

Macquarie University
**Macquarie University Central
Courtyard Precinct (MUCCP)
Redevelopment**
Transport Assessment - State
Significant Development Application

Final Issue1 | 22 November 2017

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 251278

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Swept paths

1 Introduction

This report supports a State Significant Development Application (SSDA) submitted to the Department of Planning and Environment (DP&E) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Macquarie University (MU) is seeking development consent for the first phase of the Macquarie University Central Courtyard Precinct (MUCCP) redevelopment. Under this application consent is sought for redevelopment of Building C10A, construction of two student accommodation buildings (Buildings R1 and R2) and redevelopment of the landscaped Central Courtyard.

1.1 Background

MU is a teaching and research institution of international, national and state significance. It is ranked among the top two per cent of universities in the world and holds a 5-star QS rating. MU is renowned for its innovative research and its commercial partnerships, with more than 100 leading companies located on Campus or in the surrounding Macquarie Park high-tech precinct.

The University was founded in 1964 and has since grown into a large research university with over 30,000 students and 3,000 staff. More than \$1 billion has recently been invested in MU facilities and infrastructure to ensure students and staff can thrive in an inspiring and technologically advanced learning environment.

In March 2014, MU adopted the 'Macquarie University Campus Master Plan 2014'. The Master Plan builds on the approved MU Concept Plan 2009 and sets out the physical framework to accommodate the University's predicted needs, while ensuring flexibility into the future and enhancing the existing qualities of the University's Campus. Ongoing changes in teaching methodologies, new course opportunities, a desire to increase industry engagement and the potential for commercial opportunities on the Campus were all key considerations in the development of the Master Plan.

1.2 Site Description

The MUCCP is situated in the centre of the University Campus, within Precinct A. The MUCCP currently contains Buildings C9A and C10A (the Student Hub) which are subject to a separate demolition DA to City of Ryde Council, Buildings C8A, C7A and the landscaped Central Courtyard. The MUCCP is a key component of the University Campus.

Figure 1 shows the location of the MUCCP within the context of the University Campus.

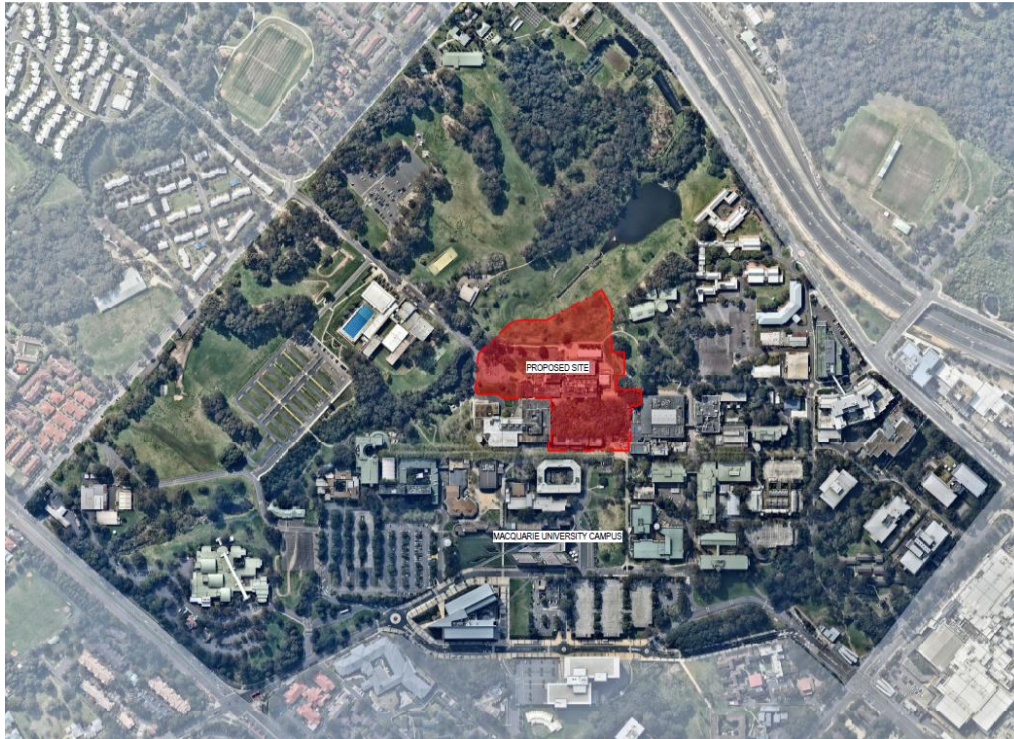


Figure 1 Location of the site

1.3 Overview of the Proposed Development

In accordance with the Master Plan, MU has identified the opportunity to move student accommodation to the heart of the Campus. The Master Plan also acknowledges the importance of the MUCCP, and the need to retain the Precinct as a key focus of the University's civic and administrative functions, with active edges for retail, and food and beverage uses.

MU is seeking to secure development consent for the first phase of the MUCC precinct redevelopment. Consent is sought for redevelopment of Building C10A (known as 1 Central Courtyard), construction of two student accommodation buildings (R1 and R2) and redevelopment of the landscaped Central Courtyard. The proposal comprises:

- Construction of a new, multi-storey Student Hub (1 Central Courtyard) in place of existing Building C10A, with ancillary retail uses.
- Construction of two student accommodation buildings (Building R1 and R2) to provide approximately 340 student beds and integrated academic uses.
- Redevelopment of the landscaped Central Courtyard.
- Construction of a shared basement including plant, loading and waste management facilities, end of trip facilities and accessible parking.
- Installation of a new substation.
- Installation of utilities and services to accommodate the proposed development.

- Upgrade of the western extent of Science Road to accommodate fire brigade access.
- Tree removal and landscaping.

The extent of the SSDA works is shown in Figure 2.

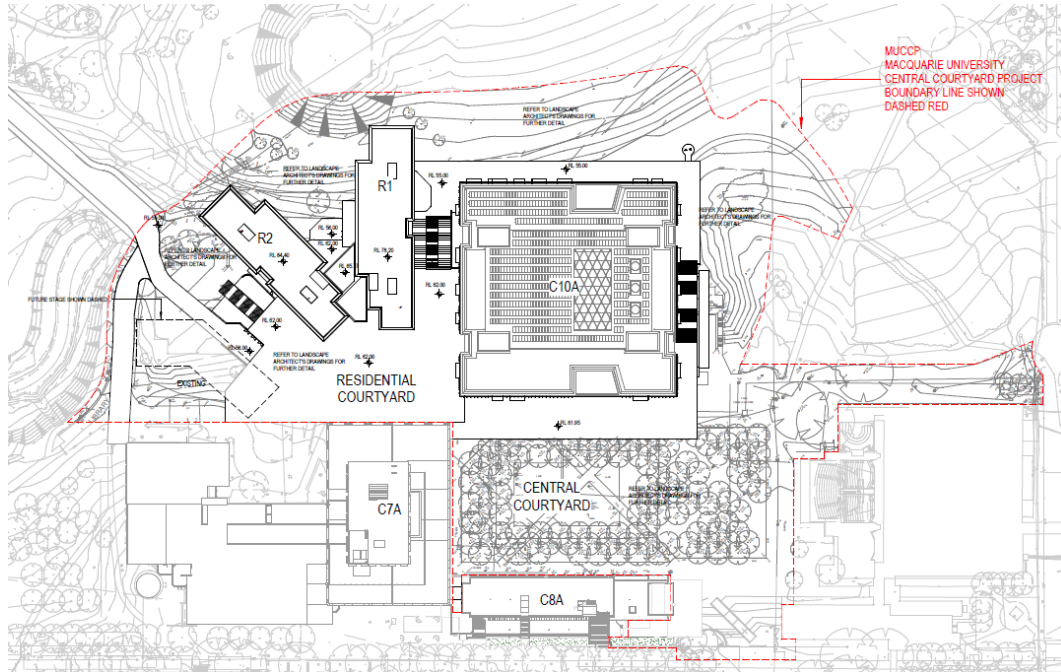


Figure 2 Extent of MUCCP SSDA

2 SEARS Report

A Secretary's Environmental Assessment Requirements (SEARs) report has been submitted by the Department of Planning.

- Application Number SSD: 8755
- Proposal Name: Macquarie University Central Courtyard Precinct Redevelopment
- Location: Macquarie University
- Date of Issue: 13 October 2017

The submission meets all the requirements of the SEARs in relation to transport and accessibility (Construction and Operation). The following details in Table 1 respond to the requirements raised in the SEARs report.

Table 1: Secretary's Environmental Assessment Requirements and response

#	SEARs Report	Reference/Comments
1	Include a transport and accessibility impact assessment, which details, but not limited to the following:	This report details a transport and accessibility impact assessment of the proposed development
2	the current daily and peak hour vehicle, public transport, pedestrian and bicycle movements and existing traffic and transport facilities provided on the road network located adjacent to the proposed development;	Discussed in Section 3
3	the number of students and staff currently using the site and the likely number using the site due to the proposed development;	Discussed in Section 3 and 5.
4	an estimate of the total daily and peak hour trips generated by the proposal, including vehicle, public transport, pedestrian and cycle trips;	Discussed in Section 5
5	assessment of the operation of existing and future transport networks, and their ability to accommodate the forecast number of trips to and from the development;	Discussed in Section 4
6	the adequacy of pedestrian and bicycle provisions to meet the likely future demand of the proposed development including suitable bicycle parking and end of trip facilities;	Discussed in Section 5
7	the operational impact of the proposed development on existing and future pedestrian network, bicycle network and public transport infrastructure within the vicinity of the site;	Discussed in Section 4 and 5
8	existing and proposed pedestrian, cyclist and vehicle access, including car, taxi and point to point transport for staff, students and visitors and compliance with Australian Standards;	Discussed in Section 3, 4 and 5
9	sustainable travel initiatives for employees, students and visitors that support the	Discussed in Section 3

#	SEARs Report	Reference/Comments
	achievement of concept plan targets, particularly the provision of bicycle parking, end-of-trip facilities, green travel plans and wayfinding strategies;	
10	assessment of the impact of additional traffic generated by the proposed development on the existing road network;	Discussed in Section 5
11	the daily and peak vehicle movements impact on nearby intersections utilising traffic modelling endorsed by Roads and Maritime Services, with consideration of the cumulative impacts from other approved developments in the vicinity and the need/associated funding for upgrading or road improvement works (if required);	Discussed in Section 5
12	measures to mitigate any associated traffic impacts and impacts on public transport, pedestrian and bicycle networks;	Discussed in Section 5
13	anticipated student and staff numbers and subsequent implications for car and bicycle parking demand on the campus;	Discussed in Section 5
14	existing and proposed car and bicycle parking provision, including end of trip facilities, and the consideration of the availability of public transport and the requirements of the relevant parking codes and Australian Standards;	Discussed in Section 3, 4 and 5
15	assessment of road and pedestrian safety adjacent to the proposed development and details of any required road safety measures;	Discussed in Section 4
16	location of bicycle parking facilities in secure, convenient, accessible areas close to main entries incorporating lighting and passive surveillance;	Discussed in Section 4
17	service vehicle access, delivery and loading arrangements and estimated service vehicle movements (including vehicle type and the likely arrival and departure times); and	Discussed in Section 4
18	traffic and transport impacts during construction, including: • how these impacts will be mitigated for any associated traffic, pedestrian, cyclists, parking and public transport; • the preparation of a draft Construction Traffic Management Plan to demonstrate the proposed management of the impact; • any cumulative impacts from construction activities for the Sydney Metro and associated Temporary Transport Plan; • an assessment of road safety at key intersections and locations subject to heavy	Discussed in Section 6.

#	SEARs Report	Reference/Comments
	vehicle construction traffic movements and high pedestrian activity; and • construction programming detailing significant milestones and events during the construction process.	

Relevant Policies and Guidelines:

- Guide to Traffic Generating Developments (Roads and Maritime Services)
- EIS Guidelines - Road and Related Facilities (DoPE)
- Cycling Aspects of Austroads Guides
- NSW Planning Guidelines for Walking and Cycling
- Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development Standards Australia
- Healthy Urban Development Checklist, NSW Health
- Development Near Rail Corridors and Busy Roads – Interim Guideline 2008
- Ryde Draft Traffic Impact Assessment Guidelines

3 Existing conditions

3.1 Existing uses

The Campus Hub is located in Buildings C9A and C10A which will be demolished as part of the proposed development (subject to a separate development application).

The main food and beverage offering on Campus is located in Building C10A (15 retail units and the student bar) while other services such as bookshop, newsagents, shops and a bank are located in Building C9A.

A car park with approximately 50 parking spaces is also located within the site boundary.

3.2 Travel characteristics

GTA consultants conducted a travel behaviour survey of University staff and students in 2014, receiving almost 1,000 responses. The findings of the survey was that the Campus (overall) had the following travel mode split:

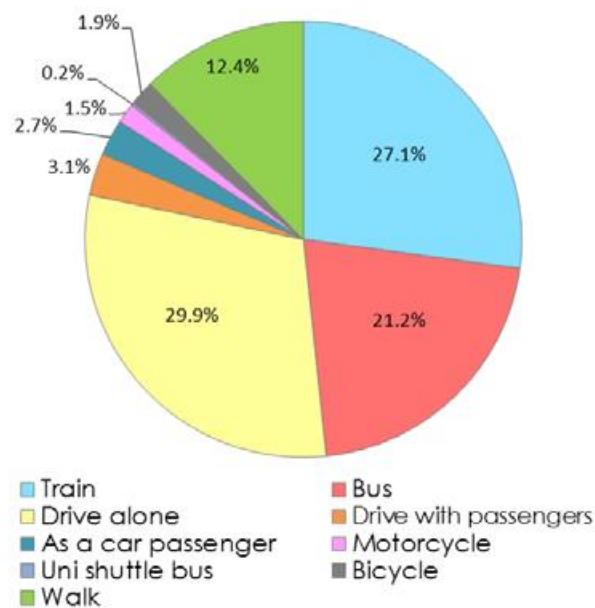


Figure 3 MU Travel Mode Split (2014 - overall)

The overall car driver mode share (both alone and with passengers) is 33%. The survey found that students had a lower car driver mode share than staff (27% v 40%). The trend in recent years has been a reduction in travel by single occupancy cars as shown in Figure 4 and Figure 5. Around half of all trips are made by public transport (train, bus and shuttle bus), while walking accounts for 12% of trips.

