passenger 4%
  - public transport 58%

- walking and cycling 3%
- total 100%

- total student trips to University across the day higher than the reported limit of 2,400, potentially due to:
  - students visit the Campus on two or more occasions during the day (as indicated by ACU)
  - average parking space turnover lower than assumed in the PPR
  - shuttle bus patronage is lower than the surveyed March 2012 value
  - walking, cycling and car passenger numbers are smaller than estimated (this cannot explain all of the difference)
  - a combination of the above.

The mode share percentages are in the same order of magnitude but slightly different from the on-line survey of first year students' travel patterns which indicate 54% using the shuttle bus, 41% driving and 5% by other mode. This could be due to a change from public transport to car as students become aware of the relative advantages of each mode. They are also similar to the proposed mode share in the Green Travel Plan. However, they assume that the 1,650 shuttle bus patronage is representative of the peak public transport usage.

If the same calculations are repeated using the ARUP August 2012 bus passenger count results (and assuming that car parking does not decline across the year as indicated by Parsons Brinckerhoff observations), the mode share for public transport drops to around 35% and the car driver mode share increased to approximately 53% (with an upper and lower range of 48% to 57% depending on the assumptions made about the number of students walking, cycling, using STA buses and travelling as car passenger).

Based on the method used in the November 2012 resident letters discussed in section 3.9, it was estimated from existing information that the number of students on-site at any one time in August was 1,228, and that the mode share to car driver was 53% and 39% to public transport (8% other).

4.4.1 Peak student attendance

Adjusting the total parking number reported by ARUP in the PPR of 856 total parking space for staff (estimated 100 parked vehicles) and resident (88 from Parsons Brinckerhoff observations), it is estimated that peak student parking is approximately 660 vehicles. From the August 2012 bus patronage information provided by ARUP during the consultation for this study (see section 4.2 for more details), the estimated maximum accumulation of students on-site that arrived by public transport is 405 at around the same time of day. Not including car passengers, pedestrians and cyclists, this would suggest that the number of students on-site during peak attendance is at least 1,075 at the start of second semester.

If the shuttle bus numbers are increased to the reported 1,650 passengers per day based on ARUP projections, the peak number of students in attendance at any one time could be in excess of 1,400. These numbers are closer to the peak attendance number of 1,439 and 1,467 (approximately 1,450) surveyed by MTE in May 2012, although the response from ARUP to the August MTE document challenges the validity of the survey method.

While the specific reasons behind the Land & Environment Court ruling and the 750 student at any one time limit are not known, the parking impact on residential street is potentially one factor that could have influenced the limit set. The success of the shuttle bus in reducing the overall parking numbers was not known in 1994 and 2002 at the time of the rulings, and should be taken into consideration in the current assessment.

4.5 Conclusion

The current traffic, parking and transport situation has not been conclusively defined by the surveys and observations made by ARUP, MTE or Parsons Brinckerhoff so far. While a number of parking, traffic and shuttle bus surveys have been presented, inconsistencies between the surveys/observations create doubt about the reliability of the data used by ARUP to conclude the future parking and shuttle bus patronage in the PPR.

If the shuttle bus patronage is consistent with the March surveys during peak student attendance times, the mode share targets are closer to current travel behaviour. However, if the shuttle bus patronage from the surveys later in the year are more representative, the mode share targets represent a significant challenge.

Similarly, if the current student numbers are close to the current Land & Environment Court limits, the increase in trip numbers could negate the benefits of the proposed travel behaviour changes. The consequences of not achieving the mode share targets and variations in trip numbers on the overall impact of the proposed expansion of the University are discussed further in section 5.

5. Analysis of issues

A number of issues have been raised in the submissions on the publically exhibited Concept Plan relating to parking and traffic impact, as well as the proposed public transport and sustainable transport initiatives. This section assesses each of the major issues identified and proposed a response for DP&I on the issue.

5.1 Trip numbers

The number of students on campus per day and at any one time has been a core issue in the objections from residents and Council. The reported assessments of trip increases from both sides have been based on:

- an increase from 2,400 students per day to 2,800 students per day by ARUP in the PPR (a 17% increase); or
- an increase from 750 students at any one time to 2,000 students at any one time (a 167% increase).

Both consultants have used a calculation method that either minimises or maximises the portrayal of the impacts of the development. The most reasonable assessment may lie somewhere between the two methods. However, collaborated data is not presented to assess where the true picture lies.

As discussed in section 4.4.1, if the number of students on campus at any one time appears to be within the range of 1,075 to 1,450, the increase to the proposed 2,000 on-site at any one time in year 2016 is between 550 and 925 students. If the 750 limit is being adhered to, the increase in peak student numbers is an additional 1,250 students at any one time. The 750, 1,075 and 1,450 student levels have been assessed further to consider the impact of the increase to a 2,000 student limit at any one time. These student level scenarios have been labelled as low, medium and high scenario respectively.

This variation in increase from the present to 2016 has implications for the number of trips generated by the University beyond current levels. Assuming the ARUP *Green Travel Plan* mode share percentages outlined in Table 2.1, the three peak student increase scenarios could translate to the additional trip numbers shown in Table 5.1. These numbers are provided to indicate our understanding of potential future increases in trips. The assumptions made regarding mode share acknowledge the reliability issues regarding the base data. They are based on the assumption that there would be no change to current travel behaviour for existing students.

Table 5.1 Increase in trips by mode made due to increase in peak student numbers between 2012 and 2016 – three student increase scenarios

	Estimate of current peak student number		
	Low	Medium	High
Peak student numbers			
Current peak student number	750	1,075	1,450
Increase to reach proposed 2,000 student limit	1,250	925	550
Increase in trips made by peak students			
Public transport	688	509	303
Car driver	375	278	165
Car passenger	100	74	44
Motor bike/scooter	13	9	6
Bicycle	25	19	11
Walk	50	37	22
Total	**1,250**	**925**	**550**

Note: Numbers rounded to the nearest 10 where appropriate.
Trip numbers are on top of the current situation
Calculations assume no change to current travel behaviour for existing students
Trip numbers assume the mode share proposed by ARUP in the Green Travel Plan for new students

Translating the car driver numbers in Table 5.1 into parked vehicles requires assumptions on the level of staff parking and resident/other parking. Assuming ARUP's estimate of 156 staff (out of 260) driving to work and the on-site observations of 90 resident/other vehicles, the possible impact on parking numbers is shown in Table 5.2.

Table 5.2 Estimated change in peak parking due to student number increase between 2012 and 2016 – three student increase scenarios

	Estimate of current peak student number		
	Low	Medium	High
Peak on-site/on-street parking			
On-site (staff + students)	717	717	717
On-street (staff + students + residents + other)	560	460	350
Increase from March 2012 parking survey	**+50**	**-50**	**-160**

Note: Numbers rounded to the nearest 10 where appropriate.
Trip numbers are on top of the current situation
Calculations assume no change to current travel behaviour for existing students
Trip numbers assume the mode share proposed by ARUP in the Green Travel Plan for new students i.e. 55% public transport passengers and 30% car drivers – if the shuttle bus numbers cannot be achieved, the impact on on-street parking could be higher

In its response to MTE's August document, ARUP forecast that peak on-street parking would decrease to a surplus of 119 above the on-site provision. Assuming approximately 90 resident and other parking, this would mean that on-street parking reduces from 506 in 2012 to approximately 210 in 2016 (a reduction of approximately 300 vehicles). This assumes that existing students will make some modification to their current travel behaviour due to the sustainable transport initiatives proposed in the Green Travel Plan.

The attempt of Parsons Brinckerhoff to understand the future trip numbers indicates that the potential of future scenarios could range between an increase on 2012 levels of around 50 vehicles to a decrease of 160 vehicles, adopting the proposed mode share targets for new students and assuming no change in travel behaviour from current students.

Both the ARUP and Parsons Brinckerhoff estimates assume that the 1,650 shuttle bus patronage number is representative of the peak demand and that the peak bus passenger numbers can be increased upon in the future by the amounts shown in Table 5.1. If the shuttle bus numbers cannot be achieved, it is likely that the proposed expansion would result in a net increase in on-street parking above 2012 levels.

The above increases assume that the 2,000 student at any one time limit is not exceeded. If the limit is exceeded, an increase in on-street parking and traffic beyond current levels is likely.

It is noted that the proposed relocation of the western gate will result in a loss of 13 parking spaces on Barker Road.

Potential response:

- The proposed mode share target contained in the Green Travel Plan should be set to achieve the proposed net reduction in on-street parking.
- A minimum requirement of no net increase in student on-street parking levels should be set, with a target reduction in on-street parking to the number proposed in the PPR (230).

5.2 Mode share

As discussed previously, if the 1,650 bus passengers per day counted in March 2012 are representative of the peak demand, then the existing mode share is likely to be approximately 35% car driver/58% public transport. The further reduction in car driver mode share to the proposed 30% is considered difficult to achieve, and when applied to the 2,000 students at any one time population, results in only a small increase in car drivers above existing car numbers. However, if the August 2012 surveys are more representative, the mode share is more likely to be 33%–37% public transport/48%–57% car driver.