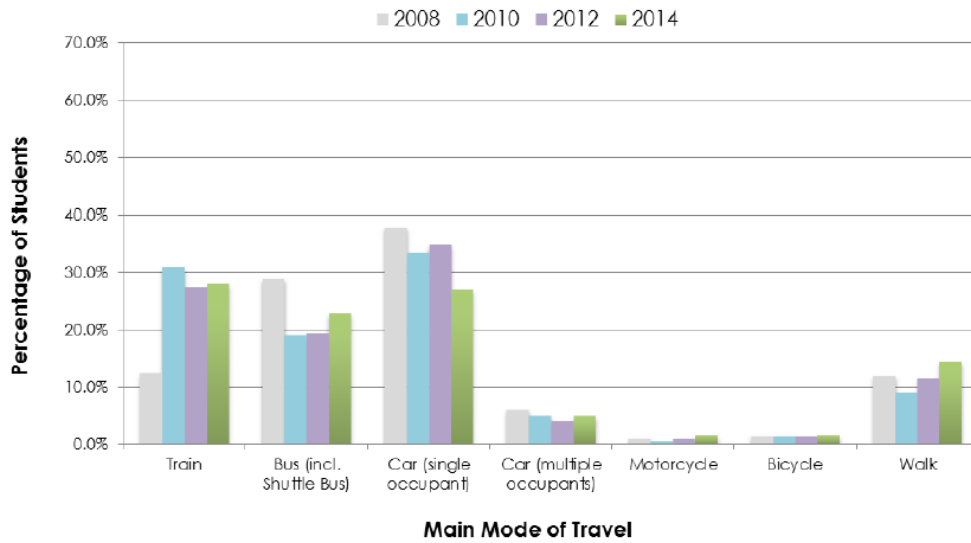


Figure 4 Student mode split trends

Source: MU Travel Plan 2020



Figure 5 Staff mode split trends

Source: MU Travel Plan 2020

3.3 Public transport

3.3.1 Bus

The Campus is served by both public and private bus services. A number of routes that stop along University Avenue, with other routes stopping along Herring Road and Waterloo Road as presented in Figure 6. In addition to public bus services, there are a number of private bus services in operation (i.e. Forest Coach Lines, Transdev NSW Buses and Hillsbus).

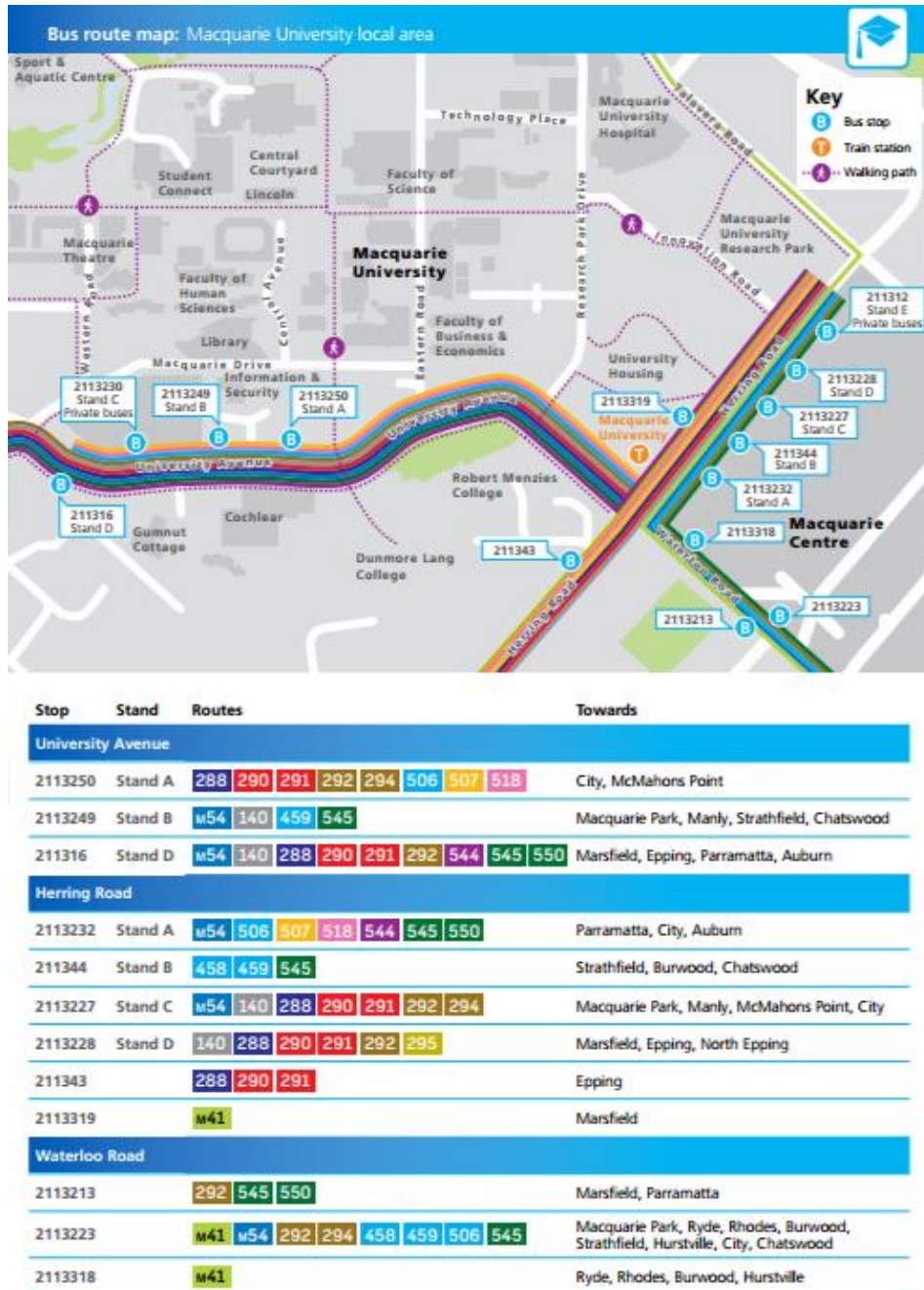


Figure 6 MU bus route map

The University also operates a complimentary shuttle bus during semester time between 4pm and 12.30am. The shuttle bus routes around the Campus, serving buildings, the Campus Hub, train station and student accommodation.

As per the Master Plan 2014, the shuttle bus will travel along Gymnasium Road in the future, with a stop at the proposed development (see Figure 7).

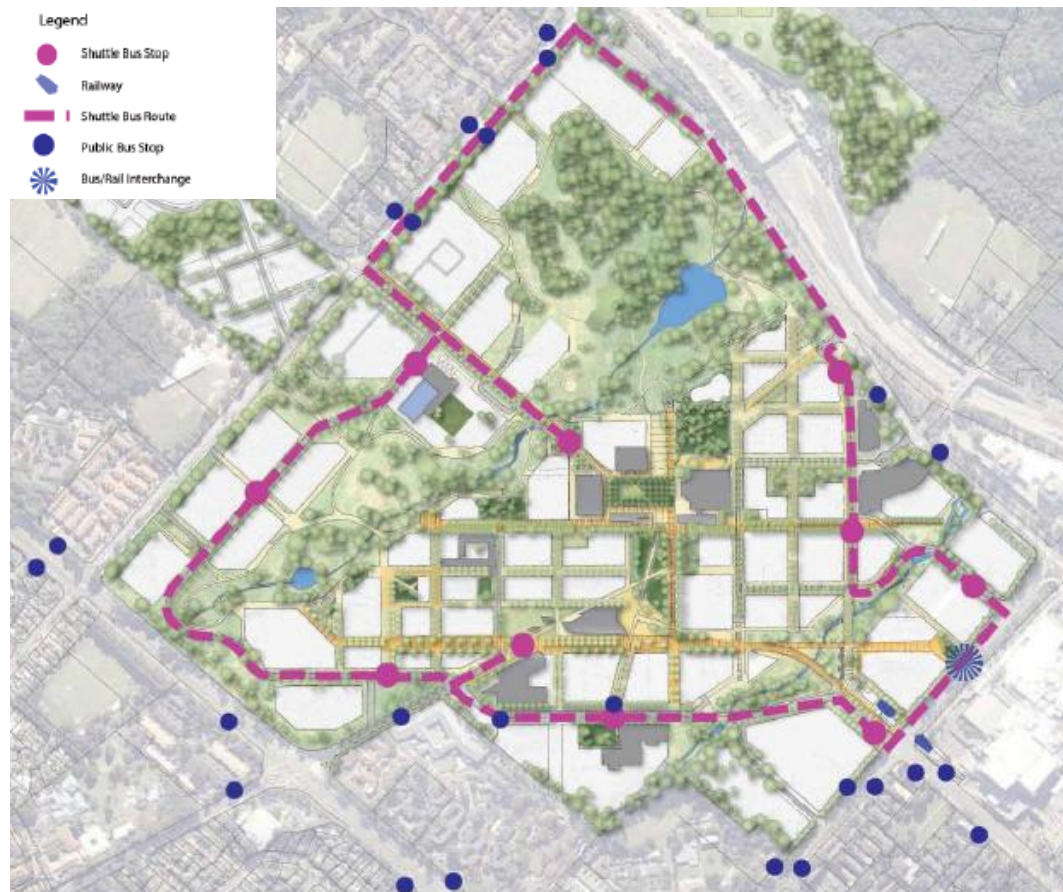


Figure 7 Master Plan shuttle bus route



Figure 8 MU shuttle bus

3.3.2 Rail

MQU is unique in that it is the only metropolitan university in Sydney with a dedicated railway station. Macquarie University Station is located only a short walk from the Academic Core, providing services between 5am and 11pm on a typical weekday. Since the integration of the station with the CityRail network in October 2009, 13 train services every hour (nine towards the city) arrive at the

station during peak hours. These services provide direct rail access to Epping and Chatswood.

Sydney Metro Northwest is an upgrade of the existing Epping to Chatswood railway line to next-generation Metro standard. The works will include overhauling the stations, new cabling, power and signalling systems and customer improvements such as platform screen doors. When completed, there will be a train at least every four minutes at peak times.

From late 2018, buses will replace trains for around seven months between Epping and Chatswood whilst the line is converted to metro operations. When Sydney's metro services start in the first half of 2019, 15 trains an hour will run in both directions between Epping and Chatswood during the peak – almost four times the number of trains running in the peak direction today.

3.4 Active transport

3.4.1 Walking

The pedestrian network on Campus is well developed and extensive, with wide footpaths provided along the internal roads and regular crossing points present to match pedestrian desire lines.

Wally's Walk is a fully pedestrianised east-west link just south of the proposed development site, while the central courtyard is also pedestrianised.

The Master Plan 2014 plans to pedestrianise Macquarie Walk and extend it to the west towards the bus and rail interchange as shown in Figure 9.

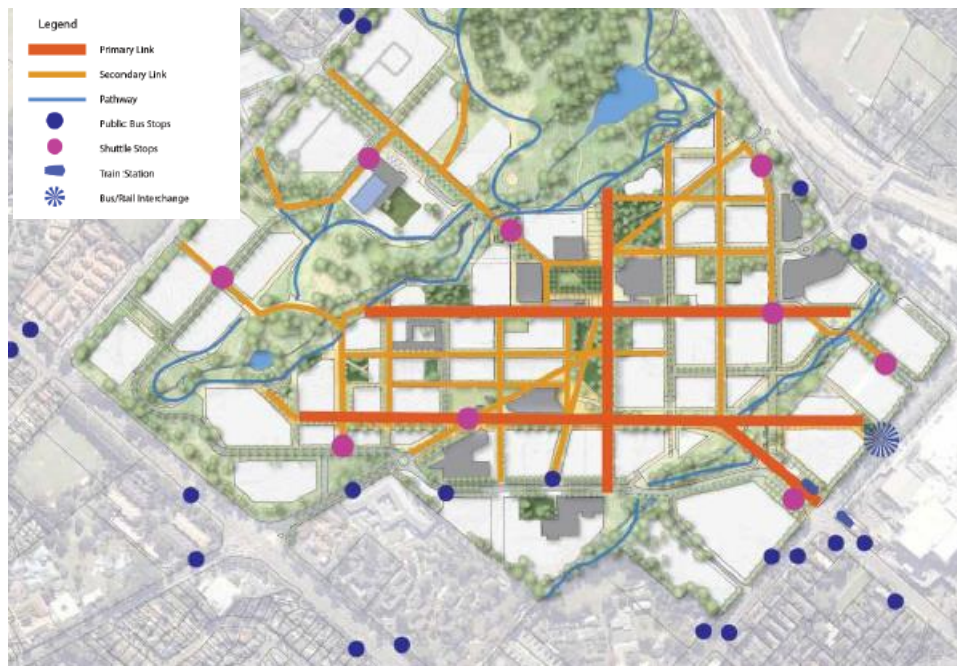


Figure 9 Master Plan pedestrian network

3.4.2 Cycling

The existing bicycle facilities surrounding and on-Campus are presented in Figure 10. On cCmpus, cyclists are generally mixed with traffic or permitted to use a network of wide informal shared paths.

Along Gymnasium Road, cyclists are mixed with traffic while an informal shared path is also provided between the Sports Centre and the Central Courtyard.

Externally, there are no facilities for cyclists along Epping Road or Herring Road.

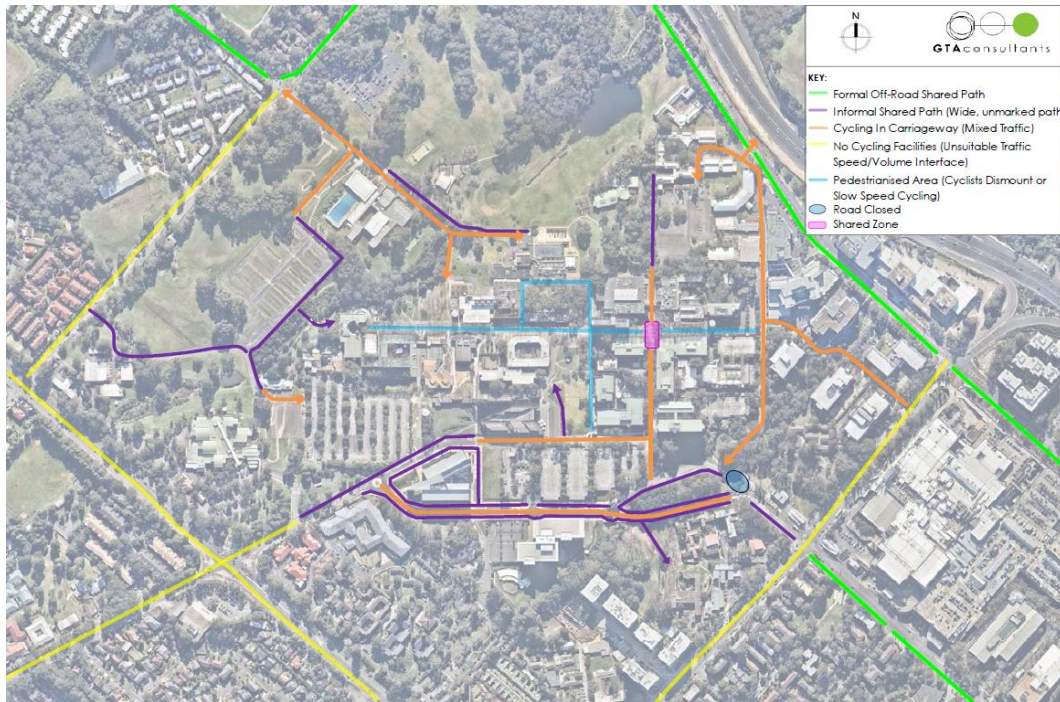


Figure 10 Existing cycle network

(Source: MU Travel Plan 2020)

The Master Plan 2014 represents the current approach for bicycle access as shown in Figure 11. It identified the need for a bike hub at the end of Gymnasium Road, with Gymnasium Road becoming one of the primary bike routes into the Campus.