The likelihood that ARUP's proposed mode share target will be achieved is dependent on which of these shuttle bus patronage numbers are the most representative:

- If the March 2012 shuttle bus numbers are more representative, the proposed mode share will be a challenge, but potentially achievable
- If the August 2012 shuttle bus numbers are more representative, it is unlikely that the initiatives affecting the use of public transport will have enough of an impact to change the public transport mode share by 20% (from 35% to 55%)

Given the importance of this statistic and the wide variation between the March and August 2012 survey results, the surveys should be repeated in March 2013. To satisfy the need for independence, these counts should be undertaken by an independent survey company and the results provided to Strathfield Council.

Potential response:

- The proponent should verify the March bus passenger load through bus patronage surveys undertaken at the time of peak student attendance on Campus (typically in March) in 2013 using an independent survey company.

5.3 Traffic impacts

As discussed in section 4.3, assessing the full impact of the proposed expansion at peak times is difficult as the traffic surveys presented in the PPR were collected at the end of semester when student numbers are potentially down. The main road impacted by the proposed expansion will be Barker Road. If a net parking reduction can be achieved, traffic volumes in local streets would also decrease. However, if the shuttle bus cannot attract sufficient trips, local streets such as Albert Road, South Street, Wilson Street and Newton Road may experience an increase.

5.3.1 Daily traffic increase

To understand the potential magnitude of the increase in car trips due to the proposed expansion, we have applied assumptions to the increase in student numbers across the day. For the proposed increase from 2,400 students and 190 staff in 2012 to 2,800 students and 260 staff in 2016 (a change of 400 daily student trips and 70 staff trips), a traffic increase of approximately 200 vehicle trips across the day is estimated.

This is less than the 300 vpd increase assessed by ARUP in the PPR. Applying the 65%/35% east/west split, this increase is likely to equate to an additional 130 vpd on Barker Road east of the University and an additional 70 vpd west of the University. While the higher on-campus parking may reduce parking impacts, especially outside business hours, the traffic increase is likely to be experienced across the day and evening. As discussed for the mode share estimates, if the 1,650 shuttle bus passengers was not a representative number, and the proposed mode share is unlikely to be achieved and the implications could be a larger increase in traffic.

It was assessed in section 4.3 that Barker Road is currently operating over its environmental capacity, even when University is not in session. ARUP and Parsons Brinckerhoff have also assessed that it is operating within the functional capacity of a collector Road when University is in session. To assess whether this is likely to still be the case after the expansion and when University student numbers are at their peak, assumptions have been made regarding the student difference between the days of the ARUP survey and the peak March student numbers. Adding the above traffic increase due to the proposed expansion, the future traffic volume (excluding growth from other sources), are likely to be in for order of 8,000 vpd east of Oxford Street and 6,000 vpd west of Wilson Street. These daily volumes are still within the functional capacity of a collector street.

5.3.2 Peak hour traffic increase

The increase in peak-hour traffic due to the proposed expansion is influenced by the current peak number of students on campus at any one time and the magnitude of the remaining increase to the proposed limit of 2,000 students per day at any one time. As the data from ARUP and MTE is contradictory on this issue, the impact during the peak is also yet to be reliably determined.

The TAS provided SIDRA intersection analysis for the nearby intersections of Arthur Street/Pemberton Street and Barker Road/Redmyre Road/Edwin Street. It also provided analysis of the signalised relocated eastern access/South Street/Barker Road intersection and the relocated western access/Barker Road intersection. This analysis was not repeated in the PPR. With the access arrangements reverting back to the un-signalised Gate 1 in the PPR, it would appear reasonable that the future performance of this access intersection be re-assessed when the peak hour traffic volumes have been determined.

The PPR traffic surveys indicated that University traffic represented about 20% of the traffic on Barker Road at the time the surveys were undertaken. If University traffic is increased by 50% to take account of the difference between peak student attendance and the day and time of year during which the surveys were undertaken, the volume would be approximately 8,150 vpd. If the peak number of students on-site at any one time increases to 2,000 and the worst-case mode share is applied, the traffic volume on Barker Road could almost reach its functional capacity. However, if the mode share proposed in the Green Travel Plan is achieved, the increase in traffic would be only around 200 vpd. The proposed staged increase in student numbers, described in section 5.11, enables progress in achieving the mode share target to be monitored before the full student increase is approved.

Potential response:

- The proposal is forecast to increase traffic volumes on Barker Road due to increased parking on campus. The forecast traffic volumes are likely to stay within the functional capacity of Barker Road, but will remain in excess of the environmental capacity.
- The increase in peak traffic generated by the proposal needs to be monitored in light of the uncertainty over the magnitude of the increase in maximum students on-site at any one time and the shuttle bus patronage.
- The intersection analysis undertaken in the TAS should be repeated in the Project Application to demonstrate acceptable operation.

5.4 On-street parking

The PPR claimed that on-street parking would reduce to 230 spaces on-street (including resident parking), based on an analysis of the increase in daily student numbers. The numbers presented in the ARUP Response to the August 2012 MTE document indicate an on-street parking level of around 210 vehicles.