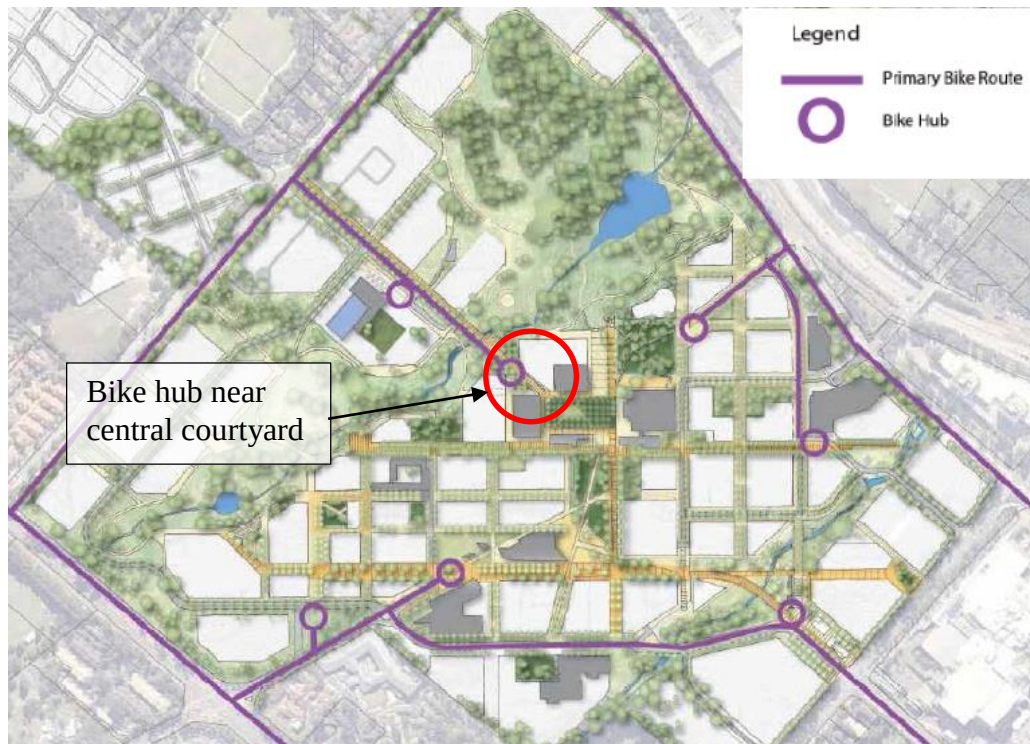


Figure 11 Master Plan cycle network

3.5 Existing road network

Macquarie University is surrounded by a number of major roads which carry significant traffic volumes (refer to Figure 12). These roads, including the administrative classification, are:

- Epping Road (State road)
- M2 Motorway (State road)
- Herring Road (Regional road between Epping Road and Talavera Road)
- Talavera Road (Regional road between Lane Cove Road and Talavera Road)
- Waterloo Road (Local road)
- Balaclava Road (Local road)
- Culloden Road (Local road)

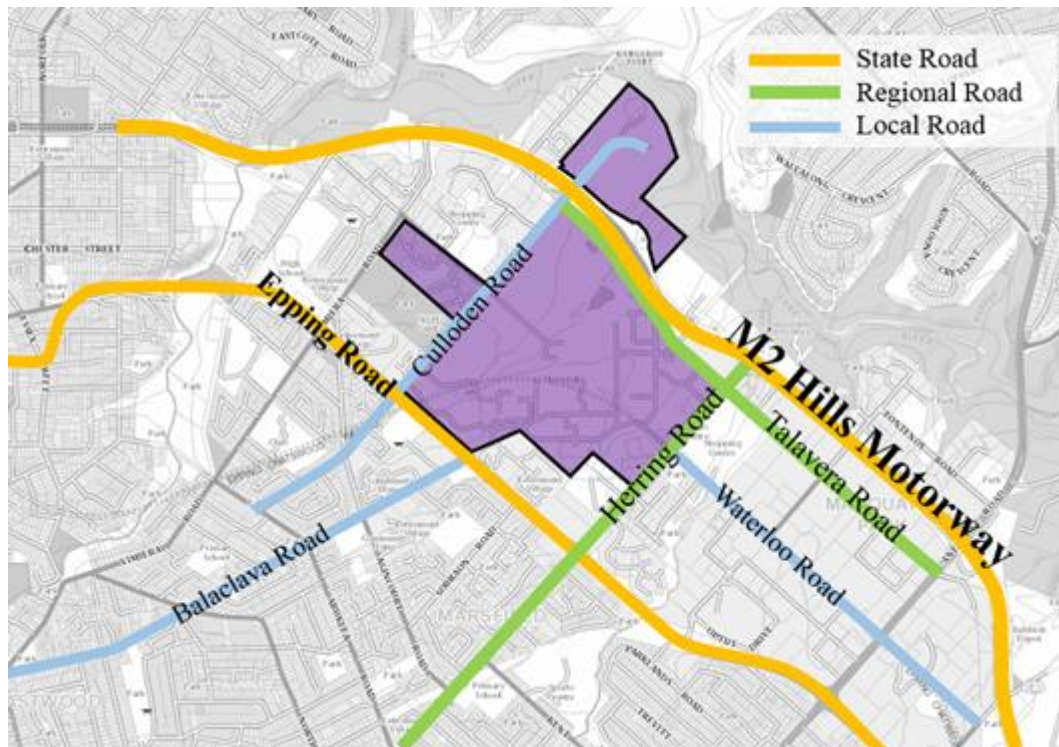


Figure 12 Road network

3.5.1 Key intersections

The operation of the Macquarie Park road network is primarily a function of the performance of key intersections including:

- **Waterloo Road / Herring Road:** Directly adjacent to the University, train station and Macquarie Shopping Centre, this intersection is signalised with pedestrian crossing facilities on all approaches. The northern leg of this intersection provides direct access to the university, becoming University Avenue within the Campus.
- **Epping Road / Balaclava Road:** Controlled by traffic signals with pedestrian crossing facilities on all approaches. Left turn slip lanes are provided on all approaches. Bus priority lanes exist on Epping Road, with a bus priority lane provided on Balaclava Road (east approach) to the junction.
- **Epping Road / Herring Road:** Controlled by traffic signals with pedestrian crossing facilities on all approaches. Left turn slip lanes are in place on all approaches. A bus priority lane exists on Epping Road (north approach) on approach to the junction.
- **Herring Road / Talavera Road / M2 Ramps:** The eastern leg of this signalised intersection provides vehicular access to and from the M2 Motorway. Pedestrian crossing facilities are provided on the northern, eastern and western approaches to the junction. A bus priority lane is provided on Talavera Road (southbound), with the right turn movement from Talavera Road to Herring Road restricted for buses only. Straight ahead movements from the M2 off ramp to Herring Road are not catered for.

- **Talavera Road / Christie Road:** This intersection is controlled by traffic signals, with pedestrian crossing facilities on the north and east approach. The Christie Road approach provides vehicular access from the M2 Motorway for traffic travelling in an eastbound direction.
- **Culloden Road / Waterloo Road:** At the northern end of the Campus, this intersection is controlled by a roundabout. There are no dedicated pedestrian crossing facilities provided.
- **Culloden Road/Gymnasium Road:** Approximately 20m south-west of the Culloden Road/Waterloo Road intersection is the Gymnasium Road access to the University. It is a priority intersection with a right turn lane provided on Culloden Road. A pedestrian crossing on Culloden Road (just to the west) connects Macquarie University Village student residences with the main Campus.

3.5.2 Internal network

Within the Campus, the key road in the vicinity of the proposed development site is Gymnasium Road. It provides access to two car parks at the northern end of the Campus. South of the Sports Centre, it provides access to car park N1 (50 spaces) and to the deliveries/loading dock areas for the existing buildings in the Central Courtyard area (including C9A and C10A).

A boom gate is in place along Gymnasium Road, restricting access beyond the Sports and Aquatic Centre.



Figure 13 Master Plan internal vehicle road network

3.5.3 Gymnasium Road traffic volumes

A 7-day traffic survey was undertaken along Gymnasium Road during term time in April 2016 to understand traffic volumes along this road. Two-way traffic volumes range between 200 and 300 vehicles between 7am and 3pm, increasing to between 300 and 450 vehicles between 3pm and 8pm. The peak period in terms of traffic volumes along Gymnasium Road is between 5pm and 6pm with 433 vehicles recorded during this period.

Eastbound movements, which represent vehicles entering the Campus, peak between 9am and 10am with 221 vehicles recorded. Westbound movements, which represent vehicles exiting Campus, peak between 5pm and 6pm with 235 vehicles recorded during this time period (see Figure 14).

A peak of 15 two-way truck/bus movements were recorded between 10am and 11am, of which the majority were two-axle delivery vehicles.

Since the survey was undertaken, many of these truck movements have temporarily moved to the other University entrances due to the 'Campus Common' project which is a temporary relocation of University Hub along with food and beverage services.

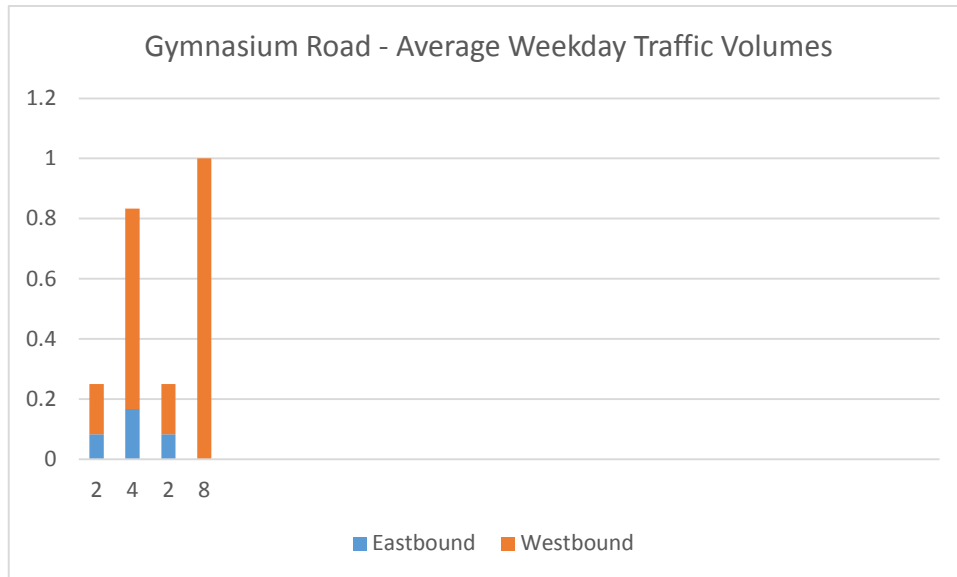


Figure 14 Gymnasium Road traffic volumes

3.6 Car parking

There are currently approximately 5,000 on-site parking spaces across the Campus in a mixture of multi-storey and at-grade car parks available to staff, students and visitors.

All car parking on Campus is managed between 06:00 and 20:00 every day, through the following three schemes:

- Parking Permit Scheme – available to staff and students to purchase, permitting them to park in designated spaces
- Pay and Display – available to anyone without a permit, permitting them to park in designated pay and display spaces only
- Private Parking – typically for commercial use only and prohibited to use by staff and students

Within the boundary of this application is car park N1 which has approximately 50 spaces. Car park N1 is used by service vehicles and those with a special permit. A portion of the car park is presently being used for construction parking (c. 20 spaces).

The 2009 Concept Plan for the University permits a maximum of 10,800 car parking spaces on Campus, with supply for academic purposes stated as 5,060. As part of the plan it is required to relocate car parking to the periphery of the Campus, with an objective to develop four new parking structures and to locate car park access points on vehicle priority roadways. The Master Plan 2014 maintains this approach with the strategy presented in Figure 15.



Figure 15 Master Plan University car parking

3.7 Macquarie University Travel Plan 2020

GTA consultants have prepared the ‘Macquarie University Travel Plan 2020’ on behalf of MU, providing the strategies and actions to manage transport demand on Campus in order to reduce car based trips.

The purpose of the Travel Plan is to bring about better transport arrangements to manage travel demands on Campus, particularly promoting more sustainable modes of transport within the University whilst recognising the unique context of travel planning at universities.

The Travel Plan aims to deliver the following benefits within the Campus:

- reduce traffic congestion and greenhouse gas emissions (GHE)
- increase Campus amenity by reducing the need to supply additional car parking
- promote a healthy lifestyle for all
- contribute to social equity and reduce social exclusion.

Contained within the Travel Plan is a site audit of the existing transport networks on the Campus, a summary of the issues and opportunities and travel plan strategies for each mode as well as for bicycle and car parking. An action plan with timeframes was prepared in accordance with the aims of these strategies.

4 Proposed development

The proposed development will consist of the following:

- Construction of a new, multi-storey Student Hub (1 Central Courtyard) in place of existing Building C10A, with ancillary retail uses.
- Construction of two student accommodation buildings (Building R1 and R2) to provide approximately 340 student beds and integrated academic uses.
- Redevelopment of the landscaped Central Courtyard.
- Construction of a shared basement including plant, loading and waste management facilities, end of trip facilities and accessible parking.
- Installation of a new substation.
- Installation of utilities and services to accommodate the proposed development.
- Upgrade of the western extent of Science Road to accommodate fire brigade access.
- Tree removal and landscaping.

1 Central Courtyard is proposed to have a graduation hall and student bar at basement level lower. As well as for graduations, the hall will also be used for conferences, exams and various functions. A food court is proposed at ground level lower and learning and teaching spaces at Level 1 and 2.

The shared basement will be accessed from the southern end of Gymnasium Road.

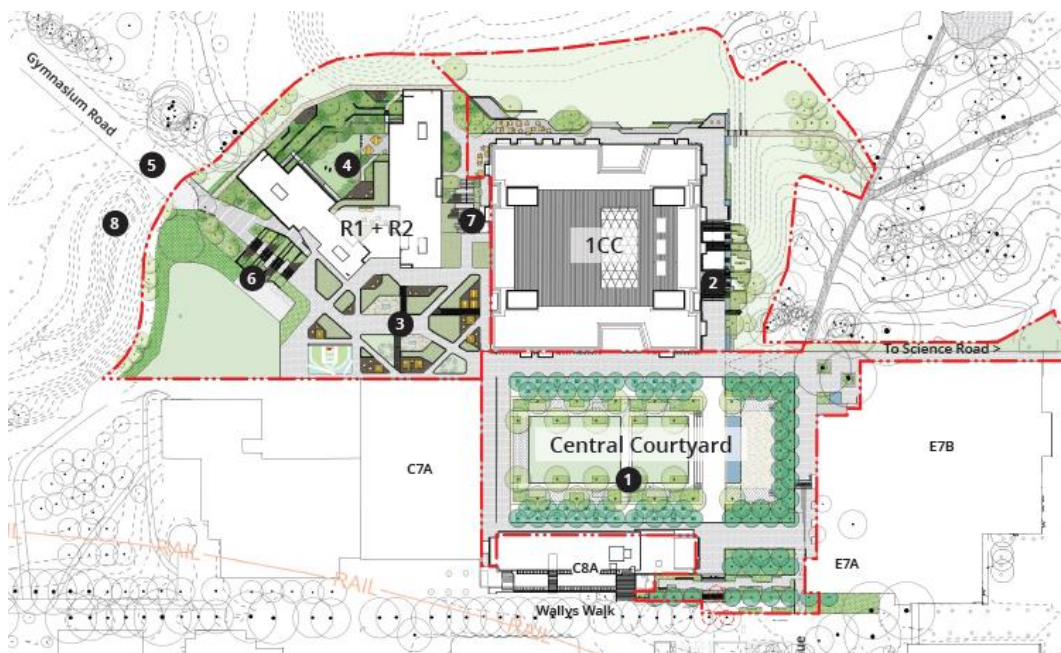


Figure 16 Proposed development

4.1 Car parking

As noted in Section 3.6, the parking strategy for University parking is to consolidate it into four main car parking areas and maintain a cap of 5,060 spaces for academic purposes.