In section 5.1, Parsons Brinckerhoff concluded that the forecast parking change could range from an increase over 2012 parking levels of around 50 vehicles to a decrease of 160 vehicles, depending on what the peak student numbers are at present and whether the target mode share for the shuttle bus can be achieved. Additional data and assessment is required from the proponent to narrow this range before the impact can be reliably forecast.

From site observations, it is noted that the majority of, if not all, residences have at least one off-street parking space. Many have multiple garages, car ports and long driveways. It does not seem that residents are as dependent on on-street parking as, say, an inner city area where many dwellings have no off-street parking.

Problems relating to students parking across driveways are an inconvenience to residents. It appears that this issue is already being addressed with the painting of parking end and start lines. The increase in off-street parking and forecast reduction on on-street parking may alleviate/reduce this issue. The University should continue to work with Council on this issue.

Potential response:

- The traffic review has concluded that the reported reduction in on-street parking associated with the proposal is possible but cannot be substantiated based on the student number data. A staged increase has been recommended in this review to allow more time for data to be collected to confirm the claims regarding current travel behaviour, which in turn affect the likelihood that the reduction can be achieved.
- Parking surveys should be repeated at least annually during peak student times to monitor the success of the sustainable transport measures.
- The University should continue to work with Strathfield Council to reduce the incidence of students blocking driveways in nearby streets.
- A minimum requirement of no net increase in student on-street parking levels should be set, with a target reduction in on-street parking to the number proposed in the PPR (230).

5.5 Resident parking scheme

A 2-hour time limit parking scheme was proposed in the TAS, but was not supported by residents as they were concerned that it would displace ACU-related parking into other areas. In addition, McLaren was concerned that the cost of administering the scheme would be placed on Council.

A resident parking scheme typically applied a time limit with exemptions for holders of a resident parking permit. The rules for a resident parking schemes (RPS) are described in the RMS Permit Parking Manual (November 2012). The eligibility criteria that must be met include (amongst others) that the:

- *resident has no on-site parking or limited on-site parking and also has no unrestricted on-street parking available near their residence.*
- *place of residence could not be reasonably modified to provide on-site parking space(s)*

Residents' visitor parking schemes also exist, where a permit is issues to the resident who can then issue the permit to and retrieve it from their visitor. The eligibility rules for residents to obtain permit(s) exclude those who have:

- *on-site parking for the visitors' vehicle(s).*
- *unrestricted on-street parking spaces in front of their residence or along their kerbside.*

Given that most residences appear to have ample on-site parking, it is likely that the number of residents who would be eligible for a permit under either scheme would be small. If introduced, it is likely that the effect would be similar to that of the introduction of timed parking, which the residents have already objected to.

The number of students currently driving is sizeable, despite the alternative modes of transport that exist. If a RPS was introduced, many of these drivers are likely to continue to drive and park outside the area of the RPS, affecting a different group of residents. Preventing this from occurring would require a RPS over a wide area, which increases the administration cost and number of residents affected.

5.6 Shuttle bus

Several surveys of shuttle bus patronage in 2012 have revealed significantly different results:

- 1,650 passengers from Strathfield Station to the University in March reported in the PPR (approximately 60% mode share for public transport based on peak demand)
- 1,100 passengers from Strathfield Station to the University in May 2012 reported by MTE (approximately 40% mode share for public transport based on peak demand)
- 840 passengers from Strathfield Station to the University in August 2012 reported by ARUP during consultation (not surveyed during peak demand - approximately 160 students on placement outside the campus).

Given the importance of the success of the shuttle bus in achieving the on-street parking reductions, the variation between surveys is of concern. The inconsistency reported in sections 4.1 and 4.2 that surveys indicate relatively steady parking levels between the start of the first and second semester, but definitive explanation of the large drop in bus patronage remains outstanding. The explanation offered for the bus patronage drop (a decline in student numbers across the year) is not supported by the parking survey results which remain relatively constant. This concern has been addressed by the recommendation that the increase in student numbers be staged to enable more data to be collected so that the impact of the full student increase can be confirmed.

It is possible that as student attendance drops and parking becomes easier to find within walking distance of the University, some public transport passengers shift back to driving. This could have two implications:

- on-street parking is influenced by availability and walk distance as well as the amount of shuttle buses provided, i.e. there is a threshold for the distance students are prepared to park and walk; and
- if more parking is provided on-site in the proposed development and parking is freed-up on-street, students could shift back to driving preserving the current on-street parking numbers.