As such, the only parking proposed to be provided as part of the development is four (4) DDA spaces and two (2) visitor spaces in the shared basement. Student residents will be permitted to apply for a parking permit and use the designated permit car parks around the Campus.

The four DDA spaces are compliant with AS 2890.6, the standard for off-street parking for people with disabilities. The spaces are 2.4m x 5.4m and have a shared area of 2.4m x 5.4m adjacent to them. The visitor spaces are 2.5m x 5.4m and are compliant with AS 2890.1, the standard for off-street car parking.

The car park is accessed from Gymnasium Road. The basement layout is presented in Figure 17.



A bike hub with secure bike parking for 34 bikes and end of trip facilities is also proposed which will be accessible to University students and staff. As is presently the case, the University will continuously monitor the demand for bicycle parking in the area and respond with additional spaces if required. The opportunity also exists to provide additional cycle parking facilities in later phases of the MUCCP redevelopment.

The end of trip facilities will be available for use by the University staff and students. The bike parking area can be internally accessed from the student residences as well as directly from Gymnasium Road as shown in Figure 18.

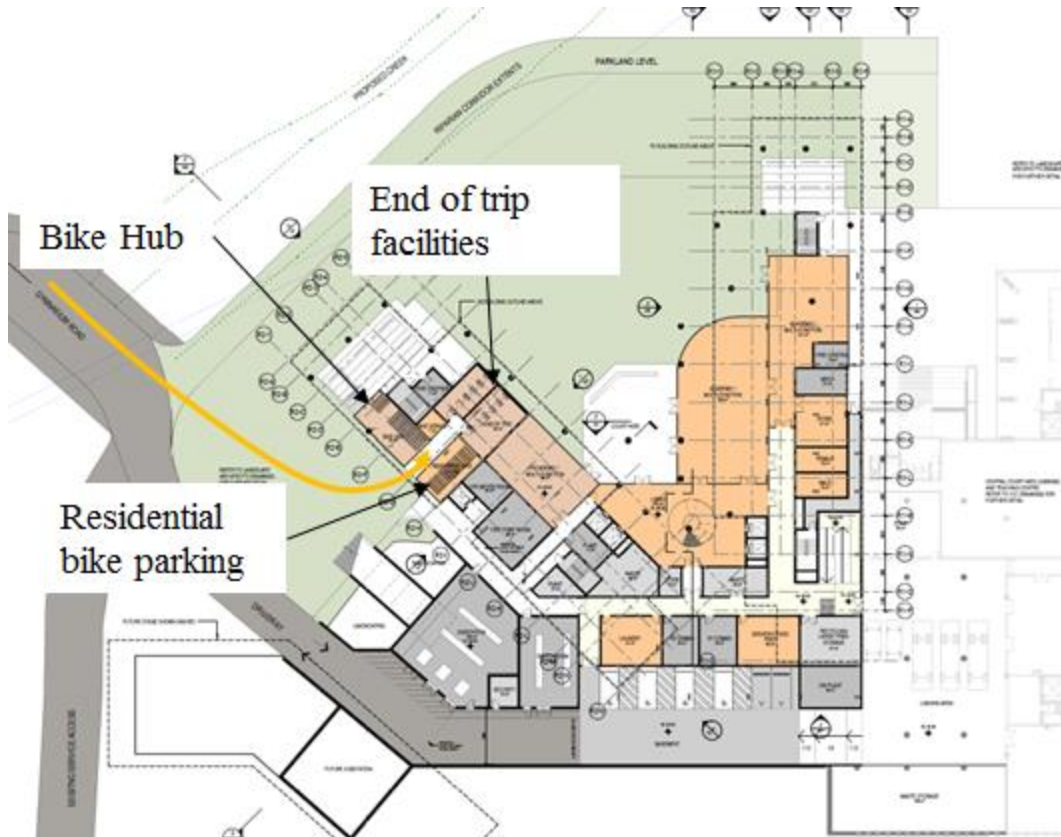


Figure 18 Bicycle access and end of trip facilities

4.3 Pedestrian access and routes

The pedestrian accessibility of R1, R2, and 1CC is excellent with high quality pedestrian connections from all directions. The central courtyard itself is very permeable, with a number of paths and links.

From Gymnasium Road, pedestrians can continue along their desire line towards the residential courtyard and the central courtyard and Wallys Walk. The entrance to the R1 and R2 is from the residential courtyard.

Wally's Walk, the main east-west pedestrian link on Campus, is running along the southern boundary of the Central Courtyard. There will be two pedestrian connections to the Central Courtyard, one of which is ramped and the other via

steps. The ramped connection also connects with Sir Christopher Ondaatje Avenue (the main north-south pedestrian link on Campus).

The main pedestrian routes are shown in Figure 19.

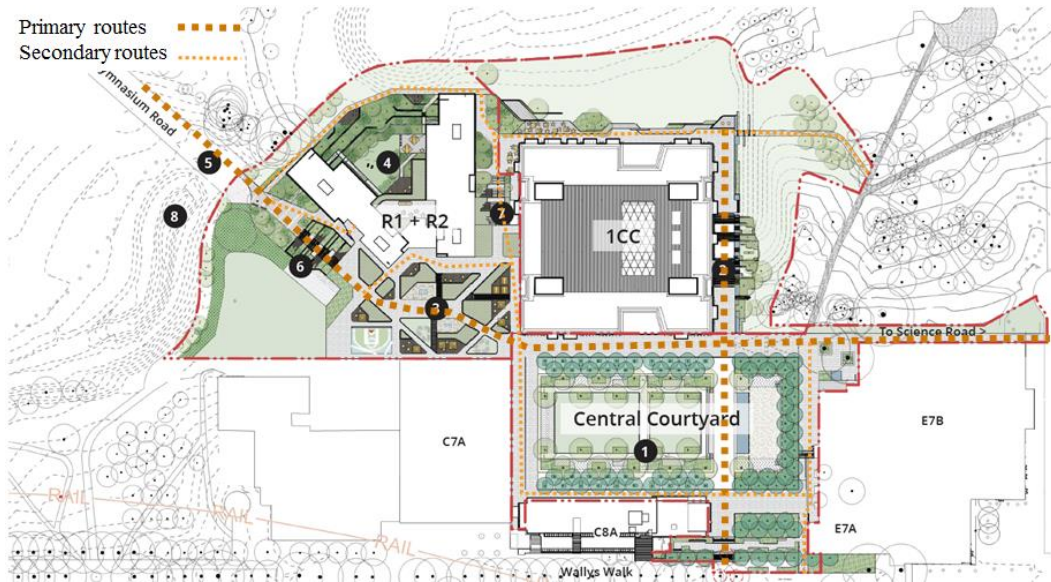


Figure 19 Main pedestrian access routes

4.4 Service access

Servicing for R1, R2 and 1CC will take place in the shared basement which is accessed by Gymnasium Road (see Figure 20). Waste collection and deliveries for R1, R2 and 1CC will be centralised in this shared basement.

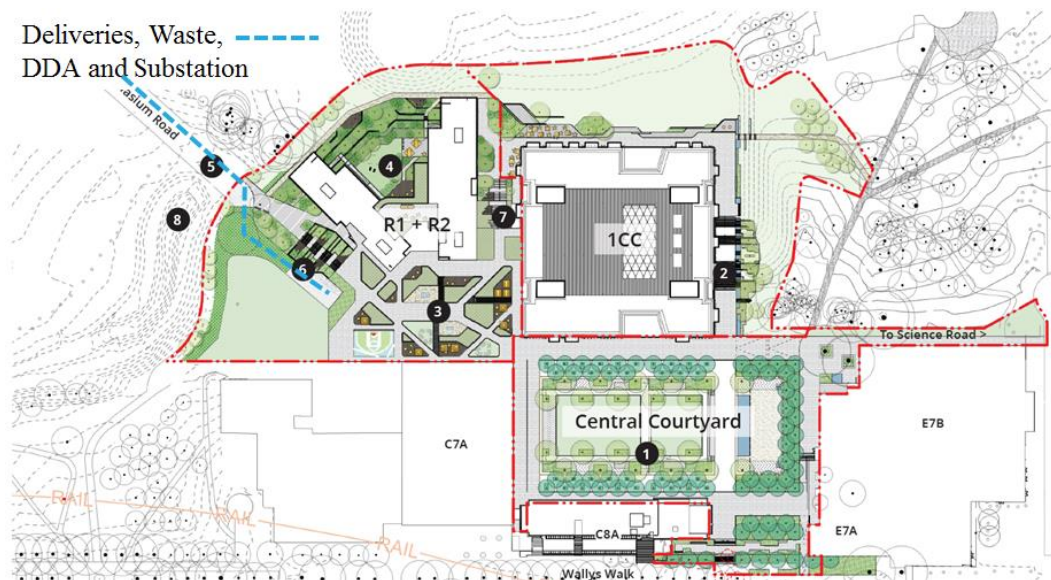


Figure 20 Service, waste and substation access strategy

The loading dock is proposed to have capacity for two SRV's and two MRV's (see Figure 17 previously). The MRV bays are 3.5m x 8.8m and the SRV bays are

3.5m x 6.4m which is compliant with AS 2890.2, the standard for off-street commercial vehicle facilities.

A swept path analysis of the loading dock area has been carried out using a 10.24m EPA garbage truck and an 8.8m MRV. The drawing is appended to this report in **Appendix A**.

The central courtyard will also be accessible for maintenance vehicles via Science Road. A new substation is also proposed which can be accessed by the access road to the shared basement. This will be accessible to Ausgrid at all times.

4.5 Emergency access

A fire tender and ambulance access strategy has been prepared for the precinct (see Figure 21 and Figure 22).

For buildings R1 and R2, the booster is located along Gymnasium Road. Fire tenders attending these buildings will access the Campus via Gymnasium Road and route along it towards the development. They will be able to perform a three-point turn to exit.

For 1CC, the booster is located just east of the building. Fire tenders attending this building and the central courtyard will route along Science Road and building E7B towards the development. They will be able to perform a three-point turn to exit. It is proposed to carry out minor pavement works along with the removal of two trees in order to facilitate this access from Science Road.

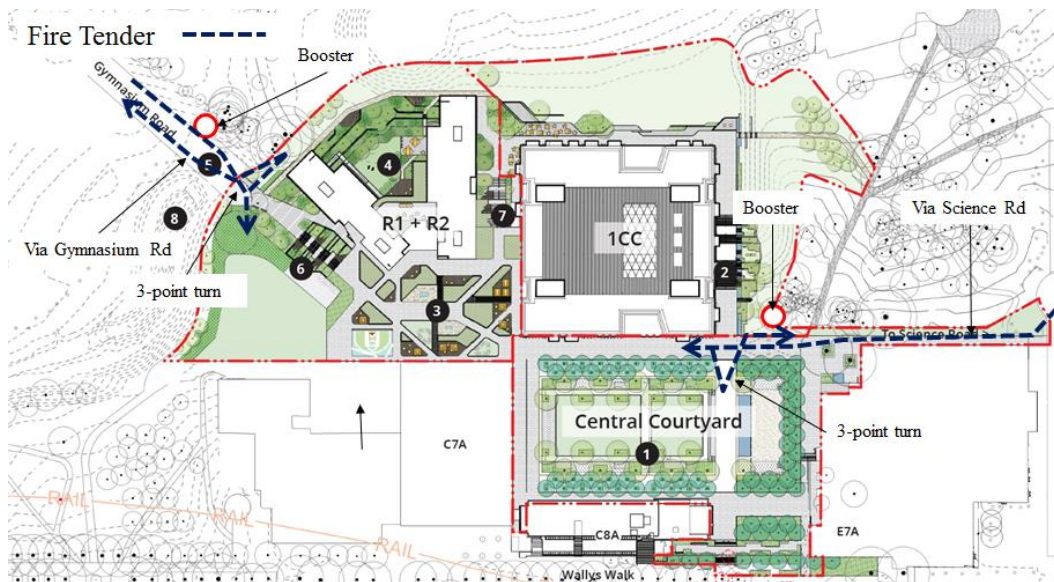


Figure 21 Fire tender access strategy

The main ambulance route for buildings R1 and R2 will be via Gymnasium Road. Ambulances will be able to access the basement car park where lift access is available. Ambulance access to 1CC and the central courtyard will be via Science Road. Ambulances will be able to circulate the courtyard and exit via Science Road also.

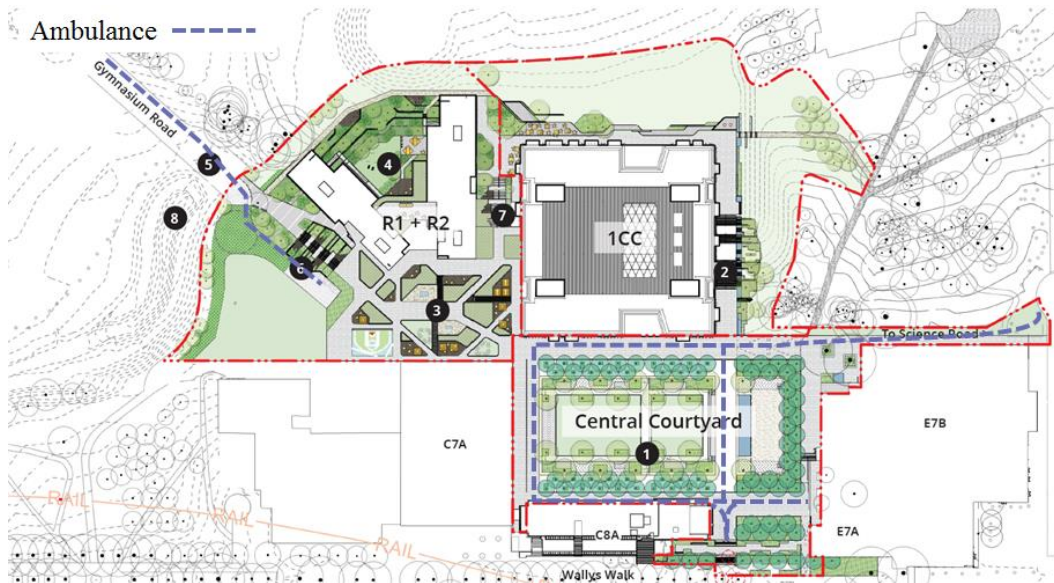


Figure 22 Ambulance access strategy

4.6 Shuttle bus access

At present the University shuttle bus uses Gymnasium Road, stopping close to car park N1. As part of the redevelopment, it is proposed to provide a shuttle bus stop close to student residential building R1 as shown in Figure 23. The shuttle bus will route along Gymnasium Road and stop outside of the development to drop-off and pick-up passengers. When departing, the shuttle bus will be able to turnaround in front of the access to the shared basement and route along Gymnasium Road.