The Green Travel Plan indicates a slightly lower daily number of 1,540 bus passengers (one-way) across the day. Why there would be a drop in the daily shuttle bus passengers from the number claimed March 2012 is not explained. However, if the student lecture timetable is changed to keep students on-campus in a block, the off-peak shuttle bus load would be reduced. The use of the shuttle bus during peak periods is considered to be a more important statistic than the daily number, as this reduces the number of car drivers during the peak, which in turn affects the maximum extent of on-street parking. Hence the discrepancy is not considered to be a significant issue.

The Green Travel Plan proposes that the peak three hour number of students who arrived by bus would be 1,100. This assumes three hours of between approximately 360 and 370 students arriving by bus – an increase of 35% over current peak March levels (a higher peak use of shuttle bus services but lower daily volumes). Some of this number could arrive on the public bus routes 407 and 483, although this number is not quantified in the ARUP reports.

The proposed number of shuttle buses of 6 operating at once during the peak (with on bus held as a spare) could move this number of students if student arrival is relatively evenly spread. The peak number of trips per hour would be 18 into and out of Strathfield Interchange – approximately one bus every 3 minutes 20 seconds. The required increase from four shuttle buses should be discussed with Strathfield Council and Transport for NSW in relation to the capacity of Strathfield Interchange.

Potential response:

- The achievement of projected shuttle bus usage is critical to reducing the impact on parking of the proposed expansion on surrounding streets.
- Shuttle bus patronage should be measured and monitored at the start and mid-way through each semester to ensure that mode share targets are being met.
- Shuttle bus frequencies should increase so that the service capacity matches the forecast increase in demand.
- The proponent should demonstrate to Transport for NSW and Strathfield Council that future increases in shuttle bus operation will not adversely impact on other transport services at the interchange on the southern side of Strathfield Station.

5.7 Access design

As discussed in section 5.2, while analysis of the revised access arrangements was not undertaken in the PPR, SIDRA intersection analysis undertaken by Parsons Brinckerhoff suggests that the proposed access intersection layouts would have sufficient capacity. This analysis should be confirmed by the proponent as part of their Project Application.

MTE raised concerns about the proximity of the relocated western access to the new underground car park and the intersection of Barker Road and Wilson Street. The AMCORD indicates that the minimum spacing between right-left staggered intersections on a collector road is 5-metres. Based on the location of Figure 6 in the PPR, the distance between the two intersections is 27-metres, and therefore complies with the AMCORD intersection stagger requirements.

The ARUP response to the MTE August 2012 document provides a further response to the issue of the location of the new western access. Parsons Brinckerhoff have not undertaken a geometric assessment of the proposed access beyond the assessment of compliance with the AMCORD guidelines above and note that both Strathfield Council and RMS will have the opportunity to review the geometry of the proposed access.

Concern has been expressed in public responses to the PPR about the amount of parking lost on Barker Street to accommodate the proposed right-turn bay for vehicles entering the new western access. The proposed design provided in the TAS requires the removal of eight parking spaces on the southern side of Barker Road and the net loss of one space on the northern side of Barker Road. Parsons Brinckerhoff notes that the proposed right-turn bay will reduce the likelihood of right-turn vehicles into the new access blocking westbound traffic on Barker Road. Widening Barker Road on the northern side has been suggested as a method to accommodate the turn lane whilst maintaining parking on the southern side. It is noted that this option is likely to require land acquisition from adjacent properties to maintain suitable vehicle paths and may be more disruptive to the surrounding properties than the impact on parking.

Potential response:

- The proposed geometry and impact on parking of the proposed access to the underground car park will be assessed by Strathfield Council and RMS as part of the development application process.
- The traffic impact assessment accompanying the Project Application should assess the future performance of the eastern and western access gates.

5.8 Pedestrian and cyclist facilities

The PPR proposes sustainable transport measures that include the consideration of bike lockers and separate male and female shower/change facilities. As mentioned in section 3.1, the Concept Plan identified between 130 and 250 bicycle spaces to be provided on-site. This range is considered to be wide given the stage of planning. The range is in excess of the 56 students estimated to ride to the University based on the 2% mode share contained in the Green Travel Plan mode share targets.

Other than the need to establish cycle routes from the University to Strathfield Station and the Bay to Bay cycle path, the TAS and PPR do not identify any specific pedestrian or cycle routes where improvements could be identified. There are no specific treatments identified on the two cycle routes mentioned. Ideally, comprehensive pedestrian and cycle plans for Strathfield would already be available to identify where improvements to pedestrian and cycle infrastructure are required in the local area. However, it is not known if Strathfield Council have these plans already prepared.

Potential response:

- The transport assessment accompanying the Project Application should identify the pedestrian and cycle access routes and assess the infrastructure provided.
- The proponent should identify any upgrades required to achieve the pedestrian and cycle components of the trip and mode targets, including upgrades to cycle facilities between the Strathfield Station, the University and the Bay to Bay cycle path. The identified works should be included in a Statement of Commitments.