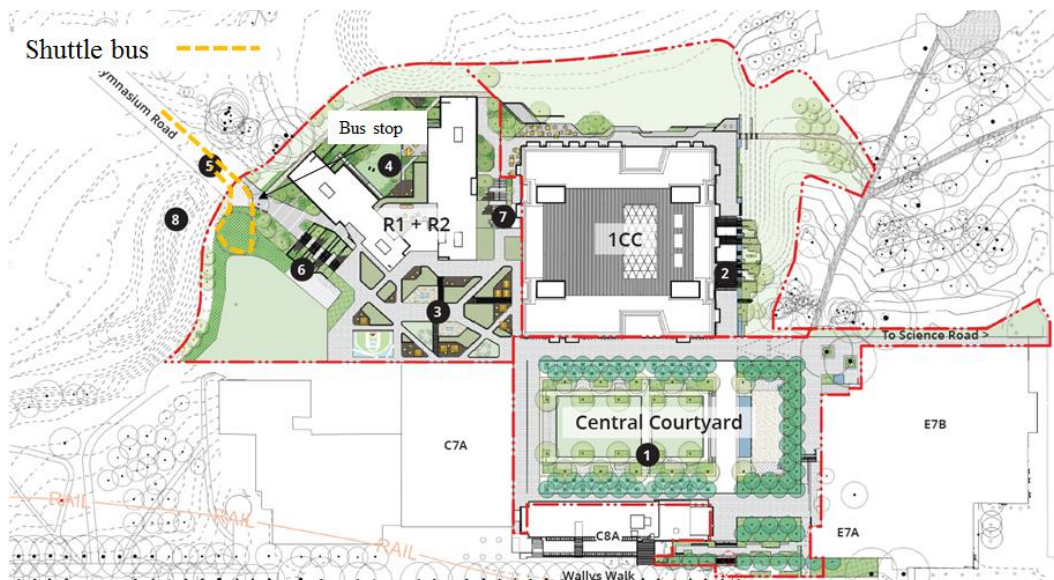


Figure 23 Shuttle bus access

5 Transport assessment

5.1 Traffic generation

5.1.1 R1 and R2

The proposed redevelopment is anticipated to have a positive traffic impact, with traffic reducing. The provision of on-Campus student accommodation is in itself a positive demand management measure as it removes the daily commute to the Campus for 340 students.

The 2014 travel survey for the University showed that 27% of students travel to Campus by car (single occupants). It is therefore anticipated that there will be a reduction of around 90 car trips per day in each direction.

The new student residences will have a small number of staff and delivery vehicle trips related to it. These are expected to generate no more than 10-20 trips per day.

5.1.2 Deliveries

The existing Campus Hub, when located in building C10A, had a bar and 15 other food and beverage retail units, with shops and other services provided in building C9A. As 1CC will have a relatively similar amount of retail units. It is anticipated that the volumes of deliveries will not change significantly compared to what is presently generated (i.e. a peak of 15 two-way movements between 10am and 11am and up to 10 two-way movements at peak times).

5.1.3 Special Events

There will be a small number of event days throughout the year which are likely to result in additional traffic movements. These days include

- Graduation (generally mid-late September)
- Residences moving in/out day

Special arrangements will be in place to manage traffic and parking on days such as these as is presently the case. The residences moving in/out days are not expected to have a large impact as apartments will be furnished and trips will occur over a weekend period.

6 Draft construction traffic management plan

6.1 Background

As part of the construction management plan for the project, a draft Construction Traffic Management Plan (CTMP) has been prepared and is described in this section of the report. The purpose of the draft CTMP is to assess the proposed operation of construction traffic associated with the development with respect to safety for all road users and capacity.

This plan details the management needed to control construction traffic, while minimising effects on the surrounding environment and allowing for appropriate access at all times.

The part of the site for which this CTMP relates is the MUCCP which is situated in the centre of the University Campus, within Precinct A. The MUCCP currently contains Buildings C9A and C10A (the Student Hub) which are subject to a separate demolition DA to City of Ryde Council, Buildings C8A, C7A and the landscaped Central Courtyard. The area is highlighted earlier in this report in Figure 1.

The appointed Contractor for the project will be responsible for preparing the final CTMP, in consultation with City of Ryde Council and other relevant stakeholders.

6.2 Construction details

6.2.1 Description of the works

The scope of construction works for this SSD application includes:

- Construction of a new, multi-storey Student Hub (1 Central Courtyard) in place of existing Building C10A, with ancillary retail uses.
- Construction of two student accommodation buildings (Building R1 and R2) to provide approximately 340 student beds and integrated academic uses.
- Redevelopment of the landscaped Central Courtyard.
- Construction of a shared basement including plant, loading and waste management facilities, end of trip facilities and accessible parking.
- Installation of a new substation.
- Installation of utilities and services to accommodate the proposed development.
- Upgrade of the western extent of Science Road to accommodate fire brigade access.
- Tree removal and landscaping.

6.2.2 Programme and hours of operation

Construction is programmed to commence in Q3 2018 and last for a period of 20 months. The expected hours of operation are as set out below.

Monday to Friday: 7am – 7pm

Saturday: 8am – 4pm

Sunday and Public Holidays: No works

No work will occur outside of the hours nominated unless approval has been given by Macquarie University.

6.2.3 Vehicle types

During the works, vehicles that will access the site during construction will comprise of 12.5m Heavy Rigid Vehicles, 19m semi-trailers and 18m truck and dog vehicles for the import of bulk material and the removal of spoil materials. Concrete agitator and pump trucks will also frequently access the site.

Occasionally, larger vehicles will access the site for specific purposes (e.g. delivery of cranes etc.). These type of movements will be infrequent and will be planned to occur outside of peak traffic periods. Disruption will be for a very short period of time and trained traffic control personnel will assist in helping these type of vehicles access and egress the site. All traffic control personnel operating within the public road network will have the appropriate verification required by Roads and Maritime Services.

6.3 Proposed measures and impact

6.3.1 Construction vehicle routes and controls

The Gymnasium Road entrance to the Campus will be the main construction access. Construction vehicles will be restricted to the state road network as much as possible, with movements along local streets prohibited. These routes are shown in Figure 24.

Key inbound traffic routes for construction vehicles will be:

- From M2 south, Talavera Road, Culloden Road and Gymnasium Road
- From M2 north, Christie Road bridge, Talavera Road, Culloden Road and Gymnasium Road
- From Epping Road North, Culloden Road and Gymnasium Road
- From Epping Road South, Culloden Road and Gymnasium Road (not permitted from 6am – 10am, Monday to Friday, alternative route during this time is along Herring Road, Talavera Road, Culloden Road and Gymnasium Road.

Key outbound traffic routes for construction vehicles will be:

- To M2 south, by Gymnasium Road, Culloden Road, Talavera Road and Christie Road
- To M2 north, by Gymnasium Road, Culloden Road, Talavera Road and M2 ramp (across from Herring Road)
- To Epping Road North, by Gymnasium Road and Culloden Road Waterloo Road and Vimiera Road (right turns are not permitted from Culloden Road onto Epping Road).
- To Epping Road South, by Gymnasium Road and Culloden Road.

Due to constraints at the intersection of Culloden Road and Gymnasium Road, vehicles larger than a 12.5 Heavy Rigid Vehicle will **not** be permitted to turn right.

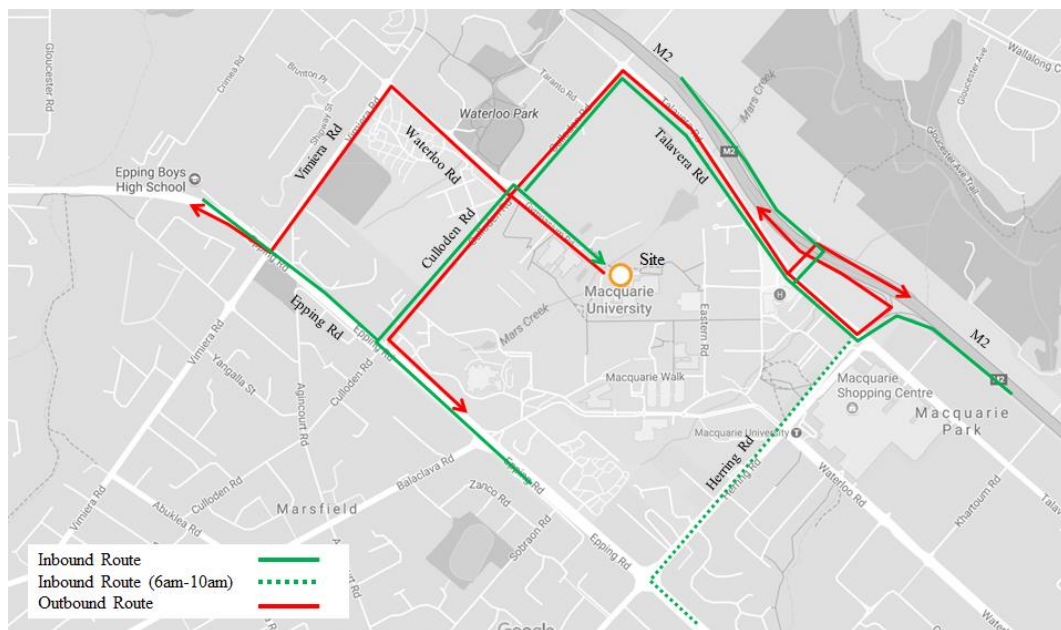


Figure 24 Construction vehicle routes

6.3.2 Construction vehicle access and egress

During the works, the main construction access and egress to the Campus will be via the intersection of Gymnasium Road and Culloden Road. The site itself will be accessed at the southern end of Gymnasium Road.

An assessment of the swept paths of the various construction vehicles expected to access the site using this intersection has been carried and is appended to this report as **Appendix A**. The following modifications and measures are proposed to the intersection to accommodate the swept path of larger construction vehicles:

- Removal of the existing median on Gymnasium Road and replacement with line marking.
- Prohibit vehicles larger than a 12.5m Heavy Rigid vehicle from turning right out of Gymnasium Road.

- Permit construction vehicles only to turn right from Culloden Road to Gymnasium Road.
- Removal of bollards and provision of barriers where body of construction vehicle overhangs.

6.3.3 University vehicle access

Gymnasium Road will continue to be accessible for general vehicle access. The following measures are proposed during the construction stage:

- Assign car park N3 as a permit only car park
- Temporary removal of on-street parking spaces on Gymnasium Road
- Relocation of DDA spaces to rear of Sports and Aquatic Centre
- Relocation of boom gate further north on Gymnasium Road to control access to the north. Only construction and servicing vehicles will be permitted south of the Sport and Aquatic Centre
- Convert the existing construction access off Culloden Road (being used for extension of car park W5) into a new vehicle access

The main vehicle access plan is shown in Figure 25.

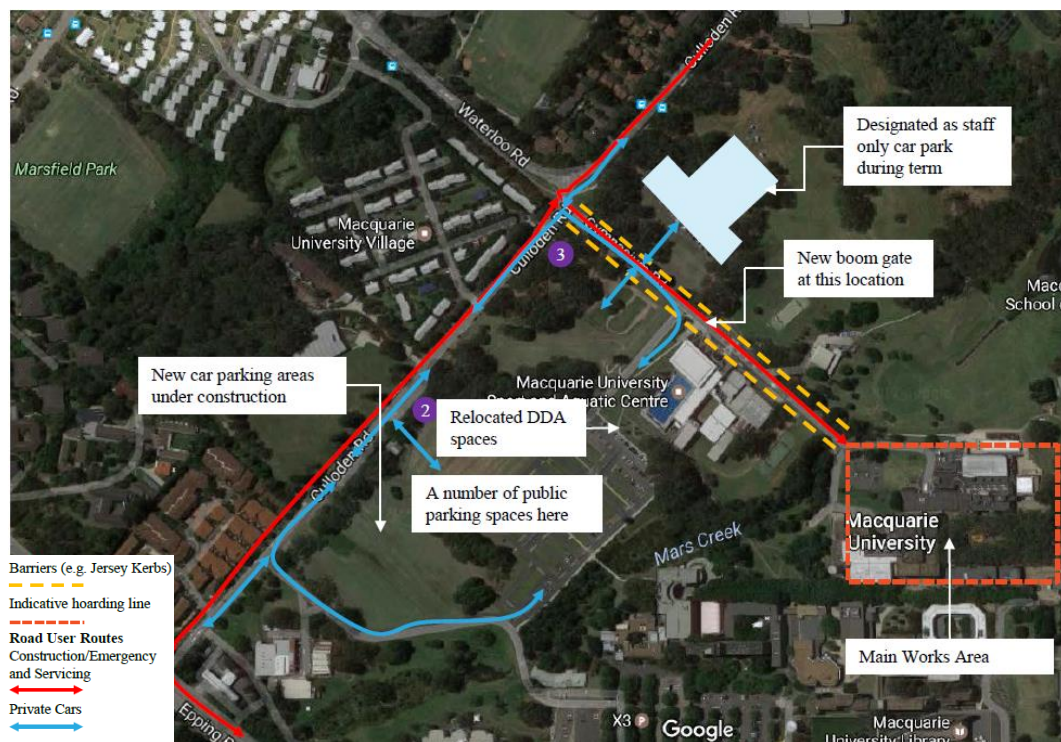


Figure 25 Vehicle access arrangements

6.3.4 Pedestrian and Cycle access

Gymnasium Road will continue to be accessible for pedestrians and cyclists. The following measures are proposed during the construction stage:

- Designation of two crossing points along Gymnasium Road – barriers are proposed along the footpath on both sides of the road to channel pedestrians towards these crossings
- Formalisation of pedestrian paths
- A traffic controller will be in place along Gymnasium Road to assist with crossing the road

The main pedestrian and cycle access plan is shown in Figure 26 and Figure 27.

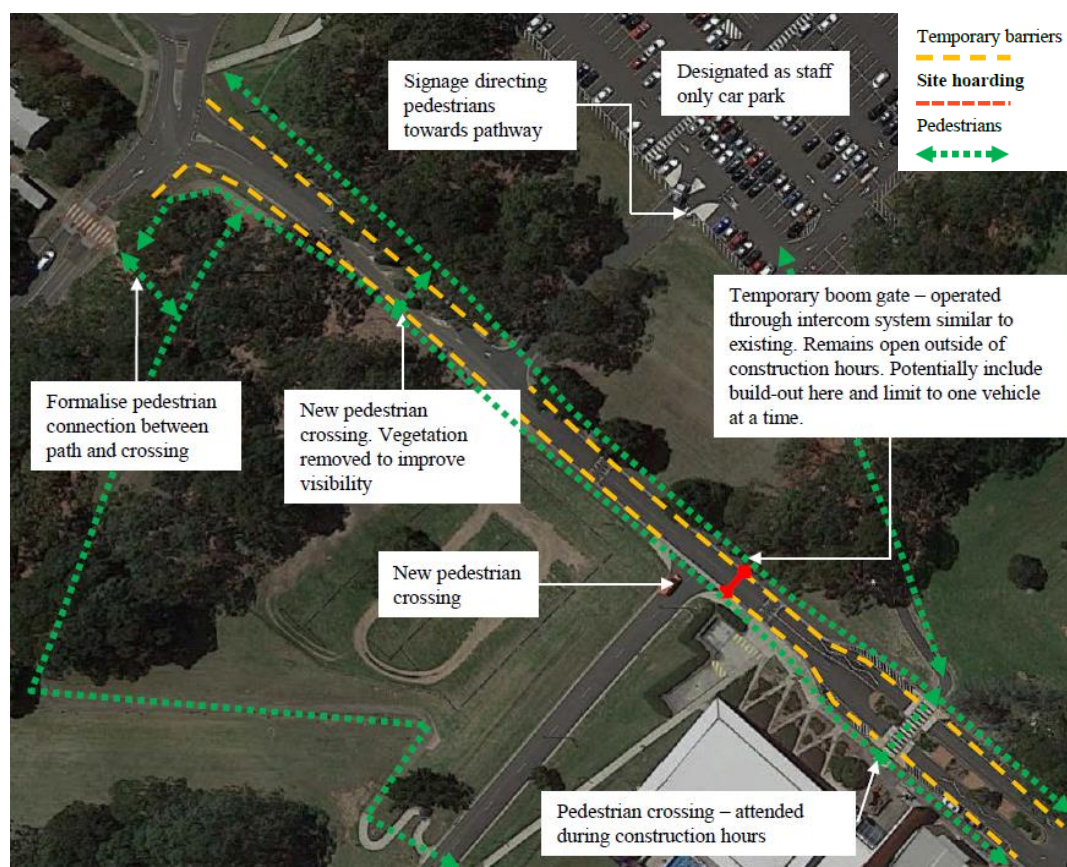


Figure 26 Pedestrian access arrangements along Gymnasium Road (north)

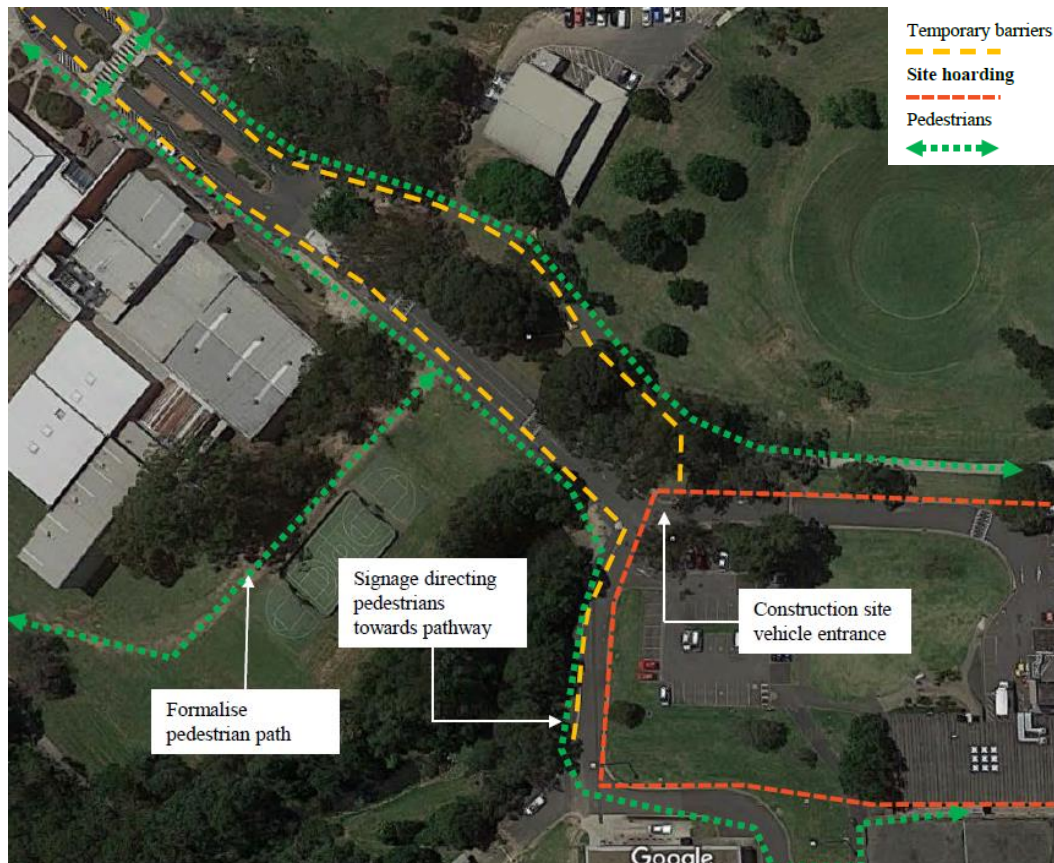


Figure 27 Pedestrian access arrangements along Gymnasium Road (south)

6.3.5 Construction traffic

Indicative daily traffic volumes for the project are expected to consist of the following:

- Articulated vehicles (up to 19m long) 10 per day
- Heavy Rigid Vehicle (12m) 20 per day
- Medium Rigid Vehicle (9m) 20 per day
- Special – eg. Mobile Crane (12m) 1 per week
- Contractors vehicles (cars/ vans) 50 per day

Construction traffic generation of 50 trucks is anticipated at the peak of the works, with each truck generating an entry and exit trip. It is anticipated that a peak of 15 two-way truck movements may occur during a one hour period. Trips generated by construction staff will typically be outside of the main road network peaks. The impact of construction traffic volumes on the external network is therefore expected to be low.

6.3.6 Parking

A limited amount of parking will be contained within the site for construction staff and visitors to the site. Other car parks on the Campus are subject to parking permits and will not be available for use by contractor staff.

It is expected that a number of workers will travel by public transport to the site, with workers able to store their tools on site. Carpooling will also be encouraged.

6.3.7 Work zones and staging areas

No work zones are required outside of the site boundary. If required, Gymnasium Road (south of the Sport and Aquatic Centre) will be used as a staging/layover area.

6.3.8 Vehicle movements

Mitigation measures shall be adopted during the construction phase to ensure traffic movements have minimal impact on surrounding land uses and the community in general, and would include the following:

- Truck loads will be covered during transportation off-site;
- Establishment and enforcement of appropriate on-site vehicle speed limits (20km/h), which will be reviewed depending on weather conditions or safety requirements;
- All activities, including the delivery of materials will not impede traffic flow along local roads and highways;
- Materials will be delivered and spoil removed during standard construction hours;
- Avoid idling trucks; and
- Deliveries will be planned to ensure a consistent and minimal number of trucks arriving at site at any one time.

6.3.9 Cumulative impacts

The planned future campus works and the anticipated main access routes for each project are shown in Figure 28.

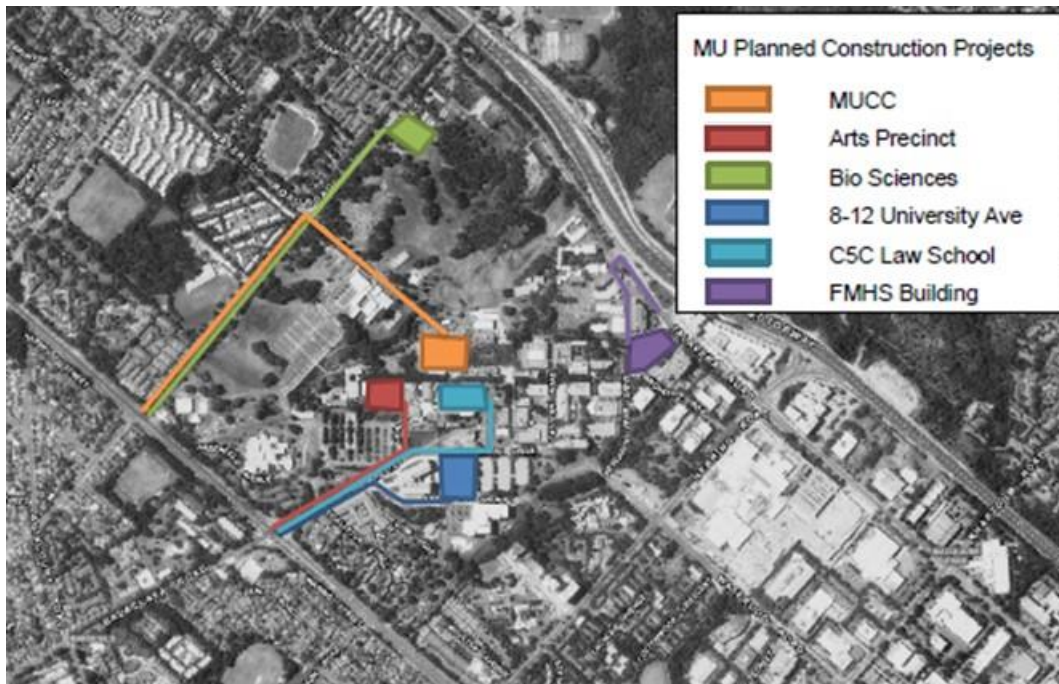


Figure 28 Planned Future MU campus Works

The estimated construction durations for these above projects are listed in Table 2.

Table 2 Duration of planned future MU campus works

Project	Construction works duration	Status
8-12 University Ave	2018-2020	Planned
Arts Precinct (W6A & W6B)	Mid 2018 – mid 2020	EIS on exhibition
C5C Law School Refurb	2020 - 2022	Planned
Bio Sciences Building	Oct 17 – Aug 18	DA Approved
FMHS Building Mid	2018 – mid 2019	Planned

The works are anticipated to overlap with the Macquarie University Arts Precinct Project which has a programme from June 2018 to February 2020. At its peak, a maximum of 30 trucks per day (60 two-way movements) are expected for this project, with numbers typically around 20 trucks per day or less. The main access to this site will be via Balaclava Road while internally the site is accessed off Western Road (see Figure 29). As the MUCCP redevelopment will use Gymnasium Road for access, the cumulative impact is expected to be low.

The Bio Sciences Project is programmed for completion in August 2018 and will therefore have a very small overlap with the MUCC works.

The works will also overlap with Metro Works which will result in the closure of Macquarie University train station (expected to last for 6 months from late 2018). A temporary transport plan is being put in place by TfNSW for this period which will see replacement bus services being provided.

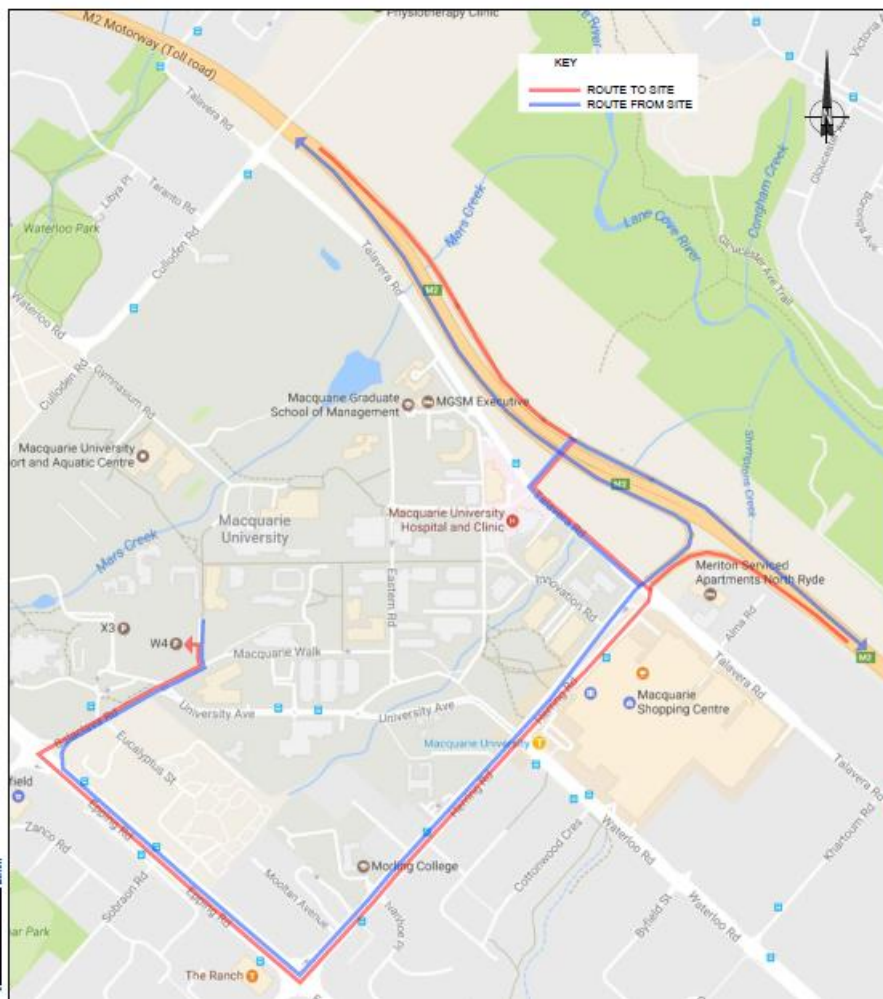


Figure 29 Arts Precinct truck access route

6.3.10 Driver code of conduct

- No queuing or marshalling of trucks will be permitted on a public road or outside of the areas identified within the Campus.
- All vehicles will enter and exit the site in a forward direction.
- Traffic controllers are not to stop traffic on public street(s) to allow trucks to enter or leave the University

6.4 Summary

Arup has prepared this draft Construction Traffic Management Plan for the construction works associated with the MUCCP. The draft CTMP provides a framework for the appointed Contractor to follow such that the works can be carried out safely, with impacts to pedestrians and other road users appropriately managed through the measures described in this section of the report.

7 Conclusion

A transport and accessibility impact assessment has been carried for the first phase of the Macquarie University Central Courtyard Precinct (MUCCP) redevelopment. The main features of the redevelopment are:

- Construction of a new, multi-storey Student Hub (1 Central Courtyard) in place of existing Building C10A, with ancillary retail uses;
- Construction of two student accommodation buildings (Building R1 and R2) to provide approximately 340 student beds and integrated academic uses;
- Redevelopment of the landscaped Central Courtyard; and
- Construction of a shared basement including plant, loading and waste management facilities, end of trip facilities and accessible parking.