5.9 Sustainable transport measures

While a number of sustainable transport initiatives are mentioned, many are non-specific and do not set tangible commitments to be provided through the next stages of the development. While the proposal is still at Concept Plan stage, it is expected that firm or minimum commitments could be provided based on the level of detail presently known.

For example, the suggested initiatives state that students living within 2 km of campus will targeted to walk to the campus, students living within 1 km of train station will be targeted as potential public transport users. However, there is no elaboration on how these students will be encouraged to change their travel behaviour after being targeted, or how many students this applies to.

Working partnerships will be established with Strathfield Council, RMS and Transport for NSW on public transport, pedestrian and cycling issues – although there are no commitments to do anything after these groups are established.

Specific comments by Parsons Brinckerhoff regarding the sustainable transport initiatives (not covered in section 5.6) include:

Pedestrian facilities

- The strategy to encourage students living within 2 km of the campus to walk should be outlined.

Bicycle facilities

- The number and location of bike parking spaces should be identified, along with clarification of whether separate male and female shower facilities will be provided.
- A student/cycle group could be formed and provide assistance in the form of resources to start a program to mentor new riders. This group could be made responsible for putting together the cycle map for the University.

Public transport facilities

- Information on public transport should be made available to all students regardless of whether they live close to a station or not.
- Shuttle bus frequency should be increased to match increasing demand.

Car pooling

- Data needs to be collected on current numbers of students travelling as a car passenger, to allow the success of this initiative is to be measured.
- Carpooling system schemes can be difficult to administer. ACU could work with an established car pool facilitator (such as Carpoolone, Carpoolworld, Carpool-it or Western Sydney carpool) if this initiative is pursued.

Small car and hybrid/electric car parking

- Designated low emission vehicle parking spaces may assist with reducing carbon emissions, but will have no impact on reducing traffic impacts.

ACU travel information

- The university travel website should be improved and maintained, including updating information on shuttle bus frequencies.

Potential response:

- The proponent will work to identify specific commitments for sustainable transport initiatives and targets for travel that are measurable and achievable.

5.10 Issues raised in submissions

Some of the issues raised in the submissions to the public exhibition of the Concept Plan have been discussed, including:

- increased on-site parking
- reduced number of access gates
- signalised intersection with South Street no longer proposed
- 2-hour paring restriction on surrounding streets no longer proposed
- additional data on the shuttle bus has been provided.

Issues regarding the level of impact on traffic volumes and on-street parking have been responded to in the PPR.

5.11 Staged increase in student numbers

Parsons Brinckerhoff were asked by DP&I to consider the potential for a staged increase in student numbers to allow time for the patronage of the shuttle bus and extent of on-street parking to be monitored.

The peak student numbers on-site at any one time for the current situation is uncertain. If the parking and bus passenger accumulation information is correct, the proposed increase to the student levels has already commenced. Between 2012 and 2016 this potentially means lower student increases than in previous years.

Whatever the current peak student levels are, the future increase could be staged. As stated in section 5.2, the likelihood that the proposed mode share is an achievable target is largely dependent on whether the March 2012 bus patronage surveys are representative of the peak student demand, and that the drop-off in students is explained by a corresponding drop in student attendance levels on Campus.

Taking the March 2012 parking survey results as the maximum acceptable threshold for on-street car parking, a cap on the student numbers has been calculated to reduce the risk of any further increase in on-street parking. The method used us outlined below:

- The worst case mode share for the current situation is estimated as 37% bus passenger, 57% car driver, 8% other, based on:
  - March 2012 parking surveys – from which it is estimated that 654 students are currently driving to the University
  - August 2012 shuttle bus passenger surveys indicating a peak of 405 students on-site who arrived by shuttle bus
  - Making conservatively low assumptions that car passenger, State Transit bus passenger, walking, motorcycle and bicycle make up 8% of total trips.
- Assuming this mode share for the proposed future situation of 2,000 students on-site at any one time, and adjusting the parking numbers for the increased on-site parking and increased staff numbers, this could result in a total of 746 vehicles parked on-street – an increase of 240 parking spaces above March 2012 levels.
- Assuming no change in the mode share, peak student numbers would need to be reduced by approximately 400 students to 1,600 students at any one time, in order to cap on-street parking at 506.

A full explanation of the calculations used to determine the 1,600 student cap is provided in Appendix A.

If ACU can demonstrate that it is meeting its mode share targets, the cap can be increased to the extent that it will not cause an increase in on-street parking beyond the 506 surveyed in March 2012, up to a maximum of the 2,000 students at any one time proposed in the Concept Plan.

Potential response:

- The limit on student numbers be capped at 1,600 students at any one time.
- Pending the results of March 2013 shuttle bus patronage surveys and satisfactory demonstration that the peak and middle of semester student parking can be accommodated with no net increase in on-street parking, the cap could be increased to the proposed limit of 2,000 students on-site at any one time.

6. Findings and recommendations

The review of project material (including submitted reports, further consultation and on-site observations) has produced several findings on the adequacy of the traffic and transport assessment, the potential impact of the proposed expansion and potential solutions for outstanding transport-related issues.

6.1 Findings

1. The traffic reports produced in support of and opposing the proposed expansion have provided a partial and sometimes inconsistent picture of current traffic, parking and transport access to the University.

2. It appears from parking and shuttle bus data that some of the proposed increase in student number limits may have already occurred. However, the impact of this increase has been reduced by the success of the shuttle bus between Strathfield Station and the University.

3. Parking surveys have indicated a gradual increase in on-street parking, which has created opposition with surrounding residents. Observations by Parsons Brinckerhoff have endorsed the ACU area of parking influence provided in Figure 3 of the PPR.

4. The shuttle bus to Strathfield Station has been successful in accommodating a large share of the increase in students, although passenger number surveys are either inconsistent or show a significant drop in patronage throughout the year.

5. It is likely that the increase in on-street parking has been matched with a corresponding increase in traffic volumes on surrounding streets. Traffic volumes on Barker Road are within the functional capacity of a collector street, but are in excess of the environmental capacity without the influence of University-related traffic.

6. The PPR claims that the increase in on-site parking will offset the increase in student numbers are supported. However, this is heavily dependent on the difference between the current peak number of students on-site at any one time and the 2,000 student limit. It is also dependent on the ability of the shuttle bus to achieve the mode share target. Depending on these variables, there is a range of potential parking impacts, from a 240 vehicle increase to a 300 vehicle decrease.

7. The mode share proposed in the Green Transport Plan is considered achievable, but only if the Strathfield Station to University shuttle bus is currently achieving the claimed 1,650 students during peak times. There is uncertainty about how representative this survey is, as a survey in August reported approximately half the number of bus passengers. If the August survey is representative the proposed mode share targets are considered unrealistic.

8. Access intersection arrangements appear reasonable but need to be confirmed at the Project Application stage.

9. The proposed list of 'sustainable transport initiatives' in the Green Travel Plan are a step in the right direction, but lack detail and tangible commitments on what infrastructure is required to achieve the mode share target, and may therefore be considered aspirational. Additional work is required to assess pedestrian and cycling routes and evaluate what improvements are required. The number and location of bicycle infrastructure within the campus needs to be identified.

6.2 Recommendations

It is the recommendation of this review that the traffic and transport reports undertaken for the proposed expansion have not been able to produce a clear and reliable assessment of the potential transport impacts of the increase in student population.

However, it is recommended that, provided the parking facility under the playing fields is constructed and opened before any further increase in student numbers, the expansion of the University could be considered with a limit of 1,600 students at any one time (which is lower than currently proposed limit of 2,000 students at any one time). Further, if it can be demonstrated through independent surveys that the current mode share to car driver for students would not result in an increase of on-street parking (with the construction of the additional on-site parking), the maximum student number limit could be increased to the extent that it will not cause an increase in on-street parking beyond the 506 surveyed in March 2012, up to a maximum of the 2,000 students at any one time as proposed in the Concept Plan. To do this it is recommended that:

1. Independent surveys of shuttle bus patronage be undertaken at the time of peak student attendance at the University campuses (throughout the year – expected to be during March).

2. An on-street parking survey be undertaken outside University sessions and at the same peak student attendance time (as identified for the shuttle bus surveys) within the area identified for ACU Strathfield parking in Figure 3 of ARUP's PPR report, with the addition of streets around Inveresk Park.

3. A travel mode survey of people entering and leaving the ACU Strathfield Campuses (including the Main Campus, Edward Clancy Campus and Sydney Adventist College (if used for ACU Strathfield classes, tutorials, etc.). This survey should be undertaken at the same time as items 1 and 2, and should detail the time of arrival/departure to the nearest minute (to avoid double counting of students moving between campuses. The survey should include a count of bicycles and motorcycles parked within the campuses.

Further recommendations are that:

- The mode share targets proposed in the Green Travel Plan be adopted for the project.
- A minimum requirement of no net increase in student on-street parking levels should be set, with a target reduction in on-street parking to the number proposed in the PPR (230).
- The University should continue to work with Strathfield Council to reduce the incidence of students blocking driveways in nearby streets.
- The proponent should be required to demonstrate progress in implementing the sustainable transport initiatives in the Green Travel Plan.

- The proponent makes a commitment to monitor on-street parking and shuttle bus patronage on an annual basis.