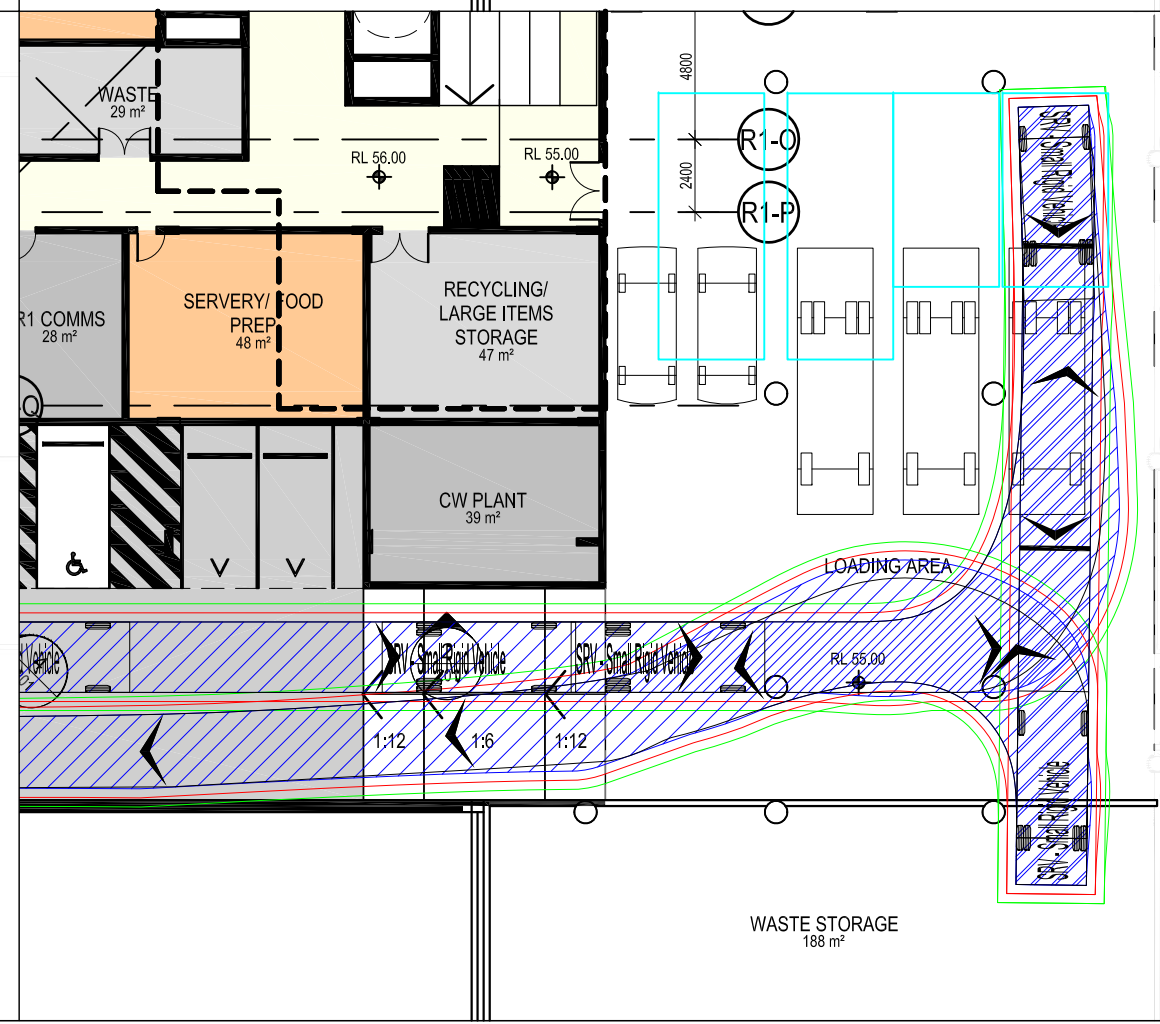
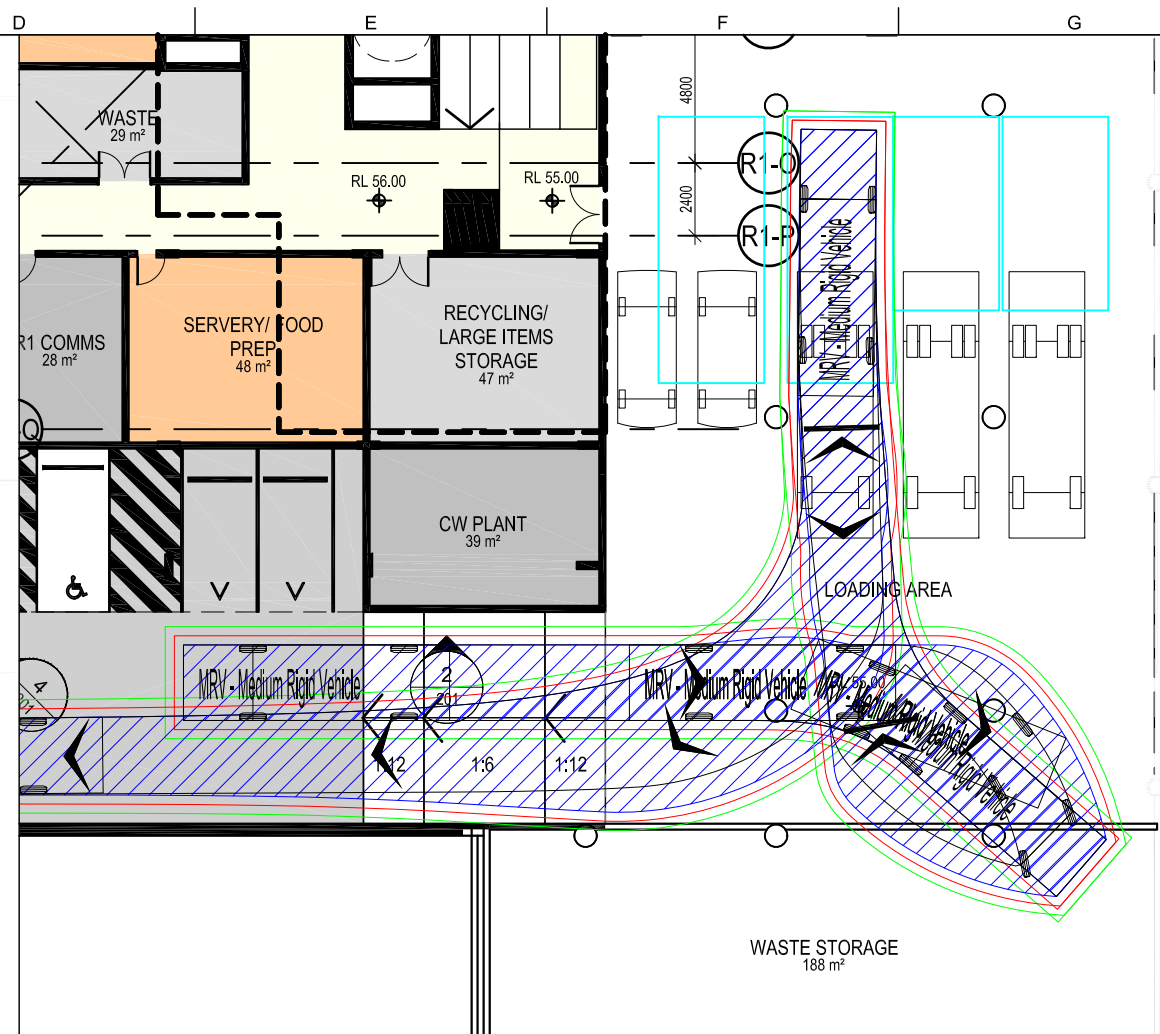
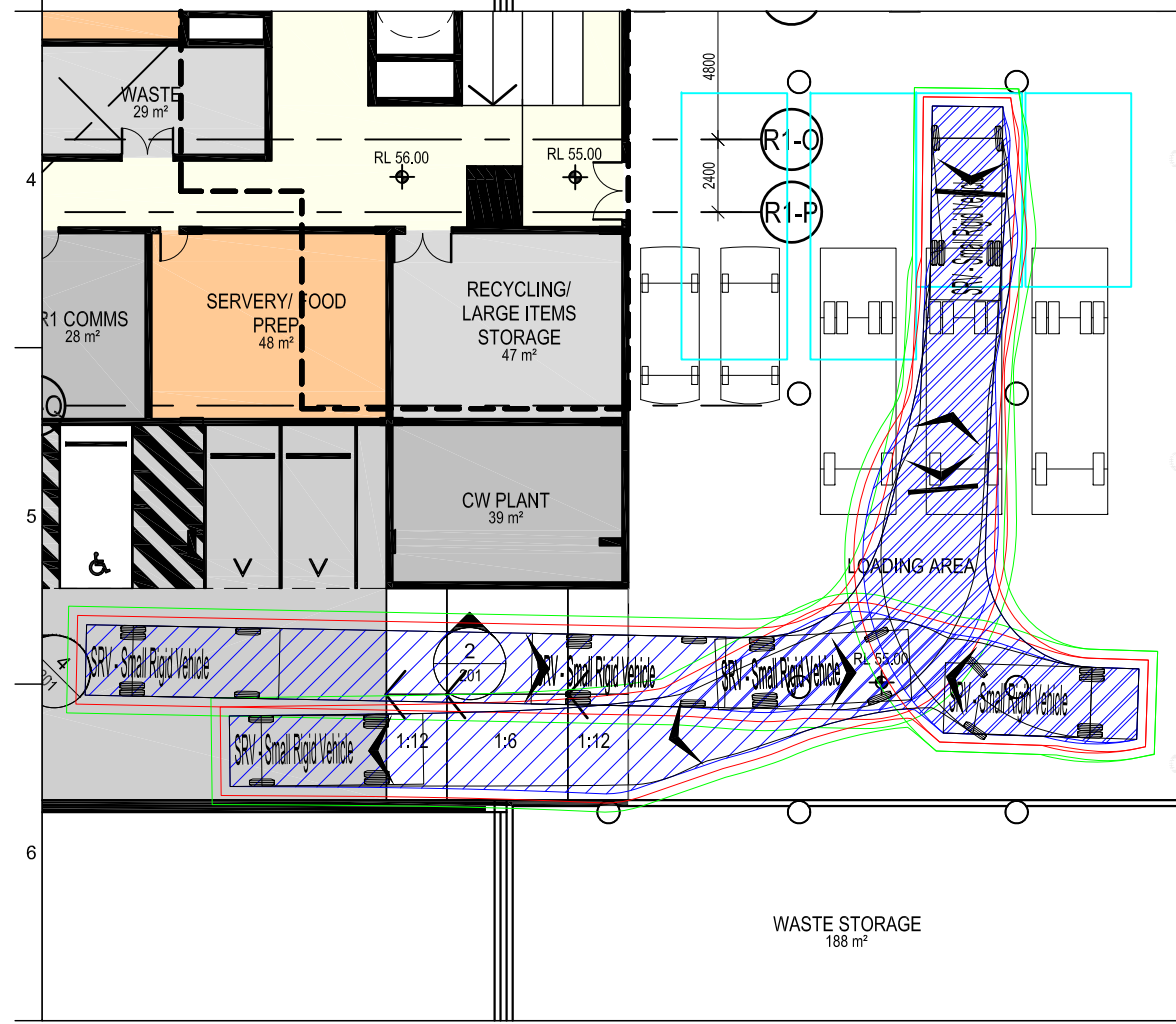
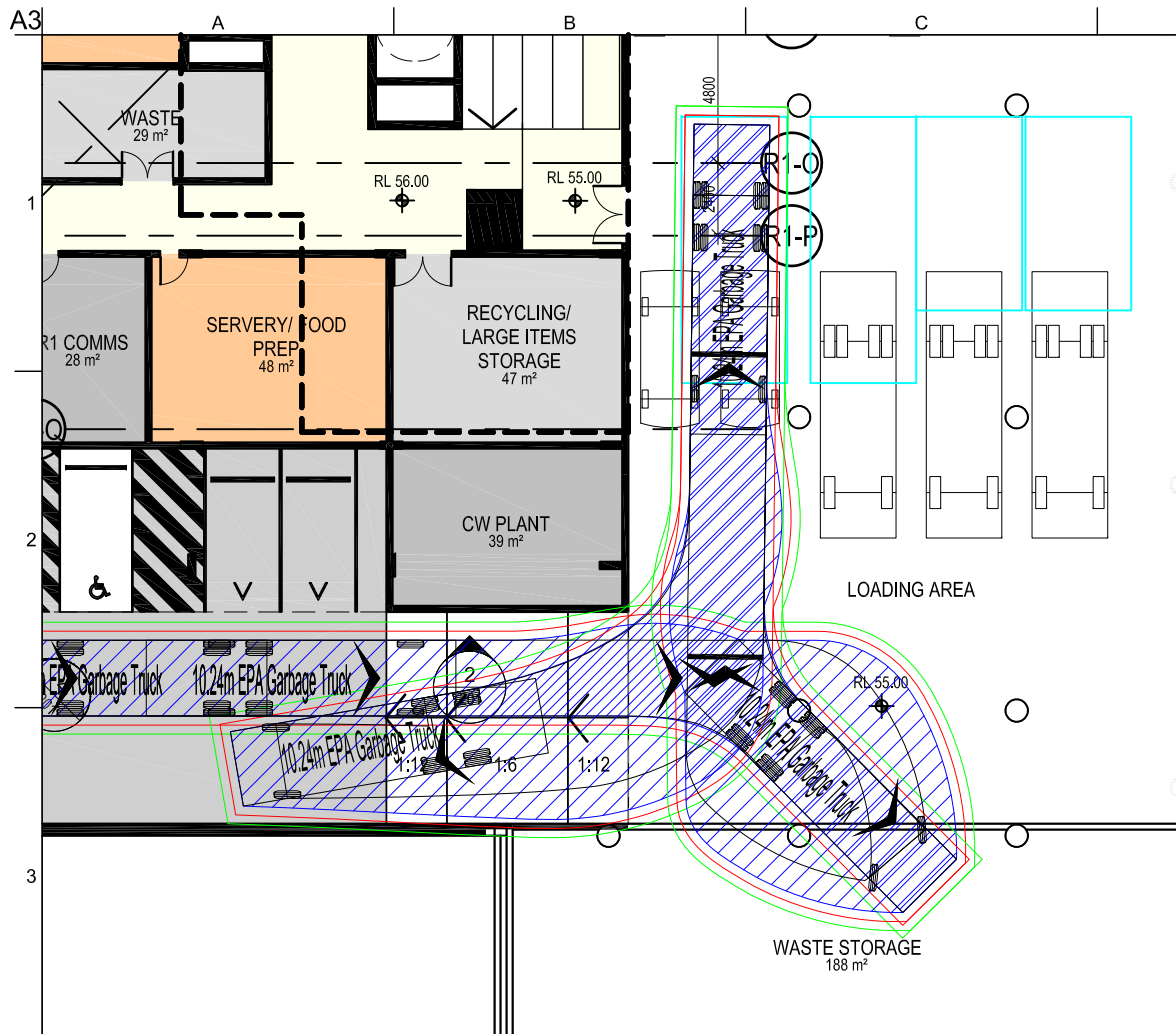
The key findings from the assessment are:

- MU has an overall car mode share of 33%;
- MU is well connected by rail and bus (including a shuttle bus) – rail will be suspended for a period of time while Metro upgrade works are taking place. This overlap with the construction period;
- 2014 Master Plan identifies strategies for pedestrians and cyclists;
- Two-way traffic volumes on Gymnasium Road is up to 300 during the morning period and 450 during the evening period. Peak of 15 two-way truck/bus movements also recorded;
- Approximately 5,000 parking spaces on Campus for academic purposes – concept plan and Master Plan seeks to keep it at this level and relocate it to the periphery of the Campus;
- The MU Travel Plan 2020 has been prepared with strategies for all modes and a detailed action plan set out to achieve objectives of the plan;
- Buildings R1, R2 and 1CC will share a basement with 4 DDA spaces, 2 visitor spaces, 2 SRV spaces and 2 MRV spaces provided (accessed via Gymnasium Road);
- Residential bike parking and a bike hub for staff and students to be provided with capacity for 68 bikes along with end of trip facilities;
- Area is very accessible for pedestrians, with connections to Gymnasium Road, Wallys Walk and Science Road;
- All servicing to take place at the loading dock in the shared basement;
- Fire tender access from Gymnasium Road for buildings R1 and R2 and from Science Road for building 1CC. Minor works required at the Science Road roundabout to facilitate this;
- Shuttle bus route to be extended on Gymnasium Road to stop outside of the residential development;

- Traffic generation to be positive, potentially removing 90 trips by car per day in both directions based on existing student mode share;
- Service vehicle volumes expected to be similar to existing volumes (when C10A was in use) given the number of retail and food and beverage units;
- A draft CTMP set out detailing a series of measures for all road users, in particular pedestrians;
- Main construction access to be via Gymnasium Road. Any construction vehicles larger than 12.5m HRV will be directed towards Epping Road when exiting the Campus;
- The right turn into the Campus from Culloden Road will be restricted to Construction vehicles only; and
- Around 50 trucks per day estimated at construction peak (100 movements two-way), with potentially 15 truck movements during peak periods.