6.2.1 Additional information to be submitted with the Project Application

Additional information to be provided with the Project Application should include:

1. Analysis of the capacity of the access intersections onto Barker Road.

2. Swept path analysis of service vehicles moving into and out of the loading dock area.

3. Identification of pedestrian and cycle routes to the University and an evaluation of infrastructure improvements required along these routes. The identified works should be included in a Statement of Commitments.

4. The proponent should demonstrate to Transport for NSW and Strathfield Council that future increases in shuttle bus operation will not adversely impact on other transport services at the interchange on the southern side of Strathfield Station.

5. Traffic surveys undertaken at peak student times on Barker Road.

6. A program to increase shuttle bus frequencies is provided to match the service capacity to the anticipated increase in demand.

These additional information items for the Project Application should not affect the ability of DP&I to make a determination on the Concept Plan submitted.

Appendix A

Calculation of student number cap

Calculation of cap on students on-site at any one time

The proposed cap of 1,600 students at any one time has been calculated based on an estimate of the impact on on-street parking of the worst-case of current behaviour, corresponding to the lowest 2012 count of shuttle bus numbers recorded in August 2012 by ARUP. The calculations of parking numbers in March 2012 are shown in Table A.1. These numbers approximately match observations of on-street parking made by Parsons Brinckerhoff in July 2012 (although it is noted that observations made by ARUP around the same time indicated a 30% lower on-street parking number).

Table A.1 March 2012 peak parking estimate

Parking type/location	Number	Comment
Parking spaces on-site	350	ARUP PPR
Peak parking on-street	506	ARUP PPR
Staff parking on-site	114	ARUP assumptions – 190 * 75% attending on a given day, 80% car driver
Student parking on-site	236	(350–114)
Resident parking	88	Parsons Brinckerhoff observations (26 July 2012 and 31 July 2012)
Student parking on-street	418	(506–88)
Total student parking	654	(236 + 418)

Peak number of students who arrived by shuttle bus on-site at any one time = 405 (based on ARUP's August 2012 surveys). This number has been used as it provides a complete set of shuttle bus numbers with matching bus trip numbers and matches Parsons Brinckerhoff's observations. Higher shuttle bus numbers claimed in the PPR require verification due to the large difference in passenger numbers.

Estimates are required for other modes, but no data has been supplied that allows quantification. For the purpose of this assessment, the following has been assumed. They are considered to be conservatively low for the purposes of setting a minimum threshold.

- State Transit bus: 21 people (5% of shuttle bus numbers)
- Car passenger: 33 people assuming a 1.05 car occupancy (based on original in formation that few students arrive as car passengers at the moment)
- Motorbikes: 12 people assuming that 1% travel by motorbike
- Pedestrian: 12 people assuming that 1% walk (based on original information that few people walked)
- Cycle: 12 people assuming that 1% ride to university (based on original information that few people cycle).

The mode share from this set of observations and assumptions is shown in Table A.2.

Table A.2 August 2012 mode share

Mode	Percentage of total student travel
Bus (shuttle and State Transit)	37%
Car driver	57%
Car passenger	3%
Motorcycle	1%
Walk	1%
Bicycle	1%
Total	**100%**

If this mode share is assumed as a worst case and applied to the proposed new student limit of 2,000 students at any one time, there would be approximately 1,140 students driving to the Campuses.

Table A.3 shows that under a worst-case scenario (i.e. assuming that the proposed Green Travel Plan targets are not met), the on-street parking could increase from 506 to 746 – an increase of 240.

Table A.3 Future peak parking estimate

Parking type/location	Number	Comment
Parking spaces on-site	717	Proposed
Peak parking on-street	**746**	(658 + 88)
Staff parking on-site	156	ARUP assumptions – 260 * 75% attending on a given day, 80% car driver
Student parking on-site	561	(717-156)
Resident parking	88	Parsons Brinckerhoff observations (26 July 2012 and 31 July 2012)
Student parking on-street	658	(506 – 88)
Total student parking	1,219	2,000 x 57% plus 80 additional after morning peak – ARUP assumption assumed to represent the impact of the change-over between morning and afternoon students

To cap the on-street parking to 2012 levels, the number of students driving needs to be reduced by 240. Assuming that 57% of students drive, the total number of students on-site at any one time needs to be cut by 421. Subtracting this number from the 2,000 proposed and rounding to the nearest 100 equates to a cap of 1,600 students (to substantially reduce the risk of increased on-street parking as a result of the development).

If ACU is meeting its mode share targets, there should be a substantial reduction in on-street parking with the construction of the new underground parking on-site. If this is demonstrated to be the case through on-going surveys, the cap can be increased to the extent that it will not cause an increase in on-street parking beyond the 506 surveyed in March 2012, up to a maximum of the 2,000 students at any one time proposed in the Concept Plan.