Appendix A

Swept paths



- Legend**
- Body Envelope
 - 300mm Envelope
 - 600mm Envelope
 - Wheel Envelope

Design Vehicle(s)

SRV - Small Rigid Vehicle
Overall Length 6.400m
Overall Width 2.330m
Overall Body Height 3.500m
Min Body Ground Clearance 0.398m
Track Width 2.330m
Lock-to-lock time 4.00s
Curb to Curb Turning Radius 7.100m

MRV - Medium Rigid Vehicle
Overall Length 8.800m
Overall Width 2.500m
Overall Body Height 3.633m
Min Body Ground Clearance 0.428m
Track Width 2.500m
Lock to Lock Time 4.00 sec
Curb to Curb Turning Radius 10.000m

B	31/10/17	JF		
For Information				
Issue	Date	By	Chkd	Appd

ARUP

Arup, Level 10, 201 Kent St
Sydney, NSW, 2000
Tel +61(02)9320 9320 Fax +61(02)9320 9321
www.arup.com.au

Client
Macquarie University

Job Title
MUCCP

Drawing Title
Turning Paths

Scale at A3 1:250

Discipline **Transport**

Drawing Status
Draft

Job No 251278	Drawing No	Issue B
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A3

A

B

C

D

E

F

G

1

2

3

4

5

6

Vehicle encroaches opposing right-turn traffic lane. Traffic controller likely to be required or closure of right turn lane

Vehicle body overhangs - remove bollards

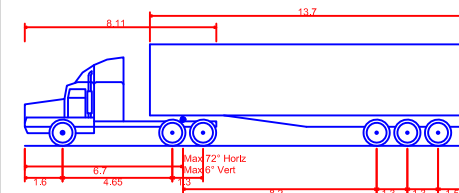
Vehicle wheels run over median - remove median and replace with road marking

Medians would need to be removed to accommodate right turn out. Vehicle blocks westbound lane when waiting at roundabout - recommended to ban right turn out for vehicles of this size.

Legend

- Body Envelope
- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

Design Vehicle(s)



Single Articulated (19 m)
Overall Length 19.00m
Overall Width 2.50m
Overall Body Height 4.30m
Min Body Ground Clearance 0.54m
Track Width 2.50m
Look to Lock Time 6.00 sec
Curb to Curb Turning Radius 12.50m

A	17/10/17	JF		
For Information				
Issue	Date	By	Chkd	Appd

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Client
Macquarie University

Job Title
MUCCP

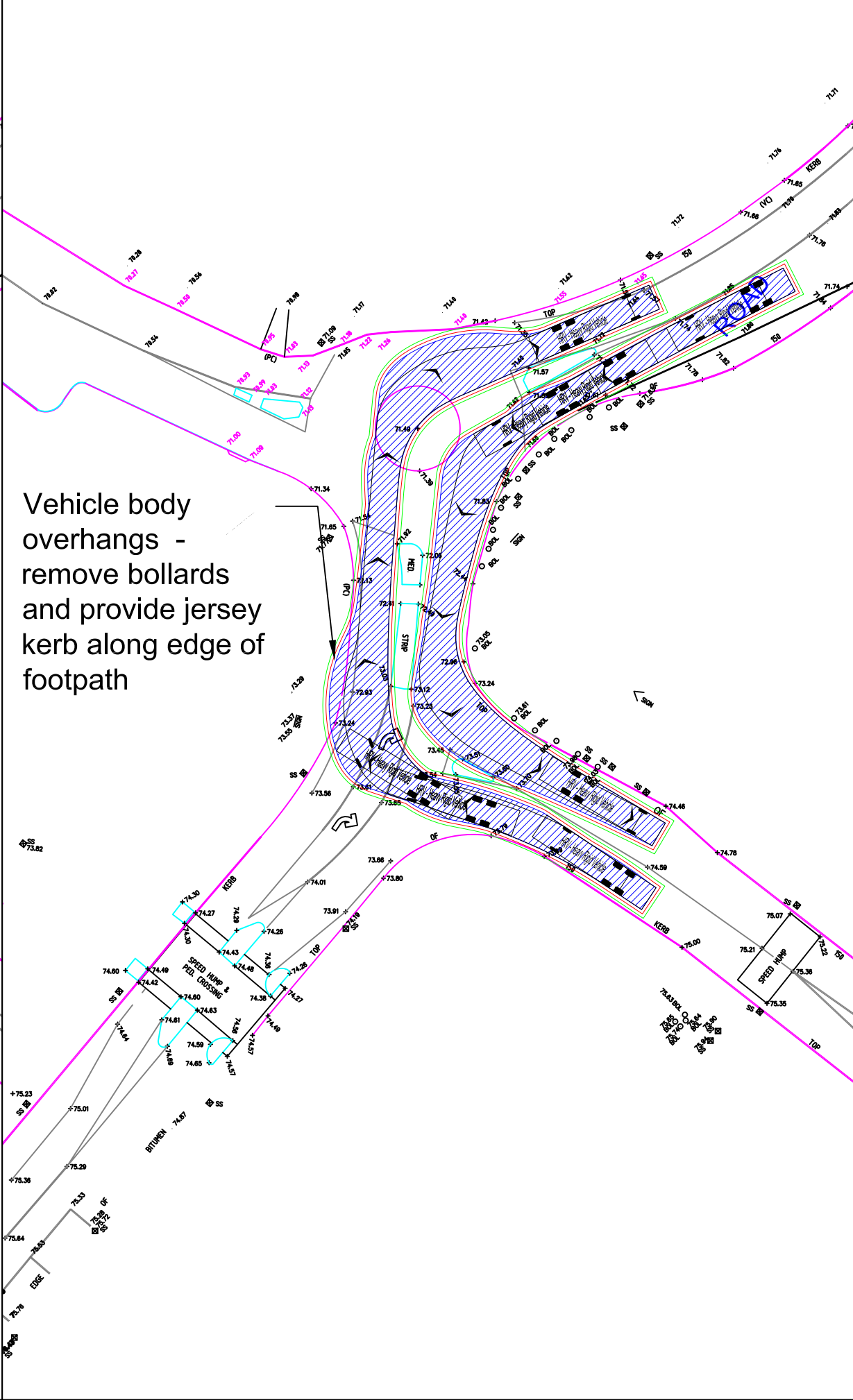
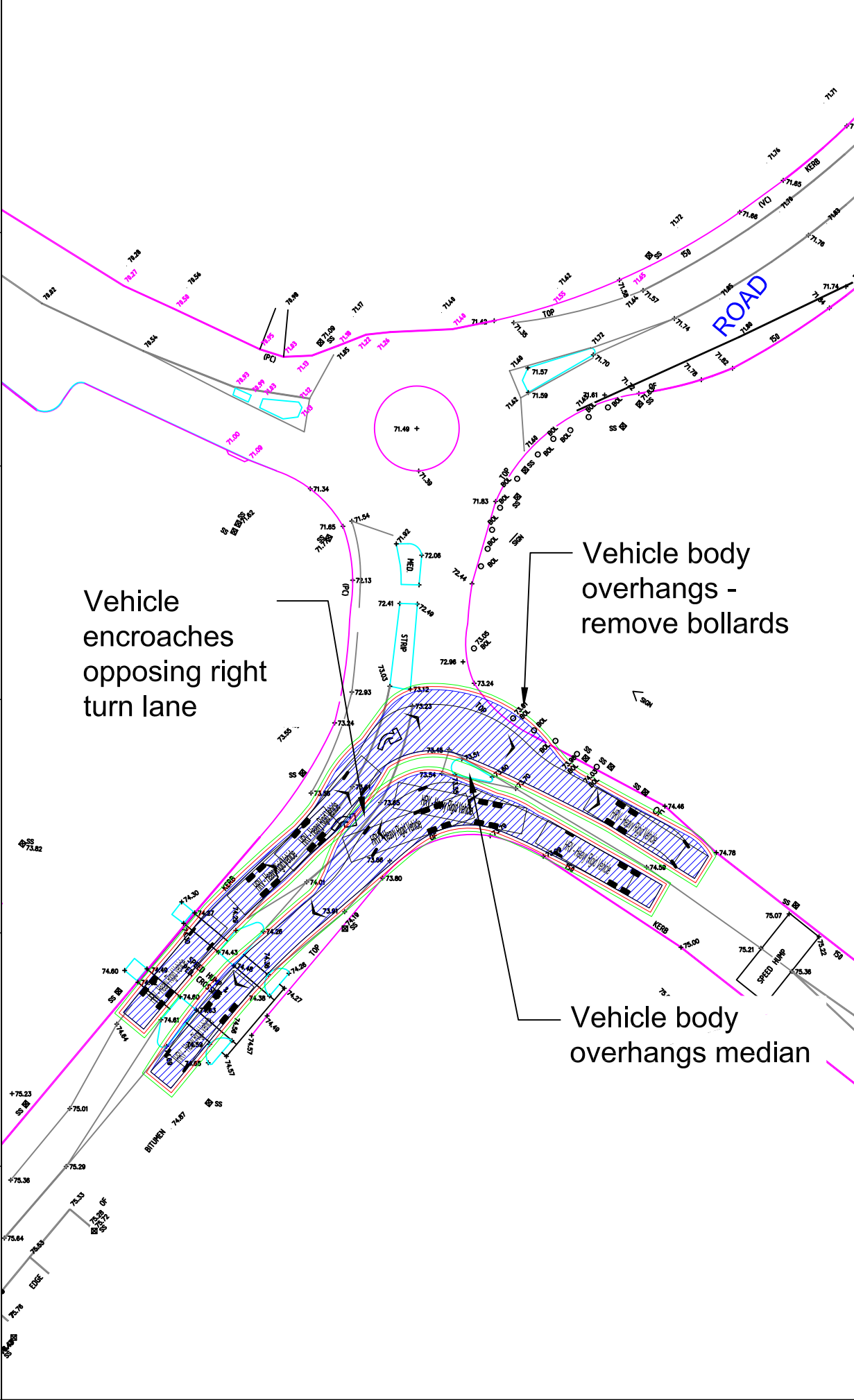
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Culloden Road & Gymnasium Road
Turning Paths - 19m Articulated Truck

Scale at A3
1:500

Discipline
Transport

Drawing Status
Draft

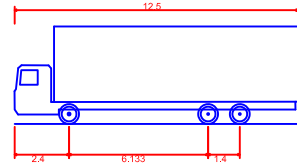
Job No 251278	Drawing No SKT008	Issue A
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Legend

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- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

Design Vehicle(s)



HRV - Heavy Rigid Vehicle
Overall Length 12.500m
Overall Width 2.500m
Overall Body Height 4.300m
Min Body Ground Clearance 0.417m
Track Width 2.500m
Lock to Lock Time 6.00 sec
Curb to Curb Turning Radius 12.500m

A	17/10/17	JF		
For Information				
Issue	Date	By	Chkd	Appd

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Client
Macquarie University

Job Title
MUCCP

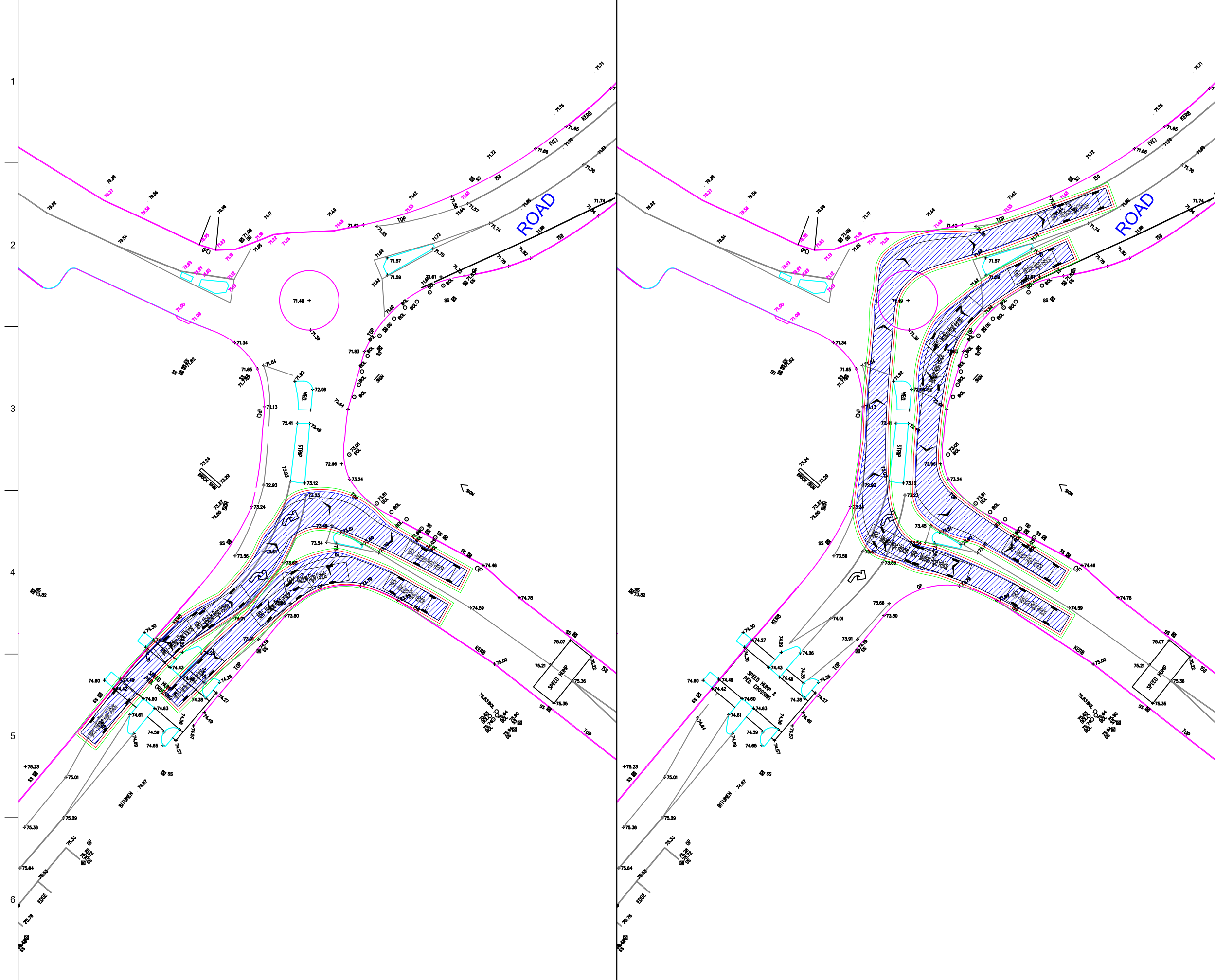
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Culloden Road & Gymnasium Road
Turning Paths - 12.5m Heavy Rigid

Scale at A3 1:500

Discipline Transport

Drawing Status
Draft

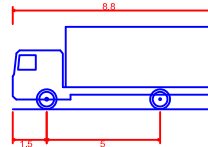
Job No 251278	Drawing No SKT009	Issue A
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Legend

- Body Envelope
- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

Design Vehicle(s)



MRV - Medium Rigid Vehicle
Overall Length 8.800m
Overall Width 2.500m
Overall Body Height 3.633m
Min Body Ground Clearance 0.428m
Track Width 2.500m
Lock to Lock Time 4.00 sec
Curb to Curb Turning Radius 10.000m

A	17/10/17	JF		
For Information				
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Client
Macquarie University

Job Title
MUCCP

Drawing Title
Culloden Road & Gymnasium Road
Turning Paths - 8.8m Medium Rigid

Scale at A3 1:500

Discipline Transport

Drawing Status

Draft

Job No 251278	Drawing No SKT010	Issue A
